V CONVEGNO AISSA #UNDER40

LE SCIENZE AGRARIE NELL'ANTROPOCENE: DALLA PRODUTTIVITÀ ALLA TUTELA DEL PATRIMONIO MATERIALE E CULTURALE

BOOK OF ABSTRACTS

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CAMPUS DI NOVOLI, EDIFICIO D6

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Giovanni Mastrolonardo - AGR/14

Ricercatore senior (RTD-B) nel settore scientifico disciplinare AGR/14, Pedologia, presso il Dipartimento di Scienze e Tecnologie Agrarie, Alimentari Ambientali e Forestali dell'Università degli Studi di Firenze. Nel 2013 ha ottenuto il dottorato in scienza del suolo presso l'Università di Firenze e l'Università Paris VI (dottorato in cotutela). Ha prestato servizio come assegnista presso il CNR, l'Università di Bologna e ha svolto un post-doc Marie Curie presso l'Università di Liège in Belgio. I suoi principali interessi di ricerca includono lo studio delle caratteristiche dei suoli in ambienti agro-forestali e urbani, con particolare riferimento alla frazione organica, e il degrado del suolo a seguito di fenomeni naturali ed antropici.

Membri

Andrea Dominici – AGR/01

Ricercatore a tempo determinato (RTD-A) nel settore scientifico disciplinare AGR/01, Economia ed estimo rurale, presso il Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali dell'Università degli Studi di Firenze. Nel 2018 ha conseguito il Dottorato di Ricerca in "Gestione sostenibile delle risorse agrarie, forestali e alimentari" nella stessa Università. È stato visiting presso l'Adelaide Business School, University of Adelaide (Australia). I suoi principali interessi di ricerca riguardano lo studio dei comportamenti di consumo per i prodotti agroalimentari e le loro caratteristiche in termini di qualità e sostenibilità. In particolare, si è occupato delle preferenze dei consumatori per il vino, analizzando le determinanti nelle scelte di acquisto e focalizzandosi sul ruolo di indicazioni di origine, certificazione biologica, caratteristiche del packaging. È docente di estimo rurale.

Leonardo Verdi – AGR/02

Ricercatore a tempo determinato di tipo A nel settore scientifico disciplinare AGR/02, Agronomia e Coltivazioni Erbacee, presso il Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali (DAGRI) dell'Università degli Studi Firenze. Nel 2018 ha ottenuto il Dottorato di Ricerca in Scienze Agrarie e Ambientali presso la stessa Università. I suoi principali ambiti di ricerca includono l'agronomia e l'agrometeorologia, la fertilizzazione organica, le emissioni di gas serra dal suolo agricolo, la coltivazione di cereali da granella e lo studio del ruolo dell'agricoltura nella mitigazione dei cambiamenti climatici.

Luisa Leolini – AGR/02

Luisa Leolini è RTD-A nel settore scientifico disciplinare AGR/02 presso il Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali (DAGRI) dell'Università degli Studi di Firenze (UNIFI). Nel 2018, ha conseguito il Dottorato di Ricerca in Scienze Agrarie ed Ambientali presso UNIFI occupandosi di aspetti relativi alla modellistica colturale ed all'impatto del cambiamento climatico in viticoltura. Durante il suo dottorato, ha trascorso un periodo di ricerca all'estero presso l'Institut des Sciences de la Vigne et du Vin (ISVV) di Bordeaux (Francia) orientato allo sviluppo ed all'implementazione del modello della vite oggetto della tesi di dottorato. Dal 2018 al 2021, ha lavorato come assegnista di ricerca presso il DAGRI-UNIFI, occupandosi dell'implementazione di strumenti modellistici con dati derivati da sistemi di telerilevamento per il monitoraggio della coltura dell'olivo. Attualmente, si sta occupando dello sviluppo di modelli per la stima della biomassa e dei flussi di carbonio nei sistemi agro-pastorali, ed ha svolto parte delle sue attività di ricerca presso il Dipartimento di Agroecologia dell'Università di Aarhus (Danimarca).

Ermes Lo Piccolo – AGR/03

Ricercatore a tempo determinato di tipo A nel settore scientifico disciplinare AGR/03, Arboricoltura Generale e Coltivazioni Arboree, presso il Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali (DAGRI) dell'Università degli Studi Firenze. Principali linee di studio: Meccanismi fisiologici, biochimici e molecolari di risposta delle piante arboree a stress di natura abiotica e biotica. In questa linea di ricerca emergono chiare tematiche principali, come di seguito dettagliate: i) - Studio del processo fotosintetico in specie vegetali esposte a stress abiotici e biotici (stress idrico, stress salino, differenti qualità e quantità di luce); ii) Valutazione del ruolo fisiologico degli antociani in piante arboree; iii) Valutazione dell'impatto dell'inquinamento luminoso urbano su specie arboree.

Antonella Gori – AGR/03

Ricercatrice RTD-A nell'area scientifica AGR/03, Arboricoltura generale e Coltivazioni Arboree, presso il Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali (DAGRI) dell'Università di Firenze, ha completato il dottorato di ricerca in Scienze Agrarie ed Ambientali nel 2017 e ha lavorato come Postdoc presso lo stesso dipartimento dal 2018 al 2021. In passato, è stata Visiting presso l'Helmholtz Zentrum München in Germania e borsista di ricerca presso l'Istituto per la Protezione Sostenibile delle Piante (IPSP) del CNR. La sua ricerca si focalizza sulle risposte ecofisiologiche e biochimiche di piante arboree e arbustive a stress abiotici in contesto urbano e naturale, con particolare riguardo alla produzione di metaboliti secondari. Antonella Gori dedica inoltre le sue ricerche alla salvaguardia e valorizzazione delle specie selvatiche mediterranee, esplorandone le potenziali applicazioni nel settore ornamentale, alimentare e nutraceutico.

Elena Marra – AGR/06

Laureatasi all'università degli studi di Firenze in Scienze e Tecnologie dei Sistemi Forestali, ha conseguito il dottorato di ricerca in gestione sostenibile delle risorse Agrarie, Forestali e Alimentari nel 2021, presso università degli studi di Firenze. Ha perfezionato i suoi studi presso Swedish University of Agricultural Sciences (SLU - Department of forest biomaterials) e ha svolto con continuità attività di ricerca dal 2021 come ricercatrice e assegnista di ricerca presso il Centro di ricerca Foreste e Legno (CREA) e l'Università degli Studi di Firenze. Attualmente lavora presso l'Istituto di Ricerca sugli Ecosistemi Terrestri (IRET), del Consiglio nazionale delle ricerche (CNR). Le linee di ricerca su cui investiga si basa sul concetto di gestione forestale sostenibile (Sustainable Forest Operations – SFO), con particolare attenzione all'impatto al suolo ed alla vegetazione forestale nel settore scientifico disciplinare AGR/06.

Alice Checcucci – AGR/07

Ricercatrice presso il Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali dell'Università degli Studi di Firenze nel SSD AGR/07, Genetica Agraria. Nel 2017 ha ottenuto il Dottorato di Ricerca in Genetica e Microbiologia, presso l'Università degli Studi di Firenze, nello stesso anno il premio dell'Associazione Genetica Italiana come miglior tesi di dottorato. Nel 2018 è stata premiata dalla FEMS (Federation of European Microbiological Societies) con un Research Travel Grant per trascorrere un periodo di ricerca presso il CNRS di Marsiglia (Francia), e con una borsa annuale della Fondazione Adriano-Buzzati Traverso.

Ha svolto attività di ricerca presso il Dipartimento di Biologia dell'Università degli Studi di Firenze e il Dipartimento di Scienze e Tecnologie Agro-Alimentari dell'Università di Bologna. I suoi principali interessi di ricerca includono lo studio dell'interazione pianta-microrganismi per il miglioramento della produttività in campo agrario, la caratterizzazione dell'attività metabolica di cellule vegetali, e l'identificazione dei geni responsabili della resistenza a stress nelle piante.

Luigi Piemontese – AGR/08

Ricercatore junior (RTD-A) nel settore scientifico disciplinare AGR/08, Idraulica Agraria e Sistemazioni Idraulico-forestali, presso il Dipartimento di Scienze e Tecnologie Agrarie, Alimentari Ambientali e Forestali dell'Università degli Studi di Firenze. Nel 2020 ha conseguito il dottorato di ricerca in "Sustainability Science" presso lo Stockholm Resilience Centre dell'Università di Stoccolma, in Svezia. Dal 2020 lavora a Firenze su tematiche legate alla siccità, all'uso sostenibile dell'acqua in agricoltura e alla pianificazione di infrastrutture idriche in contesti aridi. Ha svolto ricerca sul campo in Italia, Uganda e Angola, è stato consulente per diverse agenzie internazionali, tra cui le Nazioni Unite e la World Bank, ed è affiliato al Bolin Centre for Climate Research, con il quale collabora su tematiche legate al cambiamento climatico.

Giulio Castelli – AGR/08

Ricercatore junior (RTD-A) nel settore scientifico disciplinare AGR/08, Idraulica Agraria e Sistemazioni Idraulico-forestali, presso il Dipartimento di Scienze e Tecnologie Agrarie, Alimentari Ambientali e Forestali dell'Università degli Studi di Firenze. Nel 2018 ha ottenuto il Dottorato di Ricerca in Gestione sostenibile delle risorse agrarie, forestali e alimentari presso la stessa Università. Nel 2017 ha vinto il Premio "Adriano Guarnieri" per il miglior elaborato in Ingegneria Agraria del XXX Ciclo di Dottorato. E' stato visiting presso lo Stockholm Resilience Center e ha lavorato come consulente per la World Bank in Ruanda e Burundi.I suoi principali interessi di ricerca includono la gestione delle risorse idriche, il water harvesting e l'utilizzo di approcci partecipati per la gestione delle risorse naturali. Attualmente ricopre anche il ruolo di visiting researcher all'Istituto di Scienze Ambientali e alla Cattedra UNESCO su Idropolitica dell'Università di Ginevra.

Ilenia Murgia – AGR/08

Assegnista di ricerca presso il Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali, si occupa dello studio del trasporto di sedimenti e legname di grandi dimensioni nei bacini forestali montani. Nel 2022 ha conseguito il dottorato di ricerca presso l'Università di Sassari, con un progetto di ricerca sul ruolo delle foreste nella protezione del suolo. La ricerca ha previsto la modellazione e quantificazione, a diverse scale di analisi, del contributo del rinforzo radicale alla stabilità di pendii. Il progetto ha previsto la collaborazione con l'Università di Scienze Applicate di Berna, con l'associazione internazionale per la gestione dei pericoli naturali (ecorisQ), e la società cooperativa DREAm Italia. Successivamente, ha svolto un assegno di ricerca presso il Politecnico delle Marche nell'ambito del progetto Biodiversità e Servizi Ecosistemici in foreste e territorio, in cui si è occupata del ruolo della foresta nella mitigazione del dissesto idrogeologico.

Giulia Angeloni – AGR/09

Assegnista di Ricerca nel settore scientifico disciplinare AGR/09 Meccanica Agraria, presso il Dipartimento di Scienze e Tecnologie Agrarie, Alimentari Ambientali e Forestali dell'Università degli Studi di Firenze. Nel 2019 ha conseguito il Dottorato di Ricerca in Gestione sostenibile delle risorse agrarie, forestali e alimentari presso la stessa Università. I suoi principali interessi di ricerca trattano argomenti inerenti alle Macchine e agli Impianti per le Industrie Agroalimentari, la Meccanica Agraria e la Meccanizzazione Agricola.
In questo ambito ha sviluppato l'attività di ricerca con particolare riferimento alla prototipazione di macchine innovative e gli impianti per il settore oleario, enologico e del caffè, alla sensoristica applicata agli impianti agroalimentari e riguardo lo studio di sistemi per il controllo di processo e di tecnologie per la gestione dei sottoprodotti delle industrie agro-alimentari. L'attività di ricerca si è sviluppata anche con obiettivi multidisciplinari ed in collaborazione con altre Università e centri di ricerca.

Lapo Pierguidi – AGR/15

Ricercatore junior (RTD-A) nel settore scientifico disciplinare AGR/15, Scienze e Tecnologie Alimentari, presso il Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali (DAGRI) dell'Università di Firenze, all'interno del gruppo di ricerca di Scienze Sensoriali (SensoryLab). Insegna Analisi Sensoriale delle uve e dei vini presso l'Università di Firenze. Ha ottenuto il titolo di Dottore di Ricerca in Gestione Sostenibile delle Risorse Agrarie, Forestali e Alimentari presso l'Università degli Studi di Firenze nel 2020. Dal 2016 ad oggi, ha lavorato presso il Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali (DAGRI) dell'Università di Firenze, ricoprendo l'incarico di dottorando, e successivamente, assegnista di ricerca partecipando a progetti di ricerca nazionali ed internazionali. Le sue attività di ricerca sono focalizzate sullo sviluppo di prodotti alimentari innovativi, maggiormente salutari e sostenibili.

Matteo Daghio – AGR/16

Ricercatore a tempo determinato (RTD-A) nel settore AGR/16 presso il Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali (DAGRI) dell'Università degli Studi di Firenze. Nel 2015 ha ottenuto il Dottorato di Ricerca in Scienze Ambientali presso il Dipartimento di Scienze dell'Ambiente e del Territorio e di Scienze della Terra (DISAT) dell'Università degli Studi di Milano-Bicocca. Ha svolto attività di ricerca post-dottorato presso l'Università di Milano-Bicocca - DISAT e presso l'Università di Firenze - DAGRI. È stato visiting scientist al Laboratory of Microbial Ecology and Technology (LabMET), Ghent University (Belgio) e al Department of Biological Sciences, Thompson Rivers University (BC, Canada). Ha partecipato a numerosi progetti di ricerca e ha esperienza nello studio di sistemi bioelettrochimici per il biorisanamento di ambienti contaminati da idrocarburi e metalli. Ha inoltre esperienza nell'uso di approcci molecolari per la caratterizzazione delle comunità microbiche in sistemi agro-industriali.

Maria Chiara Fabbri – AGR/17

Ricercatrice junior (RTD-A) nel settore scientifico disciplinare AGR/17, Zootecnia generale e miglioramento genetico presso il Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali (DAGRI) dell'Università degli Studi di Firenze. Ha conseguito il titolo di Dottore di Ricerca nel febbraio 2022, discutendo la tesi "Conservation status, genetic diversity and selection signatures of Italian autochthonous beef breeds utilizing pedigree and genomic information". I suoi principali interessi di ricerca includono: i) lo studio della diversità genetica e genomica nelle razze locali, in particolare nella specie bovina e delle potenziali strategie per la conservazione e la valorizzazione della biodiversità; ii) studi di associazione "genome-wide" applicati a specie altamente produttive ed a specie selvatiche e iii) elaborazione di indici genetici e genomici innovativi mirati al benessere riproduttivo dell'animale.

Giulia Secci – AGR/20

Laureata in Scienze e Tecnologie Alimentari (LM) presso l'Università degli Studi di Firenze con tesi risultata vincitrice del Premio di Laurea "Pierfrancesco Galigani" in Scienze Agrarie, Forestali e Ambientali (2010). Ha conseguito il titolo di Dottore di Ricerca Europeo (2016) con una tesi dal titolo "Ossidazione dei lipidi nei pesci e nei prodotti ittici di interesse per l'acquacoltura europea". Vincitore del Premio "Giovani Ricercatori Protagonisti 2016" con un progetto dal titolo "Greening animal-derived products supply chains: the innovative opportunity of insects in feeding sector". Ha perfezionato i propri studi presso l'Instituto de Investigacione Marina (CSIC-IIM) a Vigo (Spagna) e presso la DTU (Università Tecnica della Danimarca) per scopi di ricerca. Attualmente ricercatrice in Zoocolture, si occupa di ingredienti per l'acquacoltura e l'allevamento avicolo, di benessere dei pesci e di tecniche per la valorizzazione dei prodotti e dei sottoprodotti della filiera ittica.

COMITATO SCIENTIFICO

Carla Cavallo – AGR/01

Ricercatrice junior (RTD-A) nel settore scientifico disciplinare AGR/01, Economia ed estimo rurale, presso il Dipartimento di Scienze Agrarie dell'Università di Napoli Federico II, dove ha anche conseguito il dottorato nel 2016 in "Gestione e Valorizzazione delle risorse agro-forestali". È laureata in in Scienze e Tecnologie Agrarie presso l'Università di Napoli Federico II e in Management, Economics and Consumer Studies presso la Wageningen UR, Paesi Bassi. I suoi attuali interessi di ricerca sono legati al comportamento del consumatore per prodotti salutistici e sostenibili. Ha dedicato le sue attività di ricerca alla comprensione delle preferenze dei consumatori per l'olio extra vergine di oliva, considerando gli aspetti sensoriali propri dei prodotti a più alto contenuto salutistico. Nell'ambito delle diete salutari, si è occupata della percezione e del comportamento dei consumatori nei confronti delle verdure dal sapore amaro e delle possibili strategie (tradizionali e di nudging) per migliorare la dieta delle persone.

Leonardo Cei – AGR/01

Ricercatore junior (RTD-A) presso l'Università degli Studi di Padova nel settore scientifico disciplinare AGR/01, Economia ed estimo rurale. Laureato in Scienze e Tecnologie Agrarie presso l'Università degli Studi di Firenze, ha conseguito il Dottorato di ricerca in "Land, Environment, Resources and Health" presso l'Università degli Studi di Padova. I suoi principali interessi di ricerca sono i sistemi di qualità nel settore agroalimentare, con particolare riferimento ai segni di qualità comunitari, quali indicazioni geografiche, agricoltura biologica e prodotto di montagna. Inoltre, ha lavorato sull'analisi di sistemi agricoli locali, principalmente in un'ottica di valorizzazione della filiera e delle produzioni agricole, attività attraverso la quale ha partecipato a gruppi di ricerca nazionali ed internazionali.

Domenico Ronga – AGR/02

Professore Associato nel settore scientifico disciplinare AGR/02, Agronomia e Coltivazioni Erbacee, presso il Dipartimento di Farmacia dell'Università degli Studi di Salerno. Nel 2013 ha ottenuto il Dottorato di Ricerca in Scienze, tecnologie e biotecnologie agro-alimentari presso l'Università degli Studi di Modena e Reggio Emilia. Premi: "Giuseppe La Malfa", concorso SOI giovane ricercatore 2020; Sudinnova 2017; Laura Bacci 2014, per la migliore tesi di dottorato. Collaborazioni attive con Aarhus University, CREA, CRPA, CIB, WPTC.

I suoi principali interessi di ricerca includono studi per sviluppare e adottare tecniche innovative e ecosostenibili nei sistemi colturali convenzionali e a basso input, indagando le diverse risposte agronomiche delle colture anche in termini fisiologici. In particolare, le ricerche riguardano la valorizzazione di digestati, compost, tè di compost, microrganismi e biostimolanti ottenuti da coprodotti agroindustriali per la produzione di colture erbacee e per migliorarne la tolleranza agli stress abiotici anche mediante approcci di agricoltura digitale e di precisione.

Leonardo Verdi - AGR/02

Ricercatore a tempo determinato di tipo A nel settore scientifico disciplinare AGR/02, Agronomia e Coltivazioni Erbacee, presso il Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali (DAGRI) dell'Università degli Studi Firenze. Nel 2018 ha ottenuto il Dottorato di Ricerca in Scienze Agrarie e Ambientali presso la stessa Università. I suoi principali ambiti di ricerca includono l'agronomia e l'agrometeorologia, la fertilizzazione organica, le emissioni di gas serra dal suolo agricolo, la coltivazione di cereali da granella e lo studio del ruolo dell'agricoltura nella mitigazione dei cambiamenti climatici.

Vittoria Giannini – AGR/02

Ricercatrice a tempo determinato di tipo B nel settore scientifico disciplinare AGR/02, Agronomia e Coltivazioni Erbacee, presso il Dipartimento di Agronomia, Animali, Alimenti, Risorse Naturali e Ambiente (DAFNAE) dell'Università di Padova. È stata ricercatrice di tipo A presso il Dipartimento di Agraria, Università degli Studi di Sassari (2019-2022) ed assegnista di ricerca presso l'Istituto di Scienze della Vita, Scuola Superiore Sant'Anna di Pisa (2016-2019). Le principali tematiche di ricerca riguardano la fitodepurazione estensiva, il recupero agricolo di aree marginali, l'impiego di 'green infrastructure' nell'agroecosistema, strategie per la gestione eco-compatibile delle infestanti attraverso cover crops e inter-cropping. La sua attività didattica è principalmente focalizzata su coltivazioni erbacee biologiche e sistemi di produzione agricola biologica.

Antonio Pulina – AGR/02

Dottore di Ricerca in Scienze Agrarie dal 2017, è attualmente Ricercatore a tempo determinato (RTDa) in Agronomia e coltivazioni erbacee (SSD AGR/02) presso il Dipartimento di Agraria dell'Università degli Studi di Sassari. Attualmente le sue attività sono condotte nel contesto del programma PON-AIM (Attraction and International Mobility), finanziato dall'Unione Europea attraverso il Ministero dell'Università e della Ricerca, nel cui contesto ha intrapreso collaborazioni con la Purdue Universitiy (IN, USA), l'Università dell'Extremadura (SP) e la Aarhus University (DK). Le sue ricerche riguardano gli effetti della gestione agronomica sulla sostenibilità e sull'apporto dei servizi ecosistemici nei sistemi agrosilvopastorali mediterranei, con particolare riguardo agli aspetti quantitativi e qualitativi della produzione dei pascoli e al ciclo del C nell'agroecosistema, integrando attività sperimentale di campo con strumenti di remote sensing e approcci di tipo modellistico. Dal 2015 è membro della Società Italiana di Agronomia (SIA).

Giancarlo Pagnani – AGR/02

Ricercatore Junior (RTD-A) nel settore scientifico disciplinare AGR/02, Agronomia e Coltivazioni Erbacee, presso il Dipartimento Di Bioscienze E Tecnologie Agro-Alimentari E Ambientali dell'Università degli Studi di Teramo. Nel 2019 ha ottenuto il Dottorato di Ricerca in Scienze degli Alimenti presso l'Università degli Studi di Teramo. I temi di ricerca possono essere riassunti come segue: Produzioni vegetali; Agricoltura Sostenibile e Conservativa; Agricoltura di Precisione; Microbiologia ed Ecologia del Suolo. Principali Collaborazioni attive con il, Laboratorio di Microbiologia del Suolo dell'Università degli Studi dell'Aquila per lo studio ed applicazione di Microrganismi utili in Agricoltura come biofertilizzanti, e per l'analisi della biodiversità del suolo agrario in diversi tipi di gestione agronomica; Dipartimento di Fisica Medica ed Ingegneria della Neuromed, settore di Agricoltura Digitale, per lo studio attraverso la Tomografia a emissione di Positroni in agronomia, per misurazioni funzionali in vivo.

Giovanni Caruso – AGR/03

Professore Associato nel settore scientifico disciplinare AGR/03, Arboricoltura generale e coltivazioni arboree, presso il Dipartimento di Scienze Agrarie Alimentari e Agro-ambientali dell'Università di Pisa. Nel 2010 ha ottenuto il Dottorato di Ricerca in Scienza delle Produzioni Vegetatli presso la stessa Università. Nel 2020 ha ricevuto il premio Antico Fattore conferito dall'Accademia dei Georgofili per la pubblicazione dal titolo ""High resolution imagery acquired from an unmanned platform to estimate biophysical and geometrical parameters of olive trees under different irrigaton regimes", PlosOne 2019,14-e0210804. È membro del consiglio direttivo della Società di Ortoflorifrutticoltura Italiana e coordinatore del gruppo di lavoro "Olivo e Olio". I suoi principali interessi di ricerca includono la risposta agli stress abitotici delle specie arboree da frutto e la frutticoltura di precisione.

Marzia Leporino – AGR/04

Dottoranda nel settore scientifico disciplinare AGR/04, Orticoltura e floricoltura, presso il Dipartimento di Scienze Agrarie e Forestali (DAFNE) dell'Università degli Studi della Tuscia. L'attività di ricerca si focalizza sull'effetto di biostimolanti innovativi applicati a colture orticole per migliorare l'efficienza d'uso dei nutrienti e la resistenza a stress abiotici (stress idrico e salino). Nell'ambito dello spin off universitario Arcadia utilizza piattaforme di fenotipizzazione ad alta processività e collabora con il laboratorio oloBion (Barcellona) per approfondimenti sui meccanismi d'azione dei biostimolanti tramite l'analisi metabolomica. Ha partecipato al progetto Erasmus+ "Biostimulant Academy" per la diffusione di competenze e conoscenze sul settore validate dalla ricerca attraverso corsi di formazione digitali.

Roberta Bulgari – AGR/04

Ricercatrice junior (RTD-A) del settore scientifico disciplinare AGR/04, Orticoltura e floricoltura, presso il Dipartimento di Scienze Agrarie, Forestali e Alimentari (DISAFA) dell'Università di Torino, all'interno del gruppo di ricerca di Orticoltura e Piante officinali. È docente dell'insegnamento di Orticoltura presso l'Università di Torino. Laureata in Scienze Agrarie, ha conseguito il titolo di dottore di ricerca in Agricoltura, Ambiente e Bioenergia presso l'Università degli Studi di Milano nel 2018. Dal 2012 al 2021 ha lavorato presso il Dipartimento di Scienze Agrarie e Ambientali (DiSAA) dell'Università degli Studi di Milano. In questi anni ha ricoperto vari incarichi di borsista e assegnista di ricerca nell'ambito e ha partecipato a progetti di ricerca nazionali ed internazionali. Le attività di ricerca sono focalizzate sullo studio e il miglioramento della qualità degli ortaggi, anche in sistemi di coltivazione di tipo avanzato.

Giovanna Sala – AGR/05

Ricercatore (RTD-A) nel settore scientifico disciplinare AGR/05, Assestamento Forestale e Selvicoltura, presso il Dipartimento di Scienze Agrarie, Alimentati e Forestali, dell'Università degli Studi di Palermo. Nel 2016 ha conseguito il Dottorato di Ricerca in "Scienze Agrarie e Forestali" Indirizzo Sistemi Arborei Agrari e Forestali presso l' Università di Palermo. Nel 2021 ha ricevuto il premio miglior contribuito Giovane Socio SIEP conferito dalla Società Italiana di Ecologia del Paesaggio SIEP-IALE. È stata junior researcher, presso Peoples' Friendship University of Russia di Mosca. I suoi principali interessi di ricerca riguardano le risposte fisiologiche delle piante ai cambiamenti climatici attraverso analisi dendrometriche, l'uso di strumenti innovativi di monitoraggio in continuo che consentono di comprendere nel breve periodo le risposte delle piante all'ambiente.

Andrea Laschi – AGR/06

Professore Associato nel settore scientifico disciplinare AGR/06, "tecnologia del legno e utilizzazioni forestali", presso il Dipartimento di Scienze Agrarie, Alimentari e Forestali dell'Università degli Studi di Palermo. Nel 2016 ha ottenuto il Dottorato di Ricerca in "Gestione sostenibile delle risorse agrarie, forestali e alimentari" presso l'Università degli Studi di Firenze. Premio per la miglior tesi di dottorato nel settore scientifico disciplinare AGR/06 bandito da DAGRI – UNIFI e SISEF, con il patrocinio del MIPAAF e dell'AISF - Accademia Italiana di Scienze Forestali. Attualmente Deputy Coordinator del Research Group 3.05.00 "Forest Operation Ecology", International Union of Forest Research Organizations – IUFRO; socio corrispondente AISF; socio SISEF e UNIF. I suoi principali interessi di ricerca riguardano la filiera bosco-legno, in particolare la pianificazione, la sicurezza e gli impatti dei lavori di utilizzazione forestale e delle opere connesse, oltre alla valorizzazione degli assortimenti legnosi e la valutazione del ciclo di vita dei prodotti derivati.

Paola Cetera – AGR/06

Dal 2021 è ricercatrice (RTD-A) nel settore scientifico disciplinare AGR/06, Tecnologia del Legno e Utilizzazioni Forestali, presso il Dipartimento di Agraria dell'Università degli Studi di Sassari. Nel 2019 ha ottenuto il Dottorato di Ricerca in Scienze e Tecnologie Agrarie, Forestali e degli Alimenti presso l'Università degli Studi della Basilicata e nel 2017 ha svolto attività di ricerca presso l'Institute of Wood Technology (BOKU, Vienna). Dopo aver conseguito la laurea in Scienze Forestali e Ambientali ha lavorato presso il DAGRI dell'Università di Firenze, il CREA-IT di Monterotondo (Roma) e il CNR-IBE (ex IVALSA) di San Michele all'Adige (TN). Nell'ambito del SSD AGR/06, riceve prima il Premio "Nardi Berti" come miglior articolo e poi il premio SISEF-DAGRI, con il patrocinio del MIPAAF e dell'Accademia Italiana di Scienze Forestali, per la miglior tesi di dottorato. Ha svolto numerosi studi legati agli effetti dei processi di trattamento termico applicati al legno. Attualmente svolge attività di ricerca legata principalmente alla valorizzazione delle specie legnose, attraverso l'ottenimento dei metaboliti secondari ad elevata attività antiossidante e indaga le cause della presenza di TCA nel sughero.

Stefania Marzario – AGR/07

Assegnista di ricerca nel settore scientifico disciplinare AGR/07, Genetica Agraria, presso la Scuola di Scienze Agrarie, Forestali, Alimentari ed Ambientali dell'Università degli Studi della Basilicata. Nel 2011 ha conseguito la laurea magistrale in Scienze e Tecnologie Agrarie presso l'Università degli Studi della Basilicata e nel 2016, presso il Dipartimento di Scienze dello stesso ateneo, ha conseguito il Dottorato di Ricerca Internazionale in "Bioecosistemi e Biotecnologie". Dal 2016 ha svolto con continuità attività di ricerca come borsista e assegnista di ricerca in Genetica Agraria presso la Scuola di Scienze Agrarie, Forestali, Alimentari ed Ambientali dell'Università degli Studi della Basilicata. I suoi principali interessi di ricerca includono la caratterizzazione e conservazione delle risorse genetiche di cereali e leguminose per favorirne l'uso sostenibile e promuovere l'agrobiodiversità.

Stevo Lavrnic – AGR/08

Stevo Lavrnić è ingegnere ambientale ed è attualmente ricercatore senior nel settore AGR/08 (Idraulica agraria e sistemazioni idraulico-forestali) presso l'Alma Mater Studiorum - Università di Bologna. Dal 2017 presso il Dipartimento di Scienze e Tecnologie Agro-Alimentari svolge la sua attività di ricerca focalizzandosi sulla gestione e l'uso sostenibile delle risorse idriche in agricoltura, con particolare riferimento alle soluzioni naturali, e al riutilizzo delle acque reflue. Si laurea presso l'Università di Novi Sad (Serbia), consegue la laurea magistrale all'IHE Delft Institute for Water Education (Paesi Bassi) e il dottorato di ricerca all'Università di Cadice (Spagna). Ha partecipato a diversi progetti di ricerca regionali, nazionali ed internazionali ricoprendo anche i ruoli di Task e WP leader. È stato membro del comitato organizzatore, scientifico o di programma in oltre 10 convegni internazionali e svolge attività di revisore per diverse riviste scientifiche internazionali. Attualmente è membro del management committee dell'IWA (International Water Association) Specialist Group on Water Reuse e Specialist Group on Small Water and Wastewater Systems.

Giovanni Ricci – AGR/08

Ricercatore a tempo determinato di tipo B nel settore scientifico disciplinare AGR/08, Idraulica Agraria e Sistemazioni Idraulico-forestali, presso il Dipartimento di Scienze del Suolo della Pianta e Degli Alimenti (DiSSPA) dell'Università degli Studi di Bari Aldo Moro. Nel 2019 ha conseguito il titolo di Dottore di Ricerca in Biodiversità, Agricoltura e Ambiente presso la stessa Università. Nel 2021 ha vinto il Premio AIIA per Giovani ricercatori per il settore scientifico disciplinare AGR/08.
La sua attività di ricerca include tematiche quali l'analisi di dati e la modellazione idrologica a scala di bacino idrografico e l'analisi dell'effetto di pratiche di gestione sostenibile sul trasporto solido e sul trasporto di nutrienti. È autore di numerosi articoli pubblicati su riviste indicizzate ISI SCOPUS.

Maura Sannino – AGR/09

Ricercatore a tempo determinato nel settore scientifico disciplinare AGR/09, Meccanica Agraria, presso il Dipartimento di Agraria dell'Università degli Studi Napoli "Federico II". Nel 2017 il PhD in Scienze delle produzioni animali e vegetali (SPVA) XXIX ciclo di dottorato, presso il Dipartimento di scienze e tecnologie per l'agricoltura, le foreste, la natura, e l'energia (DAFNE) dell'Università degli studi della Tuscia. Collaborazioni attive con CREA-IT e l'azienda "3Bee srl". I suoi principali interessi di ricerca includono studi sulla gestione di cantieri di meccanizzazione di biomasse lignino-cellulosiche ed analisi dell'efficienza energetica delle macchine agricole; sulla caratterizzazione granulometrica di biomasse forestali e di scarti agricoli e valutazione del loro potere calorifico; sull'estrazione di olio da semi di oleaginose (Canapa, Cardo, Tabacco) ed implementazione di protocolli sperimentali di estrazione per l'analisi delle caratteristiche fisiche-chimiche sia dell'olio estratto che dei panelli, considerati residui di estrazione, sia per fini alimentari che energetici. Agricoltura di precisione: telerilevamento mediante camera multispettrale supportata da UAV (droni), per l'analisi e la realizzazione di mappe di prescrizione che evidenzino la variabilità spazio-temporale di un campo ad uso agricolo. Zootecnia di precisione: analisi dei paramenti tecnico funzionali degli AMS e degli AMF applicati alla razza bufala mediterranea.

Massimiliano Varani – AGR/09

Ricercatore junior (RTD-A) nel settore scientifico disciplinare AGR/09, Meccanica Agraria, presso il Dipartimento di Scienze e Tecnologie Agro-Alimentari dell'Alma Mater Studiorum – Università di Bologna. Nel 2018 ha ottenuto il Dottorato di Ricerca in Scienze e Tecnologie Agrarie, Ambientali e Alimentari presso Alma Mater Studiorum – Università di Bologna. Ha vinto il premio "Guarnieri-Montel" per la migliore tesi di dottorato XXX ciclo del settore AGR/09 all'interno del 1° Workshop sull'Innovazione nella Meccanica e nell'Impiantistica Applicate ai Biosistemi Agro-Alimentari e Forestali. I suoi principali interessi di ricerca includono l'analisi dell'efficienza di trattori e macchine agricole, implementazione di soluzioni elettrificate in ambito agricolo per abbatterne l'impatto ambientale e metodi per analizzare i dati di flotte di macchine agricole tramite rete CAN-Bus.

Enrica Santolini – AGR/10

Ricercatore junior (RTD-A) nel settore scientifico disciplinare AGR/10, Costruzioni rurali e territorio agroforestale, presso il Dipartimento di Scienze e Tecnologie Agro-Alimentari (DISTAL) dell'Università di Bologna. Attualmente è candidata nel Dottorato di Ricerca in Salute, Sicurezza e Sistemi del verde dell'Università di Bologna e, nel 2019, ha ottenuto il Dottorato di Ricerca in Ingegneria Agraria presso l'Università di Bologna. I suoi principali interessi di ricerca includono aspetti progettuali, energetici e ambientali relativi a diverse tipologie di costruzioni rurali (serre, cantine, edifici ad uso zootecnico). In tali tipologie di edifici, ha approfondito analisi CFD e di monitoraggio ambientale, così come aspetti energetici e di sostenibilità. È membro del gruppo di ricerca dell'Università di Bologna nell'ambito del progetto di ricerca PRIN 2017 in corso "Smart dairy farming: innovative solutions to improve herd productivity" e del progetto PRIMA "Self-enough Integrated Multi-Trophic AquaPonic systems for improving food production sustainability and brackish water use and recycling (SIMTAP)". È membro dell'Associazione Italiana di Ingegneria Agraria (AIIA), della Società Europea degli Ingegneri Agrari (EurAgEng) e della Commissione Internazionale di Ingegneria Agraria (CIGR).

Elena Costi – AGR/11

Ricercatore a tempo determinato nel settore scientifico disciplinare AGR/11, Entomologia generale ed applicata, presso il Dipartimento di Scienze della Vita dell'Università di Modena e Reggio Emilia. Nel 2017 ha ottenuto il Dottorato di Ricerca in Scienze, tecnologie e biotecnologie agro-alimentari presso l'Università degli Studi di Modena e Reggio Emilia e nello stesso anno ha trascorso un periodo di ricerca presso l'Agriculture and Agri-Food-Canada (BC, Canada) dove si è occupata dello studio della variabilità di parassitizzazione in diverse popolazioni di parassitoidi oofagi. La Dr.ssa Costi possiede competenze specifiche nel controllo biologico di insetti infestanti, sull'uso di strumenti tecnico-informatici per lo studio del comportamento animale e delle interazioni multitrofiche. Attualmente, le sue ricerche riguardano lo studio dei comportamenti di competizione tra le principali specie esotiche di parassitoidi oofagi della cimice asiatica Halyomorpha halys, e indagini di efficacia dei parassitoidi oofagi di cimice asiatica a tre anni dai rilasci del parassitoide esotico Trissolcus japonicus, recentemente rilasciato nel Nord Italia per il controllo biologico classico di H. halys.

Selena Tomada – AGR/12

Tecnico sperimentatore presso il Servizio fitosanitario e chimico, ricerca, sperimentazione e assistenza tecnica dell'Agenzia regionale per lo sviluppo rurale del Friuli Venezia Giulia – ERSA. Dal 2019 al 2022 ha ricoperto la figura di ricercatrice junior (RTD-A) presso la Libera Università di Bolzano nel settore scientifico disciplinare AGR/12, Patologia vegetale. Laureata in Scienze e Tecnologie Agrarie, nel 2017 ha ottenuto il Dottorato di Ricerca in Scienze e Biotecnologie Agrarie presso l'Università degli Studi di Udine in cooperazione con la Fondazione Edmund Mach (TN). A partire dallo stesso anno ha partecipato ad un progetto triennale di ricerca EFRE presso il Centro di Sperimentazione Laimburg (BZ). I suoi principali interessi di ricerca includono temi relativi alla gestione dei patogeni di post raccolta, epidemiologia e studio di popolazione dei principali patogeni della vite e studio degli agenti di biocontrollo.

Matteo Garau – AGR/13

Ricercatore a tempo determinato di tipo A nel settore scientifico disciplinare AGR/13, Chimica Agrarai, presso il Dipartimento di Agraria dell'Università degli Studi di Sassari. Nel 2021 ha ottenuto il Dottorato di Ricerca in Scienze Agrarie presso l'Università degli Studi di Sassari, vincitore premio SICA per la migliore tesi di dottorato edizione 2020-2021 sulla tematica "Innovazione e Tecnologie nel sistema suolo-pianta per uno sviluppo sostenibile e una agricoltura responsabile". Collaborazioni attive con l'University of Reading (UK) e il KNUST (Ghana). I suoi principali interessi di ricerca includono studi per sviluppare adottare tecniche innovative e ecosostenibili per il recupero funzionale di suoli marginali, contaminati e degradati. In particolare, le ricerche riguardano l'applicazione di ammendanti organici e consorzi microbici a suoli contaminati per aumentare l'efficienza delle tecniche di fitorisanamento; e la valorizzazione di sottoprodotti agro-industriali per la produzione di ammendanti organici da applicare a suoli degradati per incrementare le produzioni agrarie ecosostenibili specialmente in Paesi in via di sviluppo.

Costanza Ceccanti – AGR/13

Ricercatore junior (RTD-A) nel settore scientifico disciplinare AGR/13, Chimica Agraria, presso il Dipartimento di Scienze Agrarie, Alimentari e Agro-ambientali dell'Università di Pisa. Nel 2020 ha ottenuto il Dottorato di Ricerca in Scienze Agrarie, Alimentari e Agro-ambientali presso l'Università di Pisa. Collaborazioni attive con Università degli Studi di Milano Statale, CREA Sede di Bologna, Istituto Politecnico di Braganza, Università Cattolica del Sacro Cuore – Campus di Piacenza e Cremona, Università del Salento e Università Campus Bio-medico di Roma. I suoi principali interessi di ricerca includono studi mirati all'incremento della produzione nonché della qualità nutrizionale e nutraceutica di prodotti ortofrutticoli attraverso tecniche innovative agronomiche (per es. intercropping) o tecnologiche (per es. fotomodulazione). Inoltre, recentemente, i suoi interessi di ricerca includono anche lo studio delle risposte del sistema antiossidante delle piante sottoposte a stress abiotici quali lo stress salino o eccesso/carenza nell'uptake di azoto.

Mauro De Feudis – AGR/14

Ricercatore in Tenure Track (RTT) nel settore scientifico disciplinare AGR/14, Pedologia, presso il Dipartimento di Scienze e Tecnologie Agro-Alimentari dell'Alma Mater Studiorum – Università di Bologna. Nel 2017 ha ottenuto il Dottorato di Ricerca in Scienze e Biotecnologie Agrarie, Alimentari e Ambientali con specializzazione in Pedologia presso l'Università degli Studi di Perugia. Ha prestato servizio come assegnista presso l'Università di Perugia, l'Università di Bologna e Ricercatore a Tempo Determinato junior (RTDa) presso l'Università di Bologna. I suoi principali interessi di ricerca includono lo studio delle caratteristiche dei suoli in ambienti agro-forestali, con particolare riferimento all'aspetto dei processi rizosferici, delle componenti organiche, della diversità dei suoli anche attraverso l'uso di tecnologia GIS e della vocazionalità dei suoli.

Alessandra Marti– AGR/15

Professore Associato nel settore scientifico disciplinare AGR/15, Scienze e Tecnologie Alimentari, presso il Dipartimento di Scienze per gli alimenti, la Nutrizione e l'Ambiente (DeFENS) dell'Università degli Studi di Milano. Nel 2010 ha ottenuto il Dottorato di Ricerca in Biotecnologia degli Alimenti presso l'Università degli Studi di Milano. Assegnista di ricerca dal 2011 al 2015 ed RTD-A dal 2015 al 2018 presso lo stesso Ateneo. La principale attività di didattica e di ricerca della Prof.ssa Marti riguarda le Scienze e Tecnologie dei Cereali e, nello specifico, le proprietà funzionali di cereali e legumi (e loro frazioni) in relazione allo sviluppo di nuovi ingredienti e formulazioni per l'industria alimentare, con particolare attenzione per la trasformazione in pasta, pane e altri prodotti da forno, nonché snack estrusi. La Prof.ssa Marti ha una considerevole esperienza all'estero, presso università, centri di ricerca e industrie (University of Guelph, University of Minnesota, Brabender GmbH & Co. KG e German Research Centre for Food Chemistry), nonché nella gestione di progetti industriali e non. È autore di più di 100 contributi scientifici pubblicati su riviste di rilevanza internazionale.

Elisa Salvetti – AGR/16

Elisa Salvetti è RTDB nel settore scientifico disciplinare AGR/16, Microbiologia Agraria, presso il Dipartimento di Biotecnologie, Università di Verona. Nel 2012 ha conseguito il titolo di Dottore di Ricerca in Biotecnologie Agro- Industriali presso l'Università di Verona con un progetto finanziato dall'azienda Yakult Europe BV ed è stata beneficiaria di un finanziamento dalla Regione Veneto che le ha permesso di collaborare con Microbion srl e successivamente diventarne socia. Nel 2015 è stata beneficiaria di una borsa biennale Horizon 2020 Marie Skłodowska Curie presso l'APC Microbiome Institute, University College Cork (Irlanda), in collaborazione con l'azienda Chr. Hansen A/S (Danimarca), presso la quale è stata visiting scientist. Dal 2017 al 2021 ha lavorato sia come Assegnista di Ricerca presso l'Università di Verona che come consulente per aziende del settore alimentare e salutistico. I principali interessi di ricerca riguardano la biodiversità microbica, principalmente associata agli alimenti fermentati, e l'analisi della sicurezza di microrganismi di interesse industriale e alimentare.

Marika Pellegrini – AGR/16

RTD-b nel settore scientifico disciplinare AGR/16, Microbiologia Agraria, presso il Dipartimento di Medicina clinica, sanità pubblica, scienze della vita e dell'ambiente dal 2023. Nel 2018 ha ottenuto il Dottorato di Ricerca (Doctor Europaeus) in Scienze degli Alimenti presso l'Università degli Studi di Teramo. Dal 2018 al 2023 ha ottenuto contratti con organismi di ricerca privati e assegni di ricerca presso l'Università degli Studi dell'Aquila, svolgendo le attività sperimentali presso l'Ateneo aquilano. Gli ambiti di ricerca principali riguardano l'isolamento, la caratterizzazione, la formulazione e l'uso di ceppi microbici utili in agricoltura sostenibile (agenti biostimolanti, di biocontrollo e mitigazione stress abiotici) e applicazioni biotecnologiche (biominerali e bioplastiche). Altre linee di ricerca riguardano l'ecologia microbica di sistemi ambientali attraverso tecniche coltura-dipendente e molecolari.

Michela Ablondi – AGR/17

Ricercatrice junior (RTD-A) nel settore scientifico disciplinare AGR/17, Zootecnia generale e miglioramento genetico presso il Dipartimento di Scienze Medico-Veterinarie dell'Università degli Studi di Parma. Ha conseguito il titolo di Dottore di Ricerca a marzo 2021, discutendo la tesi "Pedigree and genomic information for horse breeding and genetic diversity conservation". I suoi principali interessi di ricerca includono: i) lo studio della diversità genetica e genomica nelle razze locali, in particolare nella specie equina e bovina e delle potenziali strategie per la conservazione e la valorizzazione della biodiversità; ii) stima parametri genetici e studi di associazione "genome-wide" applicati a nuovi caratteri fenotipici rilevati tramite strumenti PLF (Precision Livestock Farming).

Valentina Caprarulo – AGR/18

Ricercatrice junior (RTD-A) nel settore scientifico disciplinare AGR/18, Nutrizione e Alimentazione Animale, presso il Dipartimento di Ingegneria Civile, Architettura, Territorio, Ambiente e di Matematica (DICATAM) dell'Università degli Studi di Brescia. Nel 2017 ha ottenuto il Dottorato di Ricerca in Scienze della Nutrizione presso l'Università Università degli studi di Milano. Nel 2017 è risultata vincitrice del Cost action- Dairy care Grant. I suoi principali interessi di ricerca includono: i) strategie innovative in campo zootecnico al fine di diminuire le emissioni (ammoniaca, Greenhouse Gases – GHG) e le specie chimiche legate al ciclo dell'azoto e di aumentare l'efficienza di utilizzazione dei nutrienti e utilizzo di sostanze bioattive per il miglioramento delle produzioni animali; ii) studio in vivo ed in vitro dell'efficacia di additivi innovativi e/o ingredienti, additivi alternativi agli antibiotici, al fine di migliorare le produzioni animali, l'efficienza produttiva e la salute degli animali.

Vincenzo Lopreiato – AGR/19

Ricercatore a tempo pieno (AGR/19) in nutrizione e fisiologia dei ruminanti, e diversi articoli già pubblicati. Vincenzo è nato e cresciuto in un'allevamento di bovini da latte nel sud Italia e ha imparato ad apprezzare l'agricoltura italiana in giovane età.
Dopo aver completato la Laurea Magistrale in Produzioni Animali presso l'UCSC di Piacenza, Vincenzo ha conseguito il Dottorato di Ricerca in Scienze Animali presso l'Università Magna Graecia. Vincenzo è attualmente ricercatore a tempo pieno di nutrizione e fisiologia dei bovini (adulti e giovani) presso il Dipartimento di Scienze Veterinarie dell' Università degli studi di Messina.
Il programma di ricerca di Vincenzo si è concentrato sugli aspetti nutrizionali e fisiologici, compresa la genomica durante il periodo di transizione delle vacche da latte e dei vitelli da latte. Il suo laboratorio utilizza animali vivi come modelli per scoprire i meccanismi regolatori associati agli effetti dei nutrienti sullo sviluppo e sulla funzione dei tessuti. Trascrittomica, metabolomica, bioinformatica e citofluorimetria sono alcuni delle metodologia per l'applicazione della System Biology.

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agrobit

Agrobit è una startup agtech che sviluppa soluzioni di agricoltura digitale e sistemi di supporto alle decisioni (DSS) utilizzando immagini delle colture raccolte da smartphone, trattori e droni. La missione di Agrobit è aiutare agricoltori e tecnici a prendere decisioni migliori nella distribuzione di input chimici e acqua, riducendo gli impatti economici, sociali e ambientali delle attività agricole, in linea con il Green Deal Europeo e gli obiettivi di sostenibilità dell'ONU. Il prodotto principale di Agrobit è iAgro, un'innovativa app mobile DSS che trasforma lo smartphone in uno strumento di agricoltura di precisione scalabile e a basso costo sfruttando intelligenza artificiale (AI), realtàaumentata (AR), computer vision, la modellazione 3D (digital twin) e le tecnologie di cloud computing. L'app consente di ottenere dati biometrici e biofisici delle colture arboree, esportare report approfonditi, mappe e creare la cronologia dello stato di salute del campo. Utilizzando lo smartphone, l'utente esegue una scansione 3D sulla pianta target e algoritmi di AI creano il suo modello 3D (gemello digitale) e calcolano automaticamente i parametri biometrici (spessore, altezza, volume delal chioma), parametri di vigore (LAI, LWA, TRV) e le dosi ottimali di agrofarmaci e acqua da distribuire in campo. Ripetendo le scansioni in più punti del campo, l'app permette di generare automaticamente mappe di vigoria (utili per ottimizzare la concimazione o la raccolta dei frutti) e mappe di prescrizione per trattamenti fitosanitari ottimizzati.
Il servizio principale di Agrobit è iDrone, un servizio che sfrutta droni muniti di sensori RGB, multispettrali e termici per valutare la salute delle colture, creare mappe di vigore vegetativo, mappe termiche, mappe di prescrizione e modelli 3D, per aumentare la produttività e ottimizzare le operazioni in campo. Le mappe e i modelli 3D generati vengono analizzati da algoritmi proprietari per generare informazioni utili sulle colture al fine di ottimizzare le operazioni agricole (fertilizzazione, irrigazione, trattamenti fitosanitari e raccolta), consentendo di prendere decisioni migliori e più informate grazie ai dati digitali, verso un approccio di un'agricoltura più sostenibile e resiliente.
Agrobit nasce dall'esperienza di Simon-Paolo Kartsiotis, ingegnere aerospaziale ed analista dati con pluriennale esperienza lavorativa in ambito industriale (automotive, motorsport e aerospazio), operatore ENAC (Ente Nazionale Aviazione Civile) di aeromobili a pilotaggio remoto in aree non critiche ed abilitato al pilotaggio di droni inferiori ai 4 kg di peso. Co-fondatore dell'azienda è Niccolò Bartoloni, agronomo libero professionista con un master in viticoltura ed enologia ed esperienza ventennale a livello tecnico e direttivo di importanti aziende e gruppi vitivinicoli italiani, oltre che esperto tecnico certificatore per agricoltura biologica e pilota di droni.

AIRNOVA | la qualità è nell'aria

"Airnova, da oltre trent'anni nel mondo del controllo della Qualità dell'Aria, progetta e sviluppa soluzioni innovative per il monitoraggio dei gas, delle polveri, del microclima e delle emissioni in atmosfera, per garantire elevati standard di qualità dell'aria nei luoghi di lavoro, nell'ambiente che ci circonda e nei processi industriali.

Migliora costantemente il proprio know-how scientifico e tecnologico sviluppato nel corso degli anni, implementando una continua attività di Ricerca e Sviluppo, grazie anche al contributo ed alla stretta collaborazione con Università, Centri di Ricerca ed Associazioni di categoria.

Airnova coopera con i propri clienti e partners per contribuire alla salvaguardia della salute delle persone e dell'ambiente in cui viviamo partendo dal controllo del primo elemento naturale: l'aria."

Rossi Strumenti

ECOSEARCH ENVIRONMENTAL MONITORING AND SAMPLING

syngenta

agrobit

AIRNOVA

BIO CLASS

FRESCOBALDI TOSCANA

Mugello — Toscana POGGIO DEL FARRO

Associazione Vivaisti Italiani

RDM PROGETTI

Basilico B.Tech CAMMELLI DALLA NOSTRA TERRA ALLA VOSTRA TAVOLA

Mulino Val d'Orcia BIOLOGICI DAL 1992

MAZZEI 1435

OLIONOSTRUM

MERCOLEDÌ 26 GIUGNO 2024

08:30 Registrazione partecipanti **– Edificio D6, Campus di Novoli**

09:30 Saluti e apertura dei lavori – **Aula 018**

10:00 **Ramona Magno (CNR-IBE FIRENZE)** *"Come la crisi climatica mette a rischio acqua e suolo. Preservarli è possibile?"* ***- chair: Antonella Gori UNIFI***

10:30 Coffee break

11:00

PRIMA SESSIONE S4 - aula 007

L'importanza di biostimolanti, bioinoculanti e probiotici nel miglioramento della crescita e della salute in piante e animali

Chairs: Valentina Caprarulo UNIBS, Alice Checcucci UNIFI, Giulia Secci UNIFI

Laura Pilotto (UNIUD) S4 - 01
Sustainable Fertilization: First Evidence into the Combined Use of Natural Nano-Hydroxyapatite and P-Solubilizing Bacteria in Hordeum vulgare
Noemi Di Vita (CNR) S4 - 02
Virus-Induced Gene-Silencing as tool for triggering RNAi for weed control
Carmen Cimminella (UNINA) S4 - 03
Bacillus and microbial consortia as alternatives for improving plant health
Gaia Santini (UNIFI) S4 - 04
Evaluation of biostimulant and biocidal activity of four nostoc strains for potential agricultural exploitation
Marzia Vergine (UNISAL) S4 - 05
Resistance against invasion: the role of the endophytic community against Xylella fastidiosa in olive tree
Giacomo Rodegher (UNIVR) S4 - 06
The synergistic action of FA and CDPH to correct Fe deficiency in plants
Rihab Djebaili (UNIAQ) S4 - 07
Halotolerant plant growth promoting Bacillus strains Bm1, E1, and F1 mitigate salt stress in Phaseolus vulgaris
Francesca Vaccaro (UNIFI) S4 - 08
Genotype-by-genotype interkingdom cross-talk between symbiotic nitrogen fixing sinorhizobium meliloti strains and trichoderma species

Short communications

Giovanna Marta Fusco (UNICAMPANIA) S4 - SC01
Biostimulants as effectors of Metabolic Profiling and Phenotypic Plasticity under changing environment
Laura Alberico (UNICAMPANIA) S4 - SC02
Cerato and Curniciello dry beans: molecular characterization of two different ecotypes from Caserta's rural areas
Annamaria Massafra (UNIMORE) S4 - SC03
Sustainable strategies to improve plant growth and protection: biostimulant action of Brassicaceae hydrolysates and new solarization system for pest control
Cosimo Beltrami (UNIFI) S4 - SC04
Biological activity of plant defence inducers: deeds not words
Giulia Scimone (UNIPI) S4 - SC05
Antifungal activity of five biological extracts against the casual agent of grey mold
Laura Mandrelli (UNIBAS) S4 - SC06
Biofertilizers in almond crop

PRIMA SESSIONE S1- aula 018

Economia circolare, sviluppo sostenibile e tecnologico, consumatori

Chairs: Leonardo Cei UNIPD, Andrea Dominici UNIFI, Ilenia Murgia UNIFI

Elisa Giampietri (UNIPD) S1 - 01
How Mutual Funds should look like. A conjoint analysis applied to innovative risk management instruments
Fabio Lepore (UNIPI) S1 - 02
Participatory assessment of the digitalisation of agricultural-pastoral farms: the case of an FMIS solution for the Pecorino Toscano PDO supply chain
Giampiero Mazzocchi (CREA) S1 - 03
Conceptualising Healthy and Sustainable Diets from an agricultural policies perspective
Giulia Granai (UNIPI) S1 - 04
What influences the perceived level of transaction costs in agri-environment-climate measures among farmers? A qualitative comparative analysis
Laura Priscila Penate Lopez (UNIMI) S1 - 05
One size does not fit all: farmer's attitudes and preferences towards agricultural innovation in alpine valleys
Nunzia Gabriella Fasolino (UNIBO) S1 - 06
Assessing the impact of innovative water policy measures at the farm level using farm-level simulation models
Rossella Palmieri (UNINA) S1 - 07
Meet the neighbor: framing the European Union and African Union perspectives on the Farm to Fork goals
Elena Perucchini (UNIMI) S1 - 08
Exploring mountains potential for sparkling wine in a changing climate

Short communications

Lorenzo Baima (UNITO) S1 - SC01
Exploring economic viability: insect meal integration in pig, poultry and fish supply chains
Elisa Biagetti (UNITUS) S1 - SC02
The effects of regional suitability on productions' sustainability: the case of durum wheat
Antonina Sparacino (UNITO) S1 - SC03
Transparency and Certifications: Sustainability Communication in Italy's Apple Supply Chain
Mariavittoria Perrone (UNIMI) S1 - SC04
Unlocking Agricultural Residue Value: A Comprehensive Cost-Benefit Analysis of Biochar Implementation
Benedetta Damiani (UNIMI) S1 - SC05
"From Peaks to Plains: A Risk Comparison of Dairy Cattle Farms in Northern Italy"

PRIMA SESSIONE S7 - aula 016

Pratiche sostenibili per la gestione del sistema acqua-suolo-pianta-atmosfera

Chairs: Giovanni Francesco Ricci UNIBA, Stevo Lavrnic UNIBO, Antonella Gori UNIFI, Luisa Leolini UNIFI

Sofia Del Gaudio (UNIBAS) S7 - 01
Agronomic and qualitative evaluation of old wheat varieties for innovative use in forage farming
Michele Denora (UNIBAS) S7 - 02
Nitrogen Symbiotic Exchange Dynamics in the Wheat-Vetch Intercropping System: A Study within the AgrEcoMed Project
Annamaria Di Serio (UNISA) S7 - 03
Effect of direct sowing of processing tomato on biodegradable mulching film
Andrea Milani (CNR) S7 - 04
A mutiplex AS-LAMP (allele specific loop-mediated isothermal amplification) assay to detect two allelic variants endowing acetolactate synthase (ALS) resistance in four weedy amaranth species
Rosalinda Nicastro (UNICAMPANIA) S7 - 05
Human urine as a useful alternative to synthetic fertilizers
Antonio Pescatore (UNIFI) S7 - 06
Short-Term effects of Conservation Agriculture: A Two-Year Trial in Tuscany, Italy
Miriam Chiarulli (UNIBA) S7 - 07
Mediterranea coastal dune restoration: monitoring the effects of soild bioengineering techniques
Annunziata Fiore (UNIBA) S7 - 08
Soil bioengineering techniquesfor post-fire erosion control

Short communications

Andrea Alpigiano (UNITO) S7 - SC01
A novel indicator-based approach to assess the impact of agricultural practices on soil health
Beatrice Falcinelli (UNIPG) S7 - SC02
Sensor-based monitoring of nitrogen status in processing tomato
Sara Del Duca (CREA) S7 - SC03
Impacts of soil management and sustainable plant protection strategies on soil biodiversity in a Sangiovese vineyard
Davide Farruggia (UNIPA) S7 - SC04
Evaluation of tomato (solanum lycopersicum l.) yield and quality using different biodegradable mulching films
Maria Eleonora Pelosi (UNINA) S7 - SC05
Effect of the sustainable fertilization strategies on tomato yield and quality
Elena Tondini (CREA) S7 - SC06
Different approaches to soil fauna ecological indices to assess soil health

PRIMA SESSIONE S5 - aula 015

La microbiologia nei settori agrario, alimentare e zootecnico

Chairs: Matteo Daghio UNIFI, Lapo Pierguidi UNIFI

Andrea Brandano (UNISS) S5 - 01
Role of Phytophthora species in the lack of seedling recruitment in Quercus suberforests
Marco Carli (UNIPI) S5 - 02
Flavescence dorée phytoplasma ecology in Tuscany vineyards (Italy)
Claudia Pisuttu (UNIPI) S5 - 03
Ozonated water stimulates plant defence mechanisms and contains the spread of pathogens in (edible) flower species
Silvia Rotunno (CNR) S5 - 04
Insights into the role of the C4 protein of the geminivirus TYLCSV in transgenic tomato plants
Angela Maffia (UNIRC) S5 - 05
Effect of synthetic and organic fertilizers on microbiome biodiversity of rhizospheric soils in Corylus avellana plants through a metagenomics approach
Davide Alongi (UNIPA) S5 - 06
Co-inoculation approach combining lactic acid bacteria and yeasts to enhance the production of Nocellara del Belice green split table olives
Luca Bernabò (UNIFI) S5 - 07
Towards Sustainable Energy: Biohydrogen Production from Dairy Waste with Rhodopseudomonas palustris 42OL
Giuliana Garofalo (UNIPA) S5 - 08
Description of Ewiss cheese, a new ewe's milk cheese processed by Swiss cheese manufacturing techniques: microbiological, physicochemical and sensory aspects

Short communications

Dario Gaudioso (UNIFI) S5 - SC01
From endophytic to plant-pathogenic bacteria and return: unraveling evolution of pathogenicity and virulence
Athos Pedrelli (UNIPI) S5 - SC02
Occurrence of tomato mosaic virus (ToMV) in three tomato cultivars under salt conditions: molecular characterization of ToMV isolates and elucidation of their physiochemical effects
Federica Barbieri (UNIBO) S5 - SC03
Plant-derived antimicrobial compounds: chemical characterisation and in vitro activity against food-borne pathogens
Agnese Bellabarba (UNIFI) S5 - SC04
Influence of mulch films containing phthalates on the soil microbial community: evidence from a small-scale strawberry cultivation expriment
Matilde Ciani (UNIFI) S5 - SC05
Harnessing photosynthetic microorganisms in the photobiorefineries: resource recovery and value-added byproducts for sustainable solutions
Ida Romano (UNINA) S5 - SC06
Innovative Approaches to Bacterial Identification: Oxford Nanopore Sequencing in Complex Matrices

12:40 Poster session - **Edificio D6**

13:00 Lunch break

14:30

SESSIONE S6 - aula 015

Sviluppo sostenibile e cambiamento climatico: l'impatto sulle produzioni e sui sistemi urbani e rurali

Chairs: Michela Ablondi UNIPR, Antonella Gori UNIFI, Ermes Lo Piccolo UNIFI

Sebastien Comin (UNIMI) S6 - 01
How to reduce failure in urban tree planting programs
Giulia Daniele (UNITO) S6 - 02
The problem of invasive alien plants in European urban settings: testing non-invasive cultivars and species as alternatives to Ligustrum sinense Lour
Lucrezia Muti (UNIFI) S6 - 03
Exploring the impact of moderate water stress on anthocyanin, flavonol glycosides, and terpene dynamics across fruit development and ripening in Pistacia lentiscus L.
Andrea Salvucci (UNIVPM) S6 - 04
Impact of geopedological events on the soil fertility of drylands from United Arab Emirates
Stefania Truschi (UNIFI) S6 - 05
Hydrophobicity and Epicuticular Waxes are Crucial Leaf Traits for Salmonella enterica Attachment on 30 Baby Leaf Salads
Danilo Travascia (UNIBAS) S6 - 06
Old-growth forest dynamics in the Pollino National Park: A multivariate analysis approach
Lina F. Pulido Rodriguez (UNIFI) S6 - 07
Know what you eat: nutritional value of the alien species Callinectes sapidus
Francesco Tiezzi (UNIFI) S6 - 08
The host, the guest, the holo-biont

Short communications
Claudio Brandoli (UNIMORE) S6 - SC01
Sucrose content in the European hazel pollen: a defence strategy against changing climatic conditions
Francesco Mirone (UNIPD) S6 - SC02
Understanding future climate change impacts on grapevine productivity through an in-depth characterisation of the past
Dalila Crucitti (CNR) S6 - SC03
Host and environmental factors shape the endophytic diversity and composition od sicilian phyllosphere olive trees
Lorenzo Villani (UNIFI) S6 - SC04
The Val d'Orcia Living Lab of the AG-WaMED project: insights from modelling and participatory activities
Niccolò Renzi (UNIFI) S6 - SC05
A framework for organizational life cycle assessment (O-LCA): the experience of Agritech project within the sustainability assessment of the agricultural system
Matteo Garau (UNISS) S6 - SC06
Long-term compost restoration of potentially toxic elements (PTEs) contaminated soils: evaluation of organic matter physical fractions for the environmental risk assessment

SECONDA SESSIONE S1 - aula 018

Economia circolare, sviluppo sostenibile e tecnologico, consumatori

Chairs: Alessandra Marti UNIMI, Lapo Pierguidi UNIFI, Giulia Angeloni UNIFI

Elena Radicioni (UNIFI) S1 - 09
On the willingness to pay for sustainable wine: a meta-analytical perspective
Flavia Pucillo (UNIMI) S1 - 10
Understanding the complexity of Front-of-Pack labels: an online shopping supermarket experiment
Giovanni Sogari (UNIPR) S1 - 11
Consumer Preferences of Upcycled Plant-Based Cheese: the role of information
Giulia Mastromonaco (UNITO) S1 - 12
Sustainability and Traceability of Agri-Food Products: Insights from Italian Consumers
Marta Bonioli (UNIVR) S1 - 13
Consumer perception and preferences for 'smart' labels
Marina Domenici (UNIFI) S1 - 14
From concept to market: sensory-driven co-creation of tailor-made meat-based meals
Federica Narra (UNIPI) S1 - 15
Fate of nutraceuticals in tomato (Solanum licopersicum) and turnip greens (Brassica rapa subsp. rapa) subjected to different cooking treatments
Irene Fenga (UNIPR) S1 - 16
Commercial plant-based pizza cheese analogues: a techno-functional and sensory evaluation

Short communications
Alice Stiletto (UNIPD) S1 - SC06
Nutri-Score: checkmate to Geographical Indications? Evidence from an experimental auction in Italy
Giulia Andreani (UNIPR) S1 - SC07
Analyzing the Impact of Nutri-Score and Eco-Score Labels on Food Preferences: what is the state of the art?
Tommaso Fantechi (UNIFI) S1 - SC08
From pixels to pathways: analyzing decision-making across virtual and real nature
Leonardo Cei (UNIPD) S1 - SC09
What the GI logo can add to GI names? Insights from GI cheeses with different market share
Chiara Costamagna (UNITO) S1 - SC10
Profiling of sheep meat consumers: new perspectives towards opinions on farming system, meat quality and national market

SECONDA SESSIONE S7 - aula 016

Pratiche sostenibili per la gestione del sistema acqua-suolo-pianta-atmosfera

Chairs: Elena Costi UNIMORE, Sannino UNINA, Luigi Piemontese UNIF

Anna Verde (UNINA) S7 - 09
Securing hydrocarbon contaminated soils by turfgrass-based assisted phytostabilization technique
Angeloluigi Aprile (UNINA) S7 - 10
Use of proximal, remote sensing and reanalysis data to assess the water needs for an industrial tomato crop
Giuseppe Maistrello (UNIBO) S7 - 11
Water quality trend in an irrigation canal affected by wastewater discharge
Valentina Niccolucci (UNISI) S7 - 12
Water Footprint Assessment of agrifood products: the experience of wine making at Banfi within the Agritech PNRR Project
Sara Pini (UNIFI) S7 - 13
Water storage capacity temporal evolution in agricultural land: A study of flood-prone areas in the Bisenzio basin (Tuscany)
Lucia Crosetto (UNITO) S7 - 14
Evaluation of the effect of winter cover crops in paddy fields on SOM and N input and methane emissions
Subhoshmita Mondal (UNIMI) S7 - 15
Underlying reactions to reduce hexavalent chromium using rhodococcus qingshengii bacterial strain
Elena Scaglia (UNIBS) S7 - 16
Preliminary results on greenhouse gases and ammonia emissions from dairy cow slurry storage

Short communications
Alessandro Bizzarri (UNIFI) S7 - SC07
The importance of nursery techniques to support the recovery of degraded areas: the case of Quercus suber in Tuscany
Diletta Chirici (UNIFI) S7 - SC08
Do forest streams deliver suspended sediment? A Evidence from a forested nested catchment in the Apennine Mountains
Emanuele Giachi (UNIFI) S7 - SC09
Promoting SWBE as NBS: Biodiversity monitoring on a restored landslide, in Tuscany (Italy)
Giovanni Francesco Ricci (UNIBA) S7 - SC10
Impact of nature-based solutions on soil erosion and water resources management: perspectives from farmers
Stefania Sole (UNISS) S7 - SC11
Spatial assessment of heavy metal contamination areas: a GIS-based analysis for planning and implementing phytoremediation strategies
Chiara Capelli (UNIFI) S7 - SC12
Production of volatile fatty acids from brewing by-products

PRIMA SESSIONE S2 - aula 007

Strumenti e nuove tecnologie smart applicate ai cicli produttivi

Chairs: Roberta Bulgari UNITO, Giovanna Sala UNIPA, Leonardo Verdi UNIFI

Andrea Martelli (CREA) S2 - 01
Smart irrigation for management of processing tomato: a machine learning-based DSS application
Michele Moretta (UNIFI) S2 - 02
Analyzing the Influence of Shading on Alfalfa Phenotypic Traits in Agrivoltaic Systems: A GroIMP Modeling Approach
Nebojša Nikolić (UNIPD) S2 - 03
Advancing Weed Detection in Precision Agriculture: A Drone-Based Approach for Species-Level Identification
Camilla Cinelli (SANT'ANNA) S2 - 04
Effect of 1-MCP of the evolution of aromatic profile during ripening of a new kiwifruit variety (Actinidia chinensis, cv Dulcis)
Pietro Emilio Nepi (SANT'ANNA) S2 - 05
Variations of volatile organic compounds profile in dehydrating wine grape berries infected by Botrytis cinerea
Francesco Barbarese (UNITUS) S2 - 06
The impact of digitalization in the forestry sector: An analysis of the effects on socio-economic indicators in the Italian context
Alessandro Biglia (UNITO) S2 - 07
An innovative plant for foods quick-freezing
Valeria Maritano (UNITO) S2 - 08
Evaluation of spot-spray UASSs performance using a lab-method for perennial crops

Short communications
Riccardo Rossi (UNIFI) S2 - SC01
Automatic grapevine analysis for estimating pruning weight through uav-derived 3D-models
Cosimo Matteo Profico (UNITO) S2 - SC02
Enhancing nutritional content of maize and wheat microgreens: varietal screening and sodium selenate nutripriming
Luca de Guttry (UNIFI) S2 - SC03
A multi-sensor remote sensing approach to monitor charcoal production sites in Somalia's forests
Anna Lilian Gardossi (UNIUD) S2 - SC04
Agroecosystems Characterization for Identification of High Nature Value Farmlands

16:10 Poster session - **Edificio D6**

16:30 Coffee break

17:00 **Francesco De Filippis (Dipartimento di Agraria, Università degli Studi di Napoli Federico II)**
"L'asse microbioma-uomo-ambiente: interazioni complesse che influenzano la salute" - **Aula 018 - *chair: Matteo Daghio UNIFI***

17:30 **Michele Nucciotti ed Elisa Broccoli (Dipartimento SAGAS, Università di Firenze)**
"Le risorse culturali marine come driver di sviluppo per le blue communities" - **Aula 018 - *chair: Giulia Secci UNIFI***

18:00 Conclusione lavori

19:30 Cena Sociale (solo per chi si è registrato) presso **l'Orto botanico "Giardino dei Semplici"**, Via Pier Antonio Micheli 3, 50121

- *S1: Economia circolare, sviluppo sostenibile e tecnologico, consumatori*
- *S2: Strumenti e nuove tecnologie smart applicate ai cicli produttivi*
- *S3: Dal miglioramento genetico al recupero del patrimonio autoctono*
- *S4: L'importanza di biostimolanti, bioinoculanti e probiotici nel miglioramento della crescita e della salute in piante e animali*
- *S5: La microbiologia nei settori agrario, alimentare e zootecnico*
- *S6: Sviluppo sostenibile e cambiamento climatico: l'impatto sulle produzioni e sui sistemi urbani e rurali*
- *S7: Pratiche sostenibili per la gestione del sistema acqua uolo-pianta-atmosfera*
- *S8: Pratiche innovative di mitigazione e adattamento ai cambiamenti climatici*

GIOVEDÌ 27 GIUGNO 2024

09:00 **Vittoria Brambilla (Dipartimento di Scienze Agrarie e Ambientali - Produzione, Territorio, Agroenergia, Università degli Studi di Milano)**
"Le TEA: dalla ricerca di base alla prima sperimentazione in campo" **- Aula 018 -** ***chair: Alice Checcucci UNIFI***

09:30

SECONDA SESSIONE S4 - aula 015

L'importanza di biostimolanti, bioinoculanti e probiotici nel miglioramento della crescita e della salute in piante e animali

Chairs: Giancarlo Pagnani UNITE, Giancarlo Pagnani UNITE, Lapo Pierguidi UNIFI

Federica Scicutella (UNIFI) S4 - 09
Rumen ecology detailed study using quebracho tannin as fermentation stressing factor
Sonia Marcone (UNINA) S4 - 010
Solubilization of phosphorite by phosphate-solubilizing bacteria
Annabella Pappalardo (UNINA) S4 - 11
Novel potential biopesticide combining lignin and beneficial fungi
Deyvid Willame Silva Oliveira (UPRFE) S4 - 12
Evaluating the influence of light-dark cycles on the growth of the dinoflagellate Durusdinium glynnii
Gergely Ujvári (UNIFI) S4 - 13
The impact of plant genotype, starter fertilization and a seed-applied biostimulant on native root-associated mycorrhizal and bacterial communities in maize

Short communications
Matteo Spada (UNITUS) S4 - SC07
Two novel biostimulants alleviate drought stress and shape root architecture in durum wheat
Beatrice Farda (UNIVAQ) S4 - SC08
Investigate the use of cellulose fibers as a carrier for the development of a Gram-negative bacterial inoculant
Elia Pagliarini (UNIBO) S4 - SC09
Yield and Nutraceutical Value of Lettuce and Basil Improved by a Microbial Inoculum in Greenhouse Experiments

SECONDA SESSIONE S5 - aula 007

La microbiologia nei settori agrario, alimentare e zootecnico

Chairs: Marika Pellegrini UNIVAQ, Matteo Daghio UNIFI, Maria Chiara Fabbri UNIFI

Karima Guehaz (Kasdi Merbah University, Ouargla, Algeria) S5 - 09
Semi-characterization of polysaccharides extracted from Scenedesmus sp. strain isolated from desert environment, Southeast of Algeria
Giuseppina Magaraci (UNINA) S5 - 10
Novel microbial-based biostimulants for sustainable agriculture
Erica Pontonio (UNIBA) S5 - 11
Enzymatic approach to improve the nutritional and functional feature of Tenebrio molitor
Giorgia Secchi (F. MACH) S5 - 12
Shiga toxin-producing Escherichia Coli (STEC) screening in Trentino Traditional Dairy farms
Michela Verni (UNIROMA) S5 - 13
Sourdough Fermentation for the Valorization of Sorghum Flour: Microbiota Characterization, Metabolome Profiling and Bread-Making

Short communications
Viola Galli (UNIFI) S5 - SC07
Brewers' spent grains as reservoir of yeasts and lactic acid bacteria for biotechnological applications in brewery
Arianna Grassi (UNIPI) S5 - SC08
Plant beneficial activities of the microbiota strictly associated with arbuscular mycorrhizal fungi isolated from the rhizosphere of ammophila arenaria
Giuseppe Perri (UNIBA) S5 - SC09
Exploitation of sprouted barley grains and flour through sourdough fermentation

SECONDA SESSIONE S2 - aula 018

Strumenti e nuove tecnologie smart applicate ai cicli produttivi

Chairs: Massimiliano Varani UNIBO, Luisa Leolini UNIFI, Luigi Piemontese UNIFI

Eric Mozzanini (UNITO) S2 - 09
Hydraulic-based fixed spray delivery system for pesticide application in vineyards: first spray performance results
Enrico Buscaroli (UNIBO) S2 - 10
Kinetic modelling of acetamiprid, metalaxyl, S-metolachlor and terbuthylazine dissipation in a full-scale free water surface constructed wetland in Emilia Romagna region
Alfonso Valerio Ragazzo (CNR) S2 - 11
Application of a precision agriculture workflow in viticulture for canopy analysis using UAV multispectral and RGB imagery
Irene Crescioli (CNR) S2 - 12
Development of a qPCR method for pathogenic microalga P. bovis identification and quantification in bovine milk
Valentina Lazazzara (CNR) S2 - 13
Low-dosage UVB radiation stimulates synthesis of antioxidant polyphenols in Lactuca sativa without side effects

Short communications
Ferdinando Corti (UNIFI) S2 - SC05
Extra Virgin Olive Oil Production: Innovations and Solutions for Quality Enhancement Throughout Processing
Sabina Laveglia (UNIBAS) S2 - SC06
A novel technique to register multispectral camera images at short distance from the target crop
Niccolò Rimbotti (UNIFI) S2 - SC07
Development of open-source platform for monitoring soil carbon dioxide: proof of concept and prototyping

PRIMA SESSIONE S8 - aula 016

Pratiche innovative di mitigazione e adattamento ai cambiamenti climatici

Chairs: Antonio Pulina UNISS, Ermes LoPiccolo UNIFI, Giulia Secci UNIFI

Marina Allegrezza (UNIMI) S8 - 01
Development of an integrated system that combines a cropping system model and a tool for the optimisation of manure redistribution
Francesco Ferrero (UNITO) S8 - 02
How a multidisciplinary Living Lab approach can address different stakeholder queries about environmental impacts, production efficiency and milk quality in dairy farm
Marco Perfetto (UNIMI) S8 - 03
Assessing management practices effect on greenhouse gasses emissions from agricultural soils: a regional scale modelling study
Francesca Alderotti (UNIFI) S8 - 04
Regulated deficit irrigation tolerance in three Olea europaea L. cultivars and study of its impact on olives phenolic profile
Harsh Tiwari (UNICATT) S8 - 05
Effects of proline-rich specific yeast derivatives foliar applications on the physiology of grapevines subjected to water deficit

Short communications
Nicolò Iacuzzi (UNIPA) S8 - SC01
Agronomic response of processed tomato to water deficit in hot-arid environment
Margherita Santoni (UNIFI) S8 - SC02
Mediterranean Climate Change: Is Organic Agriculture an Option to Face a Perfect Storm?
Alexandro Ferreira (UNIBO) S8 - SC03
Evaluation of Innovative Cropping System for marginal land: the MIDAS project

10:30 Coffee break + Poster session

11:00 **Fabio D'Elia e Francesco De Carolis (FOOD HUB)**
"Innovare la comunicazione scientifica: l'approccio di Food Hub" **- Aula 018 -** ***chair: Giulia Angeloni UNIFI***

11:30

SESSIONE S3 - aula 007

Dal miglioramento genetico al recupero del patrimonio autoctono

Chairs: Stefania Marzario UNIBAS, Alice Checcucci UNIFI, Maria Chiara Fabbri UNIFI

Chiara Delvento (UNIBA) S3 - 01
High-density linkage mapping and genetic dissection of resistance to broomrape (orobanche crenata forsk.) in pea (pisum sativum l.)
Martina Ferrero (UNITO) S3 - 02
Downy mildew resistance 6 (DMR6): how to enhance biotic stress tolerance in eggplant through genome editing
Lia Obinu (UNISA) S3 - 03
The reference-free pangenome of Arabidopsis thaliana
Dario Paolo (CNR-IBBA) S3 - 04
Development of a biotech toolbox for bean research
Gabriele Usai (UNIPI) S3 - 05
Exploring the genetic diversity in Mediterranean fig (Ficus carica L.) varieties
Andrea Delledonne (UNIMI) S3 - 06
Cows'resilience of two intensive farms in Lombardy

Short communications
Leandra Leto (UNIPR) S3 - SC01
Vitro-derived hop plantlets, var. Magnum, are a rich source of bioactive compounds
Lorenzo Antonio Marino (UNITO) S3 - SC02
From Orchard to Table: enhancing Castanea sativa traceability using DNA molecular markers along the supply chain
Vera Pavese (UNITO) S3 - SC03
Development of new biotechnological strategies for improving breeding in woody species
Susanna Cialli (SANT'ANNA) S3 - SC04
Unveiling hidden potential : wild tomatoes for enhancing agrobiodiversity and face salinity stress in the Anthropocene
Fabiana Marino (UNITO) S3 - SC05
Morphological and qualitative characterization of four tomatoes (Solanum lycopersicum L.) landraces from Piedmont

TERZA SESSIONE S1 - aula 018

Economia circolare, sviluppo sostenibile e tecnologico, consumatori

Chairs: Matteo Garau UNISS, Andrea Dominici UNIFI, Luisa Leolini UNIFI

Nuria Goldáraz-Salamero (UNITO) S1 - 17
Exploring Environmental and Economic Implications of Introducing Hazelnut Skins in Livestock Diets
Marco Martinoli (CREA) S1 - 18
Improved shelf-life of gilthead seabream fillets fed an organic diet including crayfish meal
Agnese Spadi (UNIFI) S1 - 19
Comparison of different olive pomace maturation system for vermicompost production
Diana Vanacore (CNR) S1 - 20
Use of distillation of pruning waste from Pistacia Lentiscus L. to produce essential oils and tannins extracts as natural-based agrochemicals: towards green solutions for circular economy in nursery practices
Giulia Dallavalle (F. MACH) S1 - 21
Influence of Mint and Rose extraction method on in vitro rumen fermentations
Riccardo Paoloni (UNIFI) S1 - 22
Natural or artificial Christmas tree? An environmental dilemma solved by Life Cycle Assessment methodology

Short communications
Martino Rogai (CNR) S1 - SC11
Agile fuelbreak maintenance with multipurpose excavators equipped with mini-winch
Raffaella Ofano (UNINA) S1 - SC12
Soil Geochemical fingerprinting for agri-food authenticity and traceability
Carlotta Breschi (UNIFI) S1 - SC13
Extraction and use of fruit by-product's bioactive compounds for gluten free and vegan cookies fortification
Tommaso Ugolini (UNIFI) S1 - SC14
Olive tree (Olea europaea L.) leaves: intra- and interannual variability of the phenolic profile of 4 typical Tuscan cultivars
Emma Copelotti (UNIPI) S1 - SC15
Effects of saturated fatty acid enriched diets on Tenebrio molitor larvae
Adja Lira De Medeiros (UNIFI) S1 - SC16
Diets containing sesamin and alpha-lipoic acid and lipid quality of pacu's fillets

TERZA SESSIONE S2 - aula 015

Strumenti e nuove tecnologie smart applicate ai cicli produttivi

Chairs: Domenico Ronga UNISA, Leonardo Verdi UNIFI, Giulia Angeloni UNIFI

Cassandra Detti (UNIFI) S2 - 14
Investigating the physiological responses of Cinnamomum camphora to different irrigation regimes coupled with online monitoring of leaf water content in nursery settings
Ester Curci (UNITS) S2 - 15
Assessing Carbon Stock in Small Landscape Features: study area of Northeast Italy
Silvia Parrini (UNIFI) S2 - 16
Discriminant analysis as a tool to classify grasslands based on near-infrared spectra
Andrea Pagliai (UNIFI) S2 - 17
The DRONE4AGRI project: first field results on spray quality using UAV technology in high slope terraced vineyards
Alessandro Zanchin (UNIPD) S2 - 18
Three oenological applications of Digital Twins for assessing Grapevine bunch compactness
Andrea Confessore (UNIFI) S2 - 19
Does age affect the adaptation of dairy cows managed with a virtual fence system?

Short communications
Leonardo Pace (UNITUS) S2 - SC08
Soil mapping with a limited number of samples by coupling emi and nir spectroscopy in hazelnut tree orchard
Gianmarco Alfieri (UNITUS) S2 - SC09
Feasibility assessment of a low-cost visible spectroscopy-based prototype for monitoring polyphenol extraction in fermenting musts
Simone Marcolini (SANT'ANNA) S2 - SC10
Uncovering arbuscular mycorrhizal fungi diversity with proteomics
Lorenzo Pippi (UNIPI) S2 - SC11
Quality and safety of baby leaf lettuce grown in floating system with different nitrogen and salt conditions can be assessed by hyperspectral data
Giuseppe Quaratiello (UNIPI) S2 - SC12
Using hyperspectral data to predict leaf physiological traits and discriminate ozone effects grapevine (Vitis vinifera L.)

SECONDA SESSIONE S8 - aula 016

Pratiche innovative di mitigazione e adattamento ai cambiamenti climatici

Chairs: Paola Cetera UNISS, Mauro De Feudis UNIBO, Giulio Castelli UNIFI

Tommaso Frioni (UNICATT) S8 - 06
Superabsorbent Hydrogels: a new tool for vineyard water management?
Livia Passarino (UNIFI) S8 - 07
Automatic mapping and characterization of forest disturbances in Italy using remote sensing Sentinel-2 data
Raffaele Cavaliere (UNISA) S8 - 08
Chitosan nanoparticles loaded with orange essential oil against aphis gossypii: characterization, insecticidal activity and selectivity
Gregorio Fantoni (UNIFI) S8 - 09
Mitigating dismantling costs by repurposing recovered asphalt in desealed soil
Giacomo Marengo (UNITO) S8 - 10
Land use legacy drives post-abandonment forest structure and understorey composition: a multidisciplinary approach to manage novel forest landscapes
Riccardo Napolitano (CREA-ZA) S8 - 11
Caviar and sturgeon meat: from luxury to sustainable food production

Short communications
Silvia Calvani (UNIFI) S8 - SC04
Communication as a social parameter to investigate wildfires
Giulia Quagliata (UNITUSCIA) S8 - SC05
Drought response in wheat involves a changed plant ionomic network
Lorenzo D'Asaro (UNIPI) S8 - SC06
Hydrochar from Myriophyllum aquaticum: win-win circular strategy to contain an invasive species and produce a new soil amendment
Enrico Lucca (UNIFI) S8 - SC07
The Water-Energy-Food-Ecosystems Nexus approach to managing water resources: a qualitative assessment in Northern Italy
Giambattista Carluccio (UNISALENTO) S8 - SC08
Emerging bacterial diseases: a threat to the sustainability of salento's forests

13:00 Lunch break + Poster session

14:30 Workshop, Sessione partecipativa **- Aula 018**

16:30 Coffee break

17:00 Saluti finali, premiazioni e presentazione Convegno Aissa#Under40 2025 **- Aula 018**

- *S1: Economia circolare, sviluppo sostenibile e tecnologico, consumatori*
- *S2: Strumenti e nuove tecnologie smart applicate ai cicli produttivi*
- *S3: Dal miglioramento genetico al recupero del patrimonio autoctono*
- *S4: L'importanza di biostimolanti, bioinoculanti e probiotici nel miglioramento della crescita e della salute in piante e animali*
- *S5: La microbiologia nei settori agrario, alimentare e zootecnico*
- *S6: Sviluppo sostenibile e cambiamento climatico: l'impatto sulle produzioni e sui sistemi urbani e rurali*
- *S7: Pratiche sostenibili per la gestione del sistema acqua uolo-pianta-atmosfera*
- *S8: Pratiche innovative di mitigazione e adattamento ai cambiamenti climatici*

POSTER PRESENTATIONS

S1: Economia circolare, sviluppo sostenibile e tecnologico, consumatori

Marta Bonioli (UNIVR) S1 - P01
Consumer perception and preferences for 'smart' labels
Isabella Tucciarone (UNIFI) S1 - P02
Sustainable aquaculture over the last 30 years: a review by text mining approach
Martina Friuli (UNITO) S1 - P03
Olive mill biowastes upcycling: energetic valorization and environmental implications
Arianna Tiralti (UNIPG) S1 - P04
Biodiversity conservation and Value-Belief-Norm Theory: a systematic review of the literature
Claudia Camplone (UNIPG) S1 - P05
Evaluation of the impact of pesticides in agricultural ecosystem through life cycle assessment studies: a systematic literature review
Tiziana Pagnani (UNITO) S1 - P06
Mapping Consumer Food Cooperatives: Unveiling the Italian Experience
Mario Guida (UNIBO) S1 - P07
Unveiling Extra Virgin Olive Oil Quality: Consumers' Preferences in a Real Tasting Environment
Francesca Pietrangeli (UNITUS) S1 - P08
The role of environmental sustainability for developing marginal areas: the case of Viterbo province
Jonathan Squillante (UNINA) S1 - P09
Biotransformation of agri-food by-products to produce health-promoting bioactive compounds
Chiara Gelici (UNIFI) S1 - P10
Use of implicit tools in restaurants to promote the consuption of fish with low market value
Silvia Baralla (CREA) S1 - P11
The Travel Cost Method for the assessment of Touristic Activities of Wetlands: the Case Study of Sardinia
Silvia Baralla (CREA) S1 - P12
The National Water Heritage. Opportunities for tourism in rural areas
Andrea Dominici (UNIPD) S1 - P13
Exploring consumer perceptions of wine packaging sustainability: a cross-country study
Maria Paciulli (UNIPR) S1 - P14
Enhancing oxidative stability of bakery snacks with natural antioxidants: a comparative study of free and encapsulated olive leaf extract versus traditional synthetic additives
Anna Perbellini (UNIPD) S1 - P15
Valorisation of conifers (Pinus mugo and Picea abies) through steam distillation and hydroalcoholic maceration for flavouring Italian spirit grappa

S2: Strumenti e nuove tecnologie smart applicate ai cicli produttivi

Aref Sepehr (UNIPD) S2 - P01
Camera position effect in three-dimensional reconstruction of berry fruits based on photogrammetry
Aref Sepehr (UNIPD) S2 - P02
Optimizing the workflow for shape evaluation of walnuts with photogrammetry
Roberta Bulgari (UNITO) S2 - P03
A multidisciplinary approach for stress detection in vegetable crops
Carolina Perna (UNIFI) S2 - P04
Precision agriculture and Archaeology, can there be possible synergies? A case study
Roberto Natale (UNIFI) S2 - P05
The aeroponic cultivation system as a viable alternative for potato seed production
Ludovica Milzi (UNINA) S2 - P06
Light tuning for food improving; selective responde of novel dye-doped polymeric films for rigafood in greenhouse
Matteo Pecchi (CREA) S2 - P07
Open data and forests: the creation of a National Forestry Information System
Giulia Daly (UNIFI) S2 - P08
Diatom-bacterium co-culture: analysis of the exopolysaccharide matrix
Alessio Manzo (UNIMOL) S2 - P09
Determination of physical properties and porosity of mountain soil porosity through SEM image analysis and NMR analysis
Eugenio Carlon (UNIMI) S2 - P10
Using remote sensing and productivity modelling in evaluating landscape-level potential of alpine local foraging resources
Felicia Menicucci (CNR) S2 - P11
Effects of blue and red light-emitting diodes on two Cichorium intybus L. cultivars
Mattia Chiarini (UNIBO) S2 - P12
A solar powered autonomous ground vehicle in sugar beet sowing and weeding with respect to conventional practices
Enzo Antonio Lecciole Paganini (UNISS) S2 - P13
Estimation of soil erosion by water using RUSLE model in the State of Sao Paulo (Brazil)
Chiara Pastacaldi (UNIFI) S2 - P14
Ozone: unveiling its unexplored potential in its plant disease control
Deyvid Willame Silva Oliveira (UFRPE) S2 - P15
Aquaculture 4.0 in northeast Brazil: prospects and difficulties
Nicola Furnitto (UNICT) S2 - P16
Biomass Estimation in Pastures by Satellite Imagery: A Pre- and Post-Grazing Analysis
Irene Giordano (UNINA) S2 - P17
Probiotic behaviour: a study of ultrasound attenuation-induced gene expression changes through RNA sequencing analysis

S3: Dal miglioramento genetico al recupero del patrimonio autoctono

Stefania Stelluti (UNITO) S3 - P01
Wild leafy vegetables of the north-western Italian Alps: traditional food system to innovate horticulture
Giulia Alfreducci (UNIFI) S3 - P02
Phenotype Microarray-based Assessment of metabolic variability in plant protoplasts
Anna Lilian Gardossi (UNIUD) S3 - P03
Crowdsensing for linear landscape elements survey: a study case in Nord East Italy
Carmen Verrastro (UNIBAS) S3 - P04
Exploring lentil genetic diversity through phenotypically and genetically detailed germsplasm collection
Valeria Morante (UNIBAS) S3 - P05
Intelligent characterization of lentil genetic resources to promote agrobiodiversity
Francesca Bernini (UNIMI) S3 - P06
Heterozygosity rich regions in autochthonous and cosmopolitan cattle breeds
Rocco Sabato (UNIBAS) S3 - P07
Field phenotyping of common bean germplasm collection
Clarissa Clemente (UNIPI) S3 - P08
Maize landraces as sources of important bioactive compounds
Walter Vieri (UNIFI) S3 - P09
Integrating phenotypic, genotypic, and environmental data for predictive modeling in durum wheat (Triticum durum Desf.) cultivation using Artificial Intelligence
Giuseppe Perri (UNIBA) S3 - P10
Development of a new rapid method based on FT-NIR analysis to safeguard and enhance the traceability of sourdough bread

S4: L'importanza di biostimolanti, bioinoculanti e probiotici nel miglioramento della crescita e della salute in piante e animali

Damiano Barbato (UNIFI) S4 - P02
Selection of indigenous Metschnikowia pulcherrima strains for grape bioprotection
Anna Agosti (UNIPR) S4 - P03
Wood distillate as corroborant to improve hemp (Cannabis sativa L.) microgreen growth and antioxidant activity
Giuseppina Magaraci (UNINA) S4 - P04
Novel microbial-based biostimulants for sustainable agriculture
Davide Farruggia (UNIPA) S4 - P5
Foliar biostimulants affect productive and chemicals characteristc of organically grown sage
Giulia Franzoni (UNIMI) S4 - P06
Effect of biostimulant treatments on seed germination
Letizia Pagliaro (UNICAMPANIA) S4 - P07
Ascophyllum nodosum based extract mitigates salt stress effects in MicroTom roots even under sub-optimal nutrient conditions
Domenico Ronga (UNISA) S4 - P08
Effects of nitrogen-fixing bacteria used as seed coating on Sulla (Hedysarum coronarium L.) growth and soil quality
Martina Grattacaso (CNR) S4 - P09
Enhancing bioactive compound production in Tanacetum balsamita L. through sustainable soil cropping management strategies
Marika De Angelis (UNIMOL) S4 - P10
Effects of hydrogels made of carboxymethyl cellose on lettuce seeds
Ivan Ciliberti (UNINA) S4 - P11
BALOs as biocontrol agents in bivalve shellfish depuration
Pasquale Napoletano (UNIMOL) S4 - P12
Suitability of hydrogels made of carboxymethyl cellose on lettuce germination and soil microflora assessed by scanning electron microscopy (SEM)
Gian Piero Ricci (UNIPI) S4 - P13
Pros and cons of Ailanthus altissima management with Verticillium species
Giancarlo Pagnani (UNITE) S4 - P14
Unlocking the growth potential of green beans: PGPB intervention in Rhizoctonia-infested soils, a preliminary study
Sara Beltrami (UNIFI) S4 - P15
Enhancing plant photosynthetic performances by boosting plant carbonic anhydrase activity

S5: La microbiologia nei settori agrario, alimentare e zootecnico

Mohammed Salman (UNINA) S5 - P01
Control of Food Spoilage by Anti-Quorum Sensing Activity of Probiotics
Enrico Buscaroli (UNIBO) S5 - P02
The swine waste Resistome: spreading and transfer of antibiotic resistance genes in Escherichia coli strains and the associated microbial communities in three different pig farms
Anna Di Blasio (UNINA) S5 - P03
Antimicrobial activity of prunus spinosa extracts
Matteo Voltarelli (UNIFI) S5 - P04
A fast detection tool for flavescence dorée management
Gemma Bianchi (UNIPI) S5 - P05
The potential role of a new natural formulation in vineyard defence: a first grapevine trunk diseases in-vitro screening
Vincenzo Naselli (UNIPA) S5 - P06
Technological affinity index for interaction between lactic acid bacteria and Saccharomyces cerevisiae strains to modulate the fruity and floreal aroma of Catarratto wines

S6: Sviluppo sostenibile e cambiamento climatico: l'impatto sulle produzioni e sui sistemi urbani e rurali

Matteo Voltarelli (UNIFI) S6 - P01
Adaptive strategies in grape agriculture: harnessing muscadine innovative processing strategies for climate resilience in the southeastern United States
Alessandra Lepore (UNIBAS) S6 - P02
Assessing Changes in Climate Parameters in Campania: Analysis from 2008 to 2023
Rafael Barroca Silva (UNESP) S6 - P03
Fig trees as hemi-epiphytes predicted by logistic regression within urban parks

S7: Pratiche sostenibili per la gestione del sistema acqua suolo-pianta-atmosfera

Alessandra Virili (UNIUD) S7 - P01
Introducing buckwheat (Fagopyrum esculentum Moench) in soybean-based cropping systems to contain pests and weeds while supporting pollinators
Luisa Leolini (UNIFI) S7 - P02
UNIFI.GrapeML model implementation for estimating grapevine and inter-row grass cover carbon cycle
Giulia Galeone (UNIBO) S7 - P03
Impact of egg parasitoids on Halyomorpha halys (Stål) in eastern Emilia-Romagna after three years of Trissolcus japonicus (Ashmead) releases
Danilo Caruso (UNIFI) S7 - P04
Physiological adaptations and metabolic responses to prolonged water stress in Vitis vinifera L.: Preliminary assessments of berry membrane lipid profiles
Eugenio Straffelini (UNIPD) S7 - P05
Remote sensing-based workflow for monitoring hydrological processes in agricultural terraced cultural landscapes: a case study in Italy
Marisa Amato (UNINA) S7 - P06
Investigation of rhizosphere microbiota for the establishment of novel microbial consortia for sustainable agriculture systems
Simone Nesi (UNIPI) S7 - P07
Preliminary assessments of spatial variability in a super-high-density olive orchard
Matteo Carloni (UNIMORE) S7 - P08
Pollinator Diversity and flower Glucosinolate dynamics in Eruca sativa and Reseda lutea
Alessandro Rossi (UNIPI) S7 - P09
Sulphur supplementation: a promising fertilization strategy in camelina
Francesco Giovanni Salvo Angeletti (CREA) S7 - P10
Agroecological, processing and socio-economic aspects of Opuntia ficus indica cultivation in Mediterranean areas: Systematic map study and MOOC
Monica Canton (UNIPD) S7 - P11
Grapevine photosynthetic dynamics under water stress conditions - a case study in cv. Glera
Gregorio Fantoni (UNIFI) S7 - P12
Mitigating dismantling costs by repurposing recovered asphalt in desealed soil
Angela Maffia (UNIRC) S7 - P13
Comparative study of fertilizers in Tomato-Grown Soils: Soil quality, sustainability, and Carbon/Water Footprints
Mortadha Ben Hassine (UNIFE) S7 - P14
Effects of wood distillate concentrations on wheat (Triticum durum Desf.) seed germination and development under salinity stress: a preliminary petri dish test
Flora Giulia Simonelli (UNIPD) S7 - P15
Effects of Cu-contaminated soil on Robinia pseudoacacia L.: a controlled environment experiment
Giulio Castelli (UNIFI) S7 - P16
A critical analysis of the use of the concept of Food Security in the UN Security Council sessions on the Grand Ethiopian Renaissance Dam (GERD)
Edoardo Visentin (UNIPV) S7 - P17
Improvement of agroecological cropping systems for the enhancement of fertility and production of organic rice
Antonio Pulina (UNISS) S7 - P18
Assessing the effects of rotational grazing adoption in silvopastoral systems under mediterranean conditions
Bianca Rompato (UNIFI) S7 - P19
Contrasting urban soil degradation: the benefits of compost in soil compaction restoration
Beatrice Fiore (UNIFI) S7 - P20
Decline and restoration of a typical silvo-pastoral mountain landscape in the Italian Apennines. The case of Moscheta in Tuscany

S8: Pratiche innovative di mitigazione e adattamento ai cambiamenti climatici

Federica Alaimo (UNIPA) S8 - P01
Agronomic response of 13 varieties of cotton grown under organic conditions in a hot arid environment
Stefania Savoi (UNITO) S8 - P02
Strigolactones as possible elicitors in sunburn defense mechanisms in grapes: preliminary results
Silvia Calvani (UNIFI) S8 - P03
A geomorphological approach to evaluate post-fire emergency rehabilitation works through a special index
Sara Anichini (UNIFI) S8 - P04
The effect of heat stress on three ancient Tuscan potato (Solanum tuberosum L.) varieties
Serena Sofia (UNIPA) S8 - P05
Enhancing Urban Forestry Management: Precision Analysis of Monumental Trees through Mobile Laser Scanning
Stefania Marzario (UNIBAS) S8 - P06
Drought stress response in lentil genetic resources under speed breeding conditions
Hafsa El Horri (UNIPI) S8 - P07
Light conversion films application on blackberry plants promotes plant photosynthetic performance, fruit production and quality
Anna Rita Balingit (UNIFI) S8 - P08
Assessing the impact of extreme weather events on wheat yield: a case study in Tuscany
Marco Bianchini (UNIVPM) S8 - P09
Climate Change Impact on Mountain Grasslands: Insights from Monti Sibillini National Park
Tommaso Frioni (UNICATT) S8 - P10
PRIN UNDER-VINE: new approaches to vineyard soil management

ORAL PRESENTATIONS

S1 - 01

How Mutual Funds should look like. A conjoint analysis applied to innovative risk management instruments

Elisa Giampietri[1,2]*, Samuele Trestini[1]

[1]Department of Land, Environment, Agriculture and Forestry, University of Padova, viale dell'Università 16, Legnaro (Padova)
[2]Department of Agronomy, Food, Natural Resources, Animals and Environment, University of Padova, viale dell'Università 16, Legnaro (Padova)
*E-mail: elisa.giampietri@unipd.it

Abstract

In line with the European Union's Common Agricultural Policy agenda, Italy is currently experiencing a surge in innovative risk management instruments, such as mutual funds (MFs) to cover yield losses. MFs are based on risk sharing, mutuality, and co-responsibility between farmers. Although research on these instruments is limited, it is important to design tools that align with farmers' preferences. This study employs a rating conjoint analysis (Louviere, 1988) which was previously used to elicit preference for insurance schemes (Sherrick et al., 2003; Deng et al., 2021). This method allowed us to gather farmers' preferences for MFs attributes in terms of their relative importance and utility. The selected attributes were the following: the deductible, the method of damage assessment, the risk type covered by the fund, and the contribution (hereafter tariff) that the farmer had to pay to get the damage coverage. Moreover, we investigated some major farmers' perceptions and personality traits as risk perception, trust, and perceived barriers to participation in MFs (Meraner and Finger, 2019; Höschle et al., 2023). Data were collected between autumn 2021 and spring 2022 through an online questionnaire sent to fruit growers from the Veneto region in Italy. 89 complete questionnaires were collected. The results show that the deductible is the most relevant feature of mutual funds, followed by tariff and the method of damage assessment, while the last attribute in terms of relative importance is the risk coverage. Based on their preferences, we identified two farmer segments through clustering. The results provide useful insights about farmers' preferred combination of MFs attributes to assist policymakers and stakeholders in the future configuration of more tailored MFs which might promote a wider farmers' adoption of such risk management instruments.

Keywords

agricultural risk management, farmer preference elicitation, mutual funds

S1 - 02

Participatory assessment of the digitalisation of agricultural-pastoral farms: the case of an FMIS solution for the Pecorino Toscano PDO supply chain

Fabio Iepore[1]*, Livia Ortolani[1], Chiara Mignani[1], Annapia Ferrara[1], Maria Bonaria Lai[1], Gianluca Brunori[1]

[1]Department of Agriculture, Food and Environment (DAFE), University of Pisa, Pisa, Italy
*E-mail: fabio.iepore@phd.unipi.it

Abstract

Cheese production is one of the many activities of the Italian agri-food sector. It is characterised by a wide range of distinctive products, including Pecorino Toscano PDO, which is recognised at the European level for its quality and typicality. However, its supply chain faces significant challenges related to the sustainability and competitiveness of livestock farms. In a time when digital transformation is affecting agriculture globally, livestock farming is also exploiting technology to intervene in productivity in terms of quantity and quality. In this regard, digital livestock farming can contribute to a solution to the problems that have long threatened the decline of sheep milk production for this cheese. The study we are conducting examines the role of digitalisation in improving the management of sheep farms, with a focus on the implementation of an FMIS solution designed in a participatory way by the stakeholders of the Pecorino Toscano PDO ecosystem (for years involved in a partnership with the academia that has already produced significant progress). We are addressing these issues through the research activities conducted within the European H2020 CODECS project (started in 2022 and coordinated by the University of Pisa). In particular, the Living Lab approach aims to foster collaboration between farmers, experts, and policymakers, enabling the development of contextualised technological solutions. Through discussion with stakeholders, a strong interest emerged in adopting digital technology to optimise dairy farm management and improve production performance. Although the potential benefits are evident, some challenges are still associated with adopting digital solutions in the contexts outlined. However, technological innovation presents itself as a key resource for addressing the livestock sector's environmental, social and economic challenges. Through its integration along the entire value chain, it is expected to balance economic growth and environmental sustainability while improving the quality of labour and the final product.

Keywords

Digital technology, Livestock farming, Impacts, Sustainability, Pecorino Cheese

S1 - 03

Conceptualising Healthy and Sustainable Diets from an agricultural policies perspective

Giampiero Mazzocchi[1]*, Maria Luisa Scalvedi[2], Annalisa Angeloni[1], Roberto Henke[1], Patrizia Borsotto[1], Sabrina Giuca[1]

[1]CREA, Department of Agricultural Policies and Bioeconomics
[2]CREA, Department of Food and Nutrition
*E-mail: giampiero.mazzocchi@crea.gov.it

Abstract

A growing number of institutional documents, published by government agencies and high-level organizations, have been addressing the (re)definition of Healthy and Sustainable Diets (HSD) in recent years, and the multiple factors that favour or hinder the creation of food systems that support sustainable nutritional habits along with fair, ecologically correct, and socially acceptable food supply mechanisms. The research is focused on building up an advanced and improved conceptual framework to orient policies supporting the promotion of HSD within the framework of national food policies. To this aim, we have analysed the documents which focus on HSD at international, European and national level. Furthermore, we have identified the policy domains that have gradients of connection with the promotion of HSD and assessed their relevance across those documents by calculating a specific Occurrency Index.

The preliminary results show that Italian national policies on HSD are very much anchored to the nutritional and health dimensions and food consumption behaviours, while having elements of connection with food processing. However, they are poorly connected with agricultural components and productive aspects of food systems, as well as with socio-economic aspects. These, however, are prevalent in international and European guidance documents, probably due to their non-binding nature and strategic direction, but also to a specific attention to trade-offs between HSD and production systems.

The results have strong implications for agricultural policies. In fact, the original conceptual framework was implemented encompassing agricultural production and socio-economic aspects, whose Occurrency Index has demonstrated to be crucial domains for HSD. In addition, the research allows to orient next steps of the project. An in-depth study of national legislation and the involvement of relevant stakeholders will be carried out to gain insights and identify policy directions for a cultural change of all actors to promote HSDs. This, in turn, aims at changing the paradigm of agricultural production in terms of quality (increasing biodiversity to vary the supply of nutritious food) and quantity (fertilizer optimization) while also increasing productivity in a efficient but sustainable way following the EAT-Lancet report recommendations.

Keywords

healthy and sustainable diets; agricultural policies; textual analysis ; conceptual framework

S1 - 04

WHAT INFLUENCES THE PERCEIVED LEVEL OF TRANSACTION COSTS IN AGRI-ENVIRONMENT-CLIMATE MEASURES AMONG FARMERS? A QUALITATIVE COMPARATIVE ANALYSIS

Salomon Espinosa Diaz[1], Roberta Moruzzo[1], Francesco Riccioli[1], Francesco Di Iacovo[1], Giulia Granai[1]*

[1]Department of Veterinary Science, University of Pisa, Viale delle Piagge 2, 56124 Pisa, Italy
*E-mail: giulia.granai@phd.unipi.it

Abstract

Agriculture is one of the main factors contributing to the aggravation of environmental challenges, such as soil degradation and water pollution (FAO, 2019). Agri-environment-climate measures (AECMs) are voluntary programs that incentivize farmers to adopt more sustainable practices by providing financial or other incentives for environmental and climate-friendly farm-management practices (European Commission, 2005) and they are increasingly being recognized as an important policy tool for addressing environmental issues (Hasler et al., 2022). The success of AECMs in this direction largely depends on the participation of farmers (Hasler et al., 2022). Unfortunately, farmers often face barriers that tend to affect their attitudes toward these initiatives and their willingness to participate. One of these barriers are transaction costs (TC) (Weber, 2014a). By identifying and addressing the factors that influence the perceptions on TC, policymakers could develop new strategies, measures and programs that are more effective in reducing TC and encourage farmers' participation in AECMs.
The objective of this study, carried out as part of the Horizon2020 project Contracts2.0, was to investigate how certain factors can influence the perceived level of TC among farmers participating in eight AECMs. To achieve this objective, a qualitative comparative analysis (QCA) was utilized to identify the necessary and sufficient conditions that lead to a high or low level of perceived transaction costs among farmers.
Results showed that the level of asset specificity is the most influential factor linked to the characteristics of the transaction and the perceptions of farmers regarding the level of TC in AECMs were greatly influenced by the availability of intermediaries that facilitate the interaction between farmers and administration. The QCA models, along with their consistency values, confirm that a combination of some conditions tested could explain the high perceived level of TC among farmers participating in AECMs.

Keywords

Sustainable and technological development; Agro-food and forestry sector; Transaction Costs (TC); Agri-environment-climate measures (AECMs); Policies.

S1 - 05

One size does not fit all: farmer's attitudes and preferences towards agricultural innovation in alpine valleys

Laura Priscila Penate Lopez[1]*, Daniele Cavicchioli[1], Eugenio Demartini[2], Danilo Bertoni[1]

[1]Department of Environmental Science and Policy (ESP), University of Milan, Via G. Celoria, 2-20133, Milano, Italy
[2]Department of Veterinary Medicine and Animal Science (DIVAS), University of Milan, Via dell'Università, 6, 26900 Lodi, LO, Italy
*E-mail: laura.penate@unimi.it

Abstract

Agriculture in mountain areas manages a remarkable share of the territory. Its permanence ensures several ecosystem services and functions (carbon sequestration, territory accessibility and biodiversity conservation), guaranteeing preservation and protection of mountain territory from natural disasters. Nevertheless, mountain agriculture is threatened by morphological weaknesses, such as remoteness, steepness, fragmentation and lack of accessibility. Those threats and their social-economic consequences may provoke farmland and agricultural activities abandonment.
Hence, avoiding the abandonment is of paramount importance. This goal can be met by enhancing the economic sustainability of the farms and improving the work conditions through the adoption of innovations. So far, few empirical evidence about innovation in mountain agriculture has been gathered, in terms of availability and feasibility, on the degree and determinants of adoption.
To cover this gap, we conducted a study to explore needs and problems of mountain farms that may be fulfilled by innovation and to depict the current status of innovative practices among mountain farmers in the Lombardy Region.
A qualitative approach was employed, following the Grounded Theory Method. Previous literature on agricultural innovation in general and mountain areas was reviewed. Afterwards, a pilot study was conducted to perform focus group discussions (FGD) with farmers in different valleys (audio recorded, transcribed and codified using the software Qualcoder).
Innovation in the mountain is site-specific, with a multifaceted reality among different valleys, depending on the geographical and climatic conditions. Innovation is not widespread, despite the potential propensity towards it. The weak economic performance of farms and hard work conditions do not allow long-term onerous investments. Additionally, interviewed farmers complained about scarce consideration of their role by the local population and institutions, resulting in a lack of investments in farm infrastructures. Innovation diffusion does not pass only through a single farmer decision, but it involves a proactive economic and social context.

Keywords

mountain agriculture, innovation, technologies

S1 - 06

Assessing the impact of innovative water policy measures at the farm level using farm-level simulation models

Fasolino N.G.[1]*, Pellegrini E.[1], Macián Sorribes H.[2], Pulido Velázquez M.[2], Viaggi D.[1]

[1]Department of Agricultural and Food Sciences (DISTAL), University of Bologna, Viale Fanin, 50 - 40127, Bologna, Italy
[2]Research Institute of Water and Environmental Engineering (IIAMA), Universitat Politècnica de València (UPV), Camí de Vera s/n, València, 46022, Spain
*E-mail: nunzia.fasolino2@unibo.it

Abstract

The negative effects caused by climate change bring additional challenges on the future water availability which will necessary have to be met through adaptation policies. For this reason, efforts to reduce water use and increase its productivity in agriculture are essential for ensuring resilient environment and economies. The presented research focuses on a case study that evaluates the effects of agricultural and water policies on farm sustainability with the aim at achieving a higher level of water conservation in the area. More in details, this study considers a highly productive agricultural region (Emilia-Romagna) where, irrigated farming systems play a major role in the regional agriculture. This methodology adopted is that of Linear Programming (LP), which allows to simulate the optimal land allocation for crops while considering several constraints. As of today, two preliminary analyses have been conducted to assess the agricultural water demand at farm level: in the first model (1), water supply is controlled by setting a threshold on the withdrawal quantity, in the second one (2) different water prices are implemented. The preliminary results show that agents adapt to the two different policies by changing their crop portfolio. Therefore, it is expected a progressive substitution of water-intensive crops by rainfed crops and by more drought tolerant crops. The model also enables a sustainability assessment of the proposed measures through appropriate economic, social and environmental indicators. This research supports policymakers when dealing with the implementation of demand side controlling measures for water which are necessary to limit the pressure on water resources, especially during prolonged drought periods. Lastly, it also considers key issues for policy makers as the effect on land use, on regional agricultural production and specialization given the change brought by farmers in water use.

Keywords

water, policy, agriculture, farm modelling, linear programming

S1 - 07

Meet the neighbor: framing the European Union and African Union perspectives on the Farm to Fork goals

Rossella Palmieri[1]*, Mario Amato[2], Fabio Verneau[3]

[1,2,3] Department of Political Science, University of Naples Federico II, Via Rodinò 22/A, 80138 Naples, Italy
*E-mail: rossella.palmieri@unina.it

Abstract

The debate surrounding the Farm to Fork Strategy and the European Green Deal with the new sustainability standards proposed by the European Commission to achieve a more sustainable food system and climate-neutral continent by 2050 is generating concerns and questions among different stakeholders along the food chain and third countries that will be impacted by these measures, if adopted. This analysis aims to expand the debate studying the different perspectives on the relationship food security/sustainability of the European Union and the African Union, that represents an economic and strategic partner at the borders. The analysis has been carried through the inductive framing of the documents produced by these institutions since the 2007 until the 2023. The results show differences in the approach about this relationship seen by the European Union as a long-term goal meanwhile, the African Union uses a short-term approach due to the urgency felt by the continental unique environment to achieve food security first. As further development, the study aims to lead a wider corpus of research with the analysis of new documents and data produced by different stakeholders along the food chain in order to enrich the study of different perspectives to better analyze differences in political priorities and formulate better targeted solutions regarding sustainability and food security.

Keywords

Food security; Sustainability; Farm to Fork; Framing

S1 - 08

Exploring mountains potential for sparkling wine in a changing climate

Elena Perucchini[1]*, Chiara Mazzocchi[2], Stefano Corsi[3]

[1]Research Fellow (Department of Agricultural and Environmental Sciences, University of Milan, Milan 20133, Italy)
[2]Associate Professor (Department of Agricultural and Environmental Sciences, University of Milan, Milan 20133, Italy)
[3]Associate Professor (Department of Agricultural and Environmental Sciences, University of Milan, Milan 20133, Italy)
*E-mail: elena.perucchini@unimi.it

Abstract

Until recent times, mountainous areas were considered unsuitable for grape cultivation due to environmental limitations like late frosts, storms, and steep terrain. However, in the current context of climate change, mountains are being reconsidered as potential solutions for adapting viticulture. Forecasts suggest heightened thermal stress and drought during the grape growing season, impacting grape and wine quality negatively. Observed trends include earlier phenology, increased sugar and alcohol content in wine, loss of aroma precursors due to earlier ripening, and the expansion of suitable wine production areas to higher altitudes. This study aims to evaluate the suitability of hilly and mountainous areas in the Umbria region for establishing vineyards, primarily focusing on the production of sparkling wines. The suitability of each municipality is gauged using a composite index consisting of 4 macro-indicators. The first assesses socio-economic variables sourced from ISTAT data, including dependency ratio, activity rate, and education level of the local population. The second examines agricultural practices, considering factors such as PDO and organic crop percentage, and farm owner demographics from ISTAT's Agricultural Census. The third evaluates tourism-related data such as tourist arrivals and accommodation facilities. The fourth incorporates climatic data from the Ania-Geosafe portal. Afterwards, normalization and weighting of variables are done using the Analytic Hierarchy Process (AHP), with the consultation of 20 industry experts, including agronomists, viticulturists, local stakeholders. Weighted values are aggregated to determine the suitability index for each municipality. The study reveals rankings of the 92 municipalities in Umbria regarding their suitability for establishing an innovative vineyard. Preliminary findings indicate that mountainous regions show a greater inclination for implementing this innovative sparkling wine vineyard, primarily because of their favorable climatic conditions. These insights provide local governments with a useful instrument for assessing development prospects and economic growth opportunities linked with establishing such vineyards, potentially tackling challenges such as depopulation and land abandonment.

Keywords

mountain, viticulture, climate change, suitability index

S1 - 09

On the willingness to pay for sustainable wine: a meta-analytical perspective

Elena Radicioni[1]*, Andrea Dominici[1], Fabio Boncinelli[1], Leonardo Casini[1]

[1]Department of Agricultural, Food, Environmental and Forestry Sciences and Technologies, University of Florence, Piazzale delle Cascine, 18, 50144 Firenze (FI), Italy
*E-mail: elena.radicioni@unifi.it

Abstract

In recent years, the concept of sustainability and its dimensions have been widely investigated in the fields of agriculture and food production. Numerous contributions have explored the consumers' perceptions and trends regarding sustainability attributes in the food sector, including the wine industry. In this specific context, one of the most common approaches used to evaluate consumers' behaviour towards wine sustainability attributes is the assessment of willingness-to-pay (WTP). However, no studies have summarized the effect sizes associated with the different wine sustainability attributes so far. Furthermore, the outcomes of articles in this domain may be influenced by study-specific characteristics, such as the methodology employed. Therefore, by conducting a meta-analysis, we synthesize and evaluate the estimated marginal WTPs of consumers for the various sustainability attributes of wine. The meta-analysis was performed following a two-step approach. Initially, we systematically reviewed the literature on WTP for sustainability attributes in wine following the PRISMA protocol and employing specific eligibility criteria regarding the studies' outcomes, the applied methodology, the year of publication and the manuscripts' language. The screening phase has been conducted on a total number of 3232 scientific works collected through precise keyword searches. These works were initially selected based on the title and abstract, and thereafter, in consideration of the full text. Subsequently, a meta-regression has been carried out to statistically aggregate the results of previous studies, obtaining a broader and more general overview of the discussed effect of sustainability properties on the consumers' WTP for wine. The results obtained through this meta-analytical approach bear significant implications both for stakeholders and policymakers in terms of marketing strategies and policy development.

Keywords

Meta-analysis, Willingness-To-Pay, Wine, Sustainability

S1 - 10

Understanding the complexity of Front-of-Pack labels: an online shopping supermarket experiment

Flavia Pucillo[1], Luca Panzone[2], Elisa De Marchi[1]*, Alessia Cavaliere[1]

[1]Department of Environmental Science and Policy, University of Milan, Via Celoria
[2]Milan, Italy 2 School of Natural and Environmental Sciences, Newcastle University, King's road, Newcastle upon Tyne, United Kingdom
*E-mail: elisa.demarchi@unimi.it

Abstract

Within nutrition information policies, front-of-pack labels (FOPL) have sparked a heated debate, with many stakeholders expressing divergent views on their efficacy and impact. Recognizing the need for a unified approach, the European Union has embarked on a mission to harmonize legislation regarding FOPL. However, despite numerous studies on these labels, particularly regarding consumer acceptance and understanding, a consensus on their effectiveness is still missing. Uncertainties persist concerning the underlying logic of these labels and their intended target audience.

This research project seeks to address these gaps by delving into three key aspects. Firstly, the study will investigate the impact of three progressively complex FOPL (NutriScore, Multiple Traffic Light, and Reference Intake) on the overall nutrient quality of the shopping basket. By employing a realistic experimental online supermarket in the UK, featuring over 1000 existing products, the research aims to provide valuable insights into how these labels influence consumer choices.

Building on Kahneman's dual-system theory, the second aim of the research explores whether consumers with a more "logic-oriented" approach derive greater benefits from more complex FOPL. Understanding the interaction between cognitive processes and label complexity is crucial for designing policies that target the desired consumer profiles.

The third aspect involves incorporating Friederick's Cognitive Response Test (CRT) to explore the potential priming effects of logic abilities on nutritional choices. By administering the CRT before the shopping task, the study aims to understand whether "heightened" logical reasoning positively influences the use of FOPL and, as a consequence, the nutritional quality of the shopping basket.

This research aims to contribute to the ongoing discourse on FOPL by shedding light on their intrinsic logic. The use of three different FOPL labels, a realistic experimental online supermarket, and the use of established cognitive theories will help pave the way for more informed policy decisions.

Keywords

Front-Of-Pack Labels, nutritional labelling, experimental supermarket, food policy

S1 - 11

Consumer Preferences of Upcycled Plant-Based Cheese: the role of information

Giovanni Sogari[1]*, Giulia Andreani[1], Florine Livat[2], Md Mofakkarul Islam[3]

[1]Department of Food and Drug, University of Parma, Parco Area delle Scienze 45, 43124, Parma, Italy
[2]Accounting, Finance & Economics Department, Kedge Business School, Bureau/Office: 18 680 cours de la Libération 33405 TALENCE Cedex, France
[3]Livelihoods and Institutions Department, University of Greenwich, Medway Campus, Central Avenue, Chatham Maritime, Kent ME4 4TB, UK

*E-mail: giovanni.sogari@unipr.it

Abstract

Given the increasing interest in plant-based alternatives and in the use of upcycled ingredients to foster a circular economy and support the transition toward sustainable diets, the present study aims at exploring consumers' purchasing behaviors for upcycled plant-based cheese (PBC). Specifically, an online, cross-country (France, Italy, and the UK) questionnaire was used to investigate whether different levels of information on the use of byproducts influence consumers' willingness-to-pay (WTP) for upcycled PBC. To do so, respondents were asked whether they would pay a lower, higher, or the same price than the average market price of regular cheese (baseline) for a 200-gr portion of PBC (round 1). The average retail price of regular cheese was defined after a market inventory in each country. Then, explicit choices similar to a multiple price list exercise were added: depending on their previous response, participants either moved on with the questionnaire or were shown a list of lower or higher prices than the baseline and selected the price they would actually pay for a PBC. The price list ranged from -50% to +50% of the baseline. Successively, each respondent was randomly assigned to one treatment group: in Treatment 1, participants received the definition of PBC only; in Treatment 2, the definition of upcycled ingredients was added; in Treatment 3, participants received the same information as in Treatment 2, plus the explanation of the environmental benefits associated to upcycled ingredients. After reading the information, the same methodology used in round 1 was applied to investigate respondents' WTP for PBC made with upcycled ingredients. In this case, the baseline was the average market price of PBC. A representative sample of 3006 respondents completed the study.
Analyses are currently ongoing, and preliminary results on the WTP highlight the crucial role of information in influencing consumers' behaviors toward upcycled foods.

Keywords

plant-based alternative, willingness to pay, acceptace, sustainability, market

S1 - 12 Sustainability and Traceability of Agri-Food Products: Insights from Italian Consumers

Giulia Mastromonaco[1]*, Antonina Sparacino[1], Valentina Maria Merlino[1], Simone Blanc[1]

[1]Department of Agricultural, Forest and Food Sciences, University of Turin, L.go P. Braccini 2, 10095, Grugliasco, TO, Italy
*E-mail: giulia.mastromonaco@unito.it

Abstract

In recent years, achieving sustainability in all dimensions of the food system has become a key challenge. To meet sustainable development objectives, it is essential to promote and accelerate the transition towards a more sustainable food production and consumption model. Additionally, consumer food purchase habits are influenced by different factors, including the weight given to sustainability of the product and its supply chain. In this context, the objective of this research was to identify the perception and the importance of sustainability certifications and traceability information for different agri-food products. In order to achieve this aim, an online pilot survey was conducted and responses were collected from a representative Italian sample of 1250 respondents. The study surveyed responsible of purchasing to determine the importance they placed on sustainability features and label information, as well as their interest in certified and guaranteed sustainable food products. In addition, the role of certifications was analysed according to socio-demographic characteristics, geographical areas (North, Centre, South and Islands) and the supply chains considered (cheese, wine, cold cuts, fruits and vegetables and meat). Respondents provided their answers using 7-point Likert scales, which were then analyzed through a probabilistic model, known as the Combination of a discrete Uniform and a shifted Binomial distribution (CUB). These models analyzed the level of liking for each selected attribute and the impact of uncertainty on their judgment. Furthermore, by incorporating covariates, these models allowed us to understand how consumer characteristics may influence the importance attributed to the features under consideration. Our results showed that the Italian consumers pay close attention to sustainable certifications and traceability in their purchases. In particular, for fruit and vegetables, the study noted a greater importance placed on sustainable certifications and less indecision in providing answers compared to other supply chains. This study provides a national scenario of consumers' perception of sustainable and traceable products and it can aid in enhancing the marketing and product positioning strategies of Italian companies across various supply chains.

Keywords

sustainability, CUB models, consumer behaviors, agri-food products

S1 - 13

Consumer perception and preferences for 'smart' labels

Marta Bonioli[1]*, Claudia Bazzani[1]*

[1]Department of Management, University of Verona, Via Cantarane 24, 37129 Verona
*E-mail: marta.bonioli@univr.it - claudia.bazzani@univr.it

Abstract

The implementation of smart labels, or e-labels, holds significant promise in enhancing traditional labels by providing real-time data, preventing food loss, and contributing to food safety, traceability, and environmental sustainability in food production and consumption. Despite their numerous benefits, these innovative technologies face limited adoption by consumers due to a lack of trust and knowledge. In this study we investigate on consumer perception and preferences for "smart" labels smart labelling, using a formal systematic review protocol aligned with PRISMA guidelines. To discern determinants influencing consumer acceptance of this technology, the Technology Acceptance Model (TAM) framework is applied, categorizing results based on perceived usefulness, ease of use, and attitude toward use. Previous studies reveal consumer preferences for detailed product information, such as production certificates and inspection details. "Perceived benefits" linked to smart labels include waste reduction and improved communication in the supply chain. Despite these advantages, gaps in consumer awareness underscore the need for effective communication strategies. In examining "perceived ease of use" our study highlight the importance of user-friendly designs, especially for activities like scanning QR codes. External variables, such as sensitivity to environmental concerns and sociodemographic factors, can influence perceptions, with younger consumers showing a higher inclination toward new packaging technologies. To enhance smart label utilization, educating consumers about benefits and ensuring accessibility, especially for non-digital natives, is imperative. As technology progresses, our findings underscore the need for in-depth case studies to understand consumer behaviour, implement efficient adoption strategies, and develop effective communication. The evolving landscape of smart labels necessitates a holistic understanding for seamless integration into various aspects of our lives.

Keywords

Smart labels, Consumer perception, Technology Acceptance Model (TAM), Sustainable consumption

S1 - 14

FROM CONCEPT TO MARKET: SENSORY-DRIVEN CO-CREATION OF TAILOR-MADE MEAT-BASED MEALS

Marina Domenici[1,2]*, Lapo Pierguidi[1], Sara Spinelli[1], Caterina Dinnella[1], Erminio Monteleone[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Italy
[2]Unicoop Firenze, Italy
*E-mail: marina.domenici@unifi.it

Abstract

The rising popularity of the 'flexitarian' diet, advocating reduced meat consumption and increased vegetable intake, has positive impacts on health and the environment. However, to widely adopt this dietary shift, innovative, tailor-made, healthier, and more sustainable meal solutions are essential. While previous research emphasizes the importance of integrating consumer perspectives and sensory methods early in product development, there's limited literature on their application throughout the entire journey from concept to market launch.
This study employed an iterative multi-step co-creation approach. Key phases involved co-creation with consumers and meat experts to translate validated concepts into actionable recipes. An online questionnaire gathered inputs from 129 consumers (flexitarians and omnivores), evaluating twenty-five recipe proposals and identifying the five most promising ones. A trained panel assessed five meat ingredients using various cooking methods, followed by a sensory shelf-life evaluation considering key attributes for consumer acceptance (tenderness, dryness, and overall flavor). Co-created dishes underwent field testing in a corporate canteen, allowing participants to select innovative dishes over current options, with consumers rating recipes based on liking, and feedback was collected. Field testing results informed the co-creation process to refine recipes, with culinary chefs also providing detailed dish descriptions and cooking tips as communication elements. The final phase of the study focused on a market test, comparing new, healthier, and more sustainable recipes against traditional meat products.
Results showed that the co-creation methodology, involving experts and consumers, facilitated practical recipe development. Field testing was integral to the iterative co-creation process, serving as a crucial stage for gathering feedback to inform innovation. The market test revealed that tailor-made, innovative, healthier, and more sustainable meal solutions were preferred by consumers as compared to traditional meat products. This approach effectively met emerging consumer needs, offering valuable insights for companies aligning their products with sustainability and health preferences.

Keywords

sustainability, flexitarians, New Product Development, meat product, consumers

S1 - 15

Fate of nutraceuticals in tomato (*Solanum licopersicum*) and turnip greens (*Brassica rapa subsp. rapa*) subjected to different cooking treatments

Federica Narra[1]*, Marta Florio[1], Eugenia Piragine[2,4], Fabiola Troisi[3], Costanza Ceccanti[1,4]

[1]Department of Agriculture, Food and Environment, University of Pisa, Via del Borghetto 80, Pisa, Italy
[2]Department of Pharmacy, University of Pisa, Via Bonanno 6, Pisa, Italy
[3]Department of Biology, University of Pisa, Via Derna 1, Pisa, Italy
[4]Nutrafood Interdepartmental Research Centre "Nutraceuticals and Food for Health", University of Pisa, Via del Borghetto 80, Pisa, Italy
*E-mail: federica.narra@phd.unipi.it

Abstract

Most vegetables are commonly cooked before consumption, and cooking is one of the factors able to affect the content and bioavailability of nutraceuticals. The aim of the present study was to evaluate the effect of common or innovative cooking technologies on the retention of nutraceuticals by tomato (*Solanum licopersicum*) and turnip greens (*Brassica rapa* subsp. *rapa*). To this purpose, bioactive compounds of tomato and turnip greens were analyzed when these vegetables were subjected to two traditional cooking methods (i.e., tomato sauce and blanching for tomato and steaming and boiling for turnip greens) and to the innovative superheated steam (SHS) cooking technology. Raw material was used as control for each vegetable. Tomato sauce preparation caused the highest loss of lycopene content (–47%) when compared to control, likely due to the combination of high temperature and cooking time (30 min). Interestingly, a higher total ascorbic acid content and antioxidant activity assessed by 2,2′-azino-di-(3-ethylbenzthiazoline sulfonic acid) assay was observed in tomatoes subjected to SHS when compared to control. Boiling turnip greens caused the highest loss of total phenolic content (–75%), ascorbic acid (–84%) and antioxidant activity (–60%) when compared to control. At the same time, a retention of all analyzed bioactive compounds and antioxidant activity was observed in turnip greens subjected to the other cooking methods (steaming and SHS). This investigation showed that SHS might be considered an innovative technology able to maintain the nutraceutical quality of vegetables.

Keywords

bioactive compounds, antioxidant activity, cooking technologies, superheated steam

S1 - 16

COMMERCIAL PLANT-BASED PIZZA CHEESE ANALOGUES: A TECHNO-FUNCTIONAL AND SENSORY EVALUATION

Irene Fenga[1]*, Marcello Alinovi[1], Emma Chiavaro[1], Maria Paciulli[1]

[1]Department of Food and Drug, University of Parma, Italy
*E-mail: irene.fenga@unipr.it

Abstract

The growing demand for plant-based alternatives to dairy products is causing significant efforts by food researchers and industries to develop prototypes with functional and sensory qualities aimed at mimic traditional animal-based options and meet consumer acceptance. This study assessed three distinct plant-based pizza cheeses available in the Italian market compared to animal-derived products, focusing on techno-functional and sensory aspects.
The raw samples were analyzed in terms of water content, pH, texture, color, and proton relaxation time assessed via 1H-NMR. The cooking behavior of these samples was analyzed through texture extensibility, meltability, color change and oiling off measurements. The melting profile was also evaluated using oscillatory rheology and differential scanning calorimetry (DSC). A sensory acceptability test involving 60 panelists, coupled with a penalty analysis, was also conducted by serving the samples melted on pizza slices. Variations in formulation resulted in significant differences among the samples. Generally, plant-based products exhibited lower extensibility compared to dairy counterparts, especially for the one containing various types of gum in the formulation. Rheological analysis indicated poor softening behavior for plant-based samples up to 80°C. Dairy samples showed increased oil release during cooking, except when compared to the plant-based analogue based on nuts, coconuts, and olive oil. Differences in chemical composition influenced DSC thermograms and ^{1}H-NMR profiles, particularly in relation to fat type and water-binding ingredients. Dairy samples received higher sensory ratings than plant-based alternatives, with stretchability was indicated as one of the main penalizing attributes for non-dairy products.
These findings offer valuable insights for food developers to define strategies to rationally improve their recipes.

Keywords

Plant-based; Cheese analogues; Techno-functionality; Thermal behavior; Sensory analysis

S1 - 17

Exploring Environmental and Economic Implications of Introducing Hazelnut Skins in Livestock Diets

Nuria Goldáraz-Salamero[1]*, Filippo Brun[1], Simone Blanc[1]

[1]Department of Agricultural, Forest and Food Sciences, University of Turin, Largo Paolo Braccini 2, 10095 Grugliasco, Italy
*E-mail: nuria.goldaraz@unito.it

Abstract

Hazelnuts are one of the world's top produced nuts, and their industry generates a high quantity of by-products. Although most of these by-products have already utilization paths, some opportunities may arise from the establishment of new applications. That is the case for hazelnut skins (HS), which have nutraceutical properties such as a high content of phenolic compounds and unsaturated fatty acids. This research aims to study the environmental and economic consequences of the valorizing HS by incorporating them into livestock diets. Eight diets were analyzed: four standard diets with different ingredient composition and four experimental diets based on the standard ones with varying proportions of HS as complementary feed. These diets were conceived for different animals, with four for cattle, two for lambs and two for swine. The implementation of HS into the diets involved substituting part of the existing ingredients in the current feed, following a 1:1 approach based on mass. The environmental analysis was carried out using the life cycle assessment methodology, with the functional unit consisting of 1 kg of feed compound. The results showed environmental benefits for most categories and HS diets studied, with an average impact reduction of 15 to 10%. The economic analysis was performed by estimating the cost of the standard diets compared to the diets with HS implementation. The analysis revealed variable results across diets, ranging from 0% to 10% of cost reduction. The outcomes of the analysis depended on the HS ratios in the diets; higher HS use led to more favorable environmental and economic results. Although the implementation of HS in livestock diets yielded overall positive results, limited data availability poses a challenge for these types of analysis. Therefore, further research should be conducted to validate the outcomes of this study.

Keywords

circular economy, life cycle assessment, by-products, cascading, feeds

S1 - 18

Improved shelf-life of gilthead seabream fillets fed an organic diet including crayfish meal

M. Martinoli[1*], M. Contò[1], N. Tonachella[1], G. Cardinaletti[2], A. Martini[1] , D. Pulcini[1], G. Renzi[1], S. Failla[1], E. Tibaldi[2], F. Capoccioni[1]

[1]Consiglio per la Ricerca in Agricoltura e l'Analisi dell'Economia Agraria (CREA) Centro di ricerca "Zootecnia e Acquacoltura" Via Salaria 31, 00015 - Monterotondo (Roma) - ITALY
[2]Dipartimento di Scienze Agroalimentari, Ambientali e Animali, Università di Udine, Via delle Scienze 206, 33100 Udine, Italia
*E-mail: marco.martinoli@crea.gov.it

Abstract

This study aims to evaluate the effects of the inclusion of a crustacean meal, rich in natural astaxanthin, to improve the shelf-life and the nutritional quality of farmed gilthead seabream (*Sparus aurata*). The fish were fed for the last 60 days of the finishing phase either 1) an experimental diet including 10% red swamp crayfish (*Procambarus clarkii*) meal and 2) a commercial control diet. The effects of the dietary treatment on fish growth and fillet oxidation were evaluated at different time points (0 to 4 days after sampling) under different storage conditions (refrigerated, and frozen for 30 days), and after cooking. The inclusion of crayfish meal showed no adverse effects on fish growth, and the fillets showed a significantly higher Flesh Lipid Quality index than the control (16.3% and 12.7%, respectively), as well as a higher n-3 PUFA (43.9% and 40.9%, respectively). Although PUFAs normally increase the levels of conjugated dienes and trienes levels, the experimental group showed reduced values for both parameters compared to the control ($p<0.001$), probably due to the antioxidant effect of astaxanthin. Fillet freshness, measured as volatile nitrogen, was not affected by dietary treatment, and all samples fell below the critical value of 9.3 mg/100g (indicating a very fresh fillet). The 2,2-diphenyl-1-picrilhydrazyl (DPPH) assay, which evaluates the radical scavenging activity, and the levels of thiols, with endogenous antioxidant activity, highlighted significantly high values in experimental fillets ($p<0.05$), effectively counteracting deterioration.
These assessments were confirmed by the evaluation of malondialdehyde (TBARS) on refrigerated, frozen, and cooked fillets, which showed lower values in experimental fillets ($p<0.01$). Overall, this study yields promising findings regarding the incorporation of P. clarkii as a functional ingredient, beyond its role as a nutrient source, in aquafeed finishing diets for gilthead seabream, granting a low sensitivity to oxidation despite high content percentage in PUFAs.

Keywords

lipid oxidation; Sparus aurata; Procambarus clarkii; astaxanthin; organic diet; functional ingredient

S1 - 19

COMPARISON OF DIFFERENT OLIVE POMACE MATURATION SYSTEMS FOR VERMICOMPOST PRODUCTION

Agnese Spadi[1],*, Giulia Angeloni[1], Ferdinando Corti[1], Francesco Maioli[1], Alessandro Parenti[1], Piernicola Masella[1]

[1]DAGRI - Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali, Piazzale delle Cascine 18, Firenze
*E-mail: agnese.spadi@unifi.it

Abstract

During the extraction of extra virgin olive oil (EVOO) a significant amount of biomass is produced, including leaves, pomace, stone, and wastewater. These are commonly referred to as byproducts and have a significant environmental impact, as well as being potentially harmful if not managed correctly. Consequently, it is necessary to study alternative uses to recycle the byproducts derived from the EVOO extraction process, allowing their valorisation both in economic and environmental terms, within a circular economy perspective. Between these, pomace is composed of a mixture of olive pulp and stones, yielding 0.5–0.6 tons of olive pomace per ton of processed olives. The management of the pomace represents an important challenge to the entire extraction process, especially with regards to the sizing of the storage tanks and the management of unpleasant odors deriving from the triggered fermentations. In this context, continuous efforts are necessary to find economically advantageous disposal methods. The objective of this research is to use pomace as a food source for earthworms, with the goal of converting it into an amendment with improved qualitative attributes. Different pomace treatments were investigated, such as mechanical blending, aeration, a blend of both techniques, and no treatment. Over a 30-day timeframe, chemical and physical parameters were evaluated to observe the composting progress and enable comparisons between the different methods utilized. Then, an appetibility assessment was carried out in a controlled setting to determine the actual palatability of the pomace for earthworm. Significant differences emerged regarding chemical parameters that influence the palatability for earthworms. Specifically, the combined system of techniques produced markedly more palatable food for earthworms, followed by the controlled air circulation system and the mechanical turning system. In general, earthworms demonstrated a greater preference for treatments showing variations in total polyphenol content, pH, total sugars, and fatty substances.

Keywords

pomace, vermicompost, circular economy, olive mill by-products, earthworms

S1 - 20

Use of distillation of pruning waste from *Pistacia Lentiscus* L. to produce essential oils and tannins extracts as natural-based agrochemicals: towards green solutions for circular economy in nursery practices

Diana Vanacore[1,2] *, Antonella Gori[2,1], Francesco Ferrini[2,1], Francesca Alderotti[2,1], Cassandra detti[2], Ermes Lo Piccolo[2], Lucrezia Muti[2], Cecilia Brunetti[1,2]

[1]National Research Council of Italy (CNR), Institute for Sustainable Plant Protection, Via Madonna del Piano 10, 50019 Sesto Fiorentino (Florence, Italy)
[2]University of Florence, Department of Agriculture, Food, Environment and Forestry (DAGRI), Viale delle idee 30, 50019 Sesto Fiorentino (Florence, Italy)
*E-mail: diana.vanacore@ipsp.cnr.it

Abstract

Each year, a substantial volume of pruning waste is generated globally in the agricultural and nursery sectors, causing several issues concerning costs and its proper disposal respecting the environment.
One method for recycling pruning waste involves the distillation process for the production of essential oils (EO). Essential oils play a significant role in the agronomical sector for weed control. The residual biomass obtained after the distillation is notably rich in polyphenols, predominantly in the form of tannins. Therefore, the residual biomass can be utilized for several applications, including biostimulants, biopesticides, soil amendments and organic mulch.
This study investigates a possible strategy to valorize the pruning waste of a Mediterranean ornamental woody plant, *Pistacia Lentiscus* L. (Anacardaceae). This was achieved through the distillation of the pruning waste to produce essential oils with antiweed potential, and, the extraction of tannins from the residual biomass.
The chemical composition of EO was determined using GC-MS. Tannin extraction was performed using various methodologies, including boiling water and ultrasound-assisted extraction (UAE), along with different ratios of ethanol to water and varying temperatures and extraction times. Then, the tannin extracts were characterized by HPLC-Q-ToF and quantified by HPLC-DAD.
The EO contained α-pinene, limonene, and myrcene as major constituents, while tannins extracts were composed of quercetin and gallic acid derivatives, with no qualitative differences among the extracts. However, while the most effective extraction method for quercetin derivatives was UAE with ethanol:water, higher yields for gallic acid derivatives were achieved using UAE with water.
In conclusion, the pruning waste of *P. lentiscus* is rich in interesting phytochemicals and can be used to obtain natural-based agrochemical products. Future research will focus on testing the efficacy of EO as anti-weed agents and exploring the potential applications of tannin extracts derived from residual biomass in various agronomic contexts.

Keywords

Pistacia Lentiscus L., pruning waste, essential oils, tannins, natural-based agrochemicals

S1 - 21

Influence of Mint and Rose extraction method on in vitro rumen fermentations

Giulia Dallavalle[2,3], Selene Massaro[1], Jonas Andersen[2], Giorgia Secchi[2,4], Diana Giannuzzi[1], Stefano Schiavon[1], Franco Tagliapietra[1], Elena Franciosi[2]

[1]University of Padova, Department of Agronomy, Food, Natural Resources, Animals and Environment (DAFNAE), Viale dell'Università, 16, 35020, Legnaro (PD), Italy
[2]Fondazione Edmund Mach, Research and Innovation Centre (CRI), Via E. Mach, 1, 38098, San Michele all'Adige (TN), Italy.
[3]University of Padova, Department of Industrial Engineering (DII), Via Gradenigo, 6/a, 35131 Padova, Italy
[4]ONFoods-Research and innovation network on food and nutrition Sustainability Safety and Security - Working ON Foods, Safety and Security - Working ON Foods, 43121 Parma, Italy
*E-mail: giulia.dallavalle@fmach.it

Abstract

During the production of essential oils, in the cosmetics industry, a large amount of solid waste is produced; these residues constitute a disposal problem for industries, both in an economic and environmental context.
Due to the high content of bioactive compounds, this waste can be used, from a circular economy perspective, as supplements in dairy cows' diet. The aim of this study was to evaluate the impact of essential oil extraction method on the rumen microbiota, during in vitro rumen fermentation of *Mentha piperita* and *Rosa centifolia L. mill.*, used as residual product obtained from a supercritical CO_2 extraction (Mint), and as a residue of glycol extraction (Rose). Each fermentation was tested in 3 repeated incubations, and every incubation was carried on using 50 mL of rumen fluids, collected from 3 different dairy cows, mixed with 100 mL of medium and supplemented with 1 g of different matrix. As controls, one bottle per each cow was fermented with medium and rumen fluid (blank), one with grass hay (control test) and one with grass hay and glycol (negative control). For each of the two plants were tested dry forage, residual product and residual of extraction plus the extract. Each bottle was fermented for 24 hours. After this a sample was taken and used for bacterial DNA extraction with a commercial kit and sequenced by Illumina NGS methodology. After the rumen fermentations with Mint, a significant increase, about 20%, in *Lachnospiraceae* in particular *Clostridia*, was highlighted. By converse, all the samples collected from the bottles containing glycol showed a significant increase in Anaerovibrio taxa, about 40%. An increase in *Butyrivibrio* was also found in all samples compared to the rumen-only control.
This study allowed us to obtain preliminary results on the potential use of waste resulting from the extraction of essential oils.

Keywords

circular economy, dairy cows, in vitro, rumen fermentation

S1 - 22

Natural or artificial Christmas tree? An environmental dilemma solved by Life Cycle Assessment methodology

Riccardo Paoloni[1]*, Lapo Azzini[2], Caterina Antonia Dattilo[3], Andrea Laschi[4], Francesco Paolo Nicese[5], Massimo Delogu[6], Francesco Neri[7], Giacomo Goli[8]

[1,2,5,7,8]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Address Piazzale delle Cascine, 18 - 50144 Firenze, Italy
[3,6]Department of Industrial Engineering (DIEF), University of Florence, via Santa Marta 3, 50139, Florence, Italy
[4]Department of Agricultural, Food and Forest Sciences, University of Palermo, Viale delle Scienze ed. 4, 90128, Palermo, Italy
*E-mail: riccardo.paoloni@unifi.it

Abstract

People's increased attention to the environmental aspects of commonly used products has pushed producers and consumers to look for more sustainable solutions to reduce harmful emissions into the environment. International organisations such as the IPCC have emphasised the importance of making more climate-friendly choices to limit global warming.
Every year, an animated debate rages about the choice between natural and artificial Christmas trees, as both have environmental implications. This study aims to answer this question and explore it further through the use of Life Cycle Assessment (LCA).
Three types of Christmas trees were compared: one natural and two artificial (a premium and a basic model). The first is grown and sold in province of Florence (Italy), while the other two are produced and distributed from China. The functional unit considered in this study is a 1.80 meter high tree without Christmas decorations. The life cycle analysis took into account the entire process, from the extraction and production of raw materials to the end of life (cradle to grave). For artificial trees, two end-of-life scenarios (incineration and landfill) were assumed, while for the natural tree, three scenarios (composting, landfill and incineration) were assumed. The transport stages from the gate to the point of sale and subsequent disposal were also considered.
Gabi 6.0 software was used for inventory analysis and assessment of environmental impacts, focusing on impact categories such as climate change, fossil depletion, freshwater consumption, freshwater ecotoxicity , freshwater eutrophication and land use.
Further investigations focused on the production phase for artificial trees, the end of life for the natural tree, and the break-even point between the two types. This study provides an empirical basis for an informed evaluation of Christmas tree options, thus contributing to more sustainable decisions during the celebrations or Christmas holidays.

Keywords

LCA, Christmas tree, Impact categories, Sustainability

S2 - 01

Smart irrigation for management of processing tomato: a machine learning-based DSS application

Andrea Martelli[1]*, Davide Rapinesi[1], Itzel Inti Donati[1], Leonardo Verdi[2], Anna Dalla Marta[2], Filiberto Altobelli[1]

[1]CREA (Research Centre for Agricultural Policies and Bioeconomy, Rome, Via Barberini 36, Italy)
[2]DAGRI (Department of Agriculture, Food, Environment and Forestry-University of Florence, Piazzale delle Cascine 18, Florence Italy)
*E-mail: andrea.martelli@crea.gov.it

Abstract

The rise of IoT in agriculture is transforming how precision irrigation is practiced, enabled by technologies like machine learning (ML). In this recent study conducted in Italy the application of ML-based decision support systems (DSS) in optimizing deficit irrigation for processing tomatoes is explored. Over three years (2021-2023), the study investigated different irrigation strategies—Full irrigation (Fi), Deficit irrigation (Di), Regulated Deficit irrigation (RDi), and Deficit irrigation (Di2)—using drip irrigation on processing tomatoes (Var. Durpeel F1). The Four volumes of irrigation correspond to the restitution of 100, 80, 60-80-60 and 60% of ETc. The experiment was closely monitored by an ML-based smart irrigation system (SIS) linked to various sensors and weather station. The objectives were to evaluate tomato responses to controlled deficit irrigation, examine water use efficiency indices (WUE, TYWUE, MYWUE, and IWP) in relation to yields and quality, and assess the impact of temperature on tomato performance. Statistical analysis revealed significant effects of deficit irrigation on growth and yield parameters. Notably, RDI and DI treatments showed high water use efficiency comparable to Fi, demonstrating improved WUE and quality while saving 32.66% of water. However, the study also highlighted concerns about extreme weather events, such as heat waves, which could undermine the benefits of deficit irrigation if not managed properly. ML-based DSS proves beneficial for water management, but requires greater sensitivity to crop vulnerability to heat and water stress to maximize its effectiveness.

Keywords

Water Use Efficiency; Water stress; Water productivity; Drip irrigation

S2 - 02

Analyzing the Influence of Shading on Alfalfa Phenotypic Traits in Agrivoltaic Systems: A GroIMP Modeling Approach

Michele Moretta[1], Riccardo Rossi[1], Giovanni Argenti[1], Nicolina Staglianò[1], Gloria Padovan[1], Enrico Palchetti[1], Marco Bindi[1], Marco Moriondo[2]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence (UNIFI), Piazzale delle Cascine 18, 50144 Florence, Italy
[2]Institute of BioEconomy, National Research Council of Italy (CNR-IBE), Via Madonna del Piano 10, 50019 Sesto Fiorentino, Italy
*E-mail: michele.moretta@unifi.it

Abstract

Agrovoltaic (AV) systems represent innovative solutions that combine agricultural practices with solar energy production, promoting sustainable integration between food cultivation and renewable energy generation. The trade-off between energy and agricultural production underlines the need for tools to assess the overall impact of AVs on crops.
Currently, the integration of plant growth models with spatial representation models of panel distribution emerges as a pivotal approach for such assessments. However, these tools require specific parameterization to assess the effects of shade AV on key phenotypic traits related to plant growth and production.
This proposed study analyzes the effect of shade on alfalfa, a crop recognized for its adaptability under these conditions (Edouard et al., 2023), within a fixed-panel AV system during the 2023 growing season.
An alfalfa growth model was parameterized using the GROIMP platform, with a three-dimensional reconstruction of the AV system. The model employs an inverse path tracking algorithm with Monte-Carlo integration (Veach, 1998) to simulate light distribution and local light interception. By incorporating light sources and geometric objects, such as solar panels, the model constitutes a complete scene, recalling the radiation model for each simulation step. The model was applied in an open alfalfa field in Emilia Romagna and under AV to simulate plant growth and development according to local management practices. In addition to modeling, key parameters were also monitored through destructive field sampling methods to validate the model's predictions. The model provides adequate answers regarding traits such as leaf area development, biomass accumulation and yield, LAI.
The proposed multifaceted approach could serve as a valuable tool to optimize AV systems, facilitating the sustainable integration of energy and agricultural production. This advancement could advance research on renewable energy and integrated agricultural practices.

Keywords

AgriVoltaic, Radiation model, GroIMP, alfalfa, renewable energy

S2 - 03

Advancing Weed Detection in Precision Agriculture: A Drone-Based Approach for Species-Level Identification

Nebojša Nikolić[1]*, Domenico Giuseppe Coscia[1], Roberta Masin[1]

[1]Department of Agronomy, Food, Natural resources, Animals and Environment (DAFNAE), University of Padova, Viale dell'Università 16, 35020 Legnaro (PD)
*E-mail: nebojsa.nikolic@unipd.it

Abstract

Weeds pose significant challenges in agricultural crop production, causing substantial short- and long-term damage. Today, weed control heavily relies on chemical methods, which have the potential to be harmful to the environment. To enhance the sustainability of crop production and minimize chemical usage, it becomes imperative to increase the effectiveness of treatments through precise species-level identification and accurate monitoring of spatial distribution. The use of drones, coupled with specialized software and algorithms, presents a promising avenue for achieving species-level weed identification.
The images over soybean and sunflower fields were acquired at altitudes ranging from 5 m to 30 m, utilizing the DJI Mavic 3 Enterprise drone equipped with an RGB optical CMOS sensor. Following image acquisition, weed classification was performed using ArcGIS software and Deep Learning (DL) algorithms, yielding high overall accuracy. For the soybean field, accuracy varied from 79% to 94% across different altitudes, while for the sunflower field, it ranged from 77.3% to 98.8%. However, recognizing the limitations in accuracy at the 30 m altitude, a tailored classification approach focusing on broadleaf and narrowleaf species differentiation was implemented, resulting in a substantial improvement, achieving an overall accuracy of 96.2%.
The outcomes of this study suggest that by optimizing image resolution and employing advanced software and algorithms, species-level classification of weeds is indeed achievable. Furthermore, implementing this methodology for weed classification could enable the creation of high-precision prescription maps. These maps not only provide valuable information on weed location for site-specific distribution through machinery but also assist in the selection and targeted application of herbicides.
Overall, the proposed methodology, supported by the obtained results, has great potential to significantly enhance the efficiency of weed control operations, preserve the environment and promote sustainable agricultural practices.

Keywords

Weeds, Precision agriculture, Remote sensing, Sustainability

S2 - 04

EFFECT OF 1-MCP ON THE EVOLUTION OF AROMATIC PROFILE DURING RIPENING OF A NEW KIWIFRUIT VARIETY (*z*)

Camilla Cinelli[1]*, Elige Salamé[1], Pietro Tonutti[1], Mirco Montefiori[2], Stefano Brizzolara[1]

[1]Crop Science Research Centre, Sant'Anna School of Advanced Studies, Via Luigi Alamanni, 22 San Giuliano Terme (PI) 56017 - Italy; 2 New Plant Soc. Cons. Agr., Via Malpighi, 5 Forlì (FC) 47122 - Italy
*E-mail : camilla.cinelli@santannapisa.it

Abstract

The new kiwifruit cultivar, DulcisTM (*Actinidia chinensis var. chinensis*), is the result of an Italian breeding program designed to incorporate the traits of yellow-fleshed A. *chinensis* varieties (sweeter, more aromatic) into the green-fleshed kiwifruit segment. Dulcis™ fruits are recognized for their distinctive aroma and sweet-to-acid balance, marking a significant novelty in the industry. During the early stages of ripening, kiwifruit is particularly sensitive to ethylene. By inhibiting the interaction of ethylene with its receptors, 1-methylcyclopropane (1-MCP) can reduce the response to the ripening hormone, thereby, slowing down ripening processes and reducing fruit loss in the supply chain. However, the effect of 1-MCP on the production of aromatic compounds remains unclear. The main goal of this research is to investigate the role of ethylene on the aroma profile of cv Dulcis™. For this purpose, kiwifruit treated with 1-MCP and ethylene were compared. Results showed that fruit treated with 1-MCP maintained significantly higher firmness levels. In contrast, those treated with ethylene showed a notable decrease in pulp firmness, accompanied by increased ethylene production and a substantially higher concentration of soluble solids. Volatile organic compound (VOC) profile includes 34 compounds belonging to the classes of alcohols, ketones, aldehydes, esters and terpenes. The compounds with the highest relative abundance belong to the class of aldehydes (hexanal, (E)-2-hexenal and sorbaldehyde) and alcohols (hexanol and (E)-2-hexen-ol), which contribute to fresh, herbaceous and green notes. Interestingly, several terpenoids have been detected and may play an important role in conferring to this kiwifruit a distinctive aroma.
Moreover, results preliminarily indicate a strong effect of 1-MCP treatment on several aroma components.

Keywords

Volatile Organic Compounds, Ethylene, Shelf-life, Postharvest

S2 - 05

VARIATIONS OF VOLATILE ORGANIC COMPOUNDS PROFILE IN DEHYDRATING WINE GRAPE BERRIES INFECTED BY *BOTRYTIS CINEREA*

Pietro Emilio Nepi[1]*, Claudia Pisuttu[2], Gemma Bianchi[2], Cristina Nali[2], Pietro Tonutti[1], Stefano Brizzolara[1]

[1]Crop Science Research Center, Scuola Superiore Sant'Anna di Studi Universitari, Piazza Martiri della Libertà,33, 56127, PISA, ITALY;
[2]Department of Agriculture, Food and Environment, University of Pisa, Via del Borghetto 80, 56124, PISA, ITALY;
*E-mail: pietroemilio.nepi@santannapisa.it

Abstract

Enriching grape must for dry or sweet wine production by incorporating partially dehydrated grapes is a globally practiced tradition, and it is currently experiencing renewed interest, exemplified by wines like Amarone. However, the controlled conditions in grape dehydration chambers are conducive to the development of *Botrytis cinere*a, resulting in significant grape losses. Few published papers report specific quanti-qualitative alterations in the profile of volatile organic compounds (VOCs) in response to *B. cinerea*. This knowledge can be applied to the development of specific VOC sensors for early detection. With this goal and to enhance understanding of VOCs specifically induced in intact berries by *B. cinerea* infection, partially dehydrated grape samples from Sangiovese (40% Weight Loss, WL) and Corvina (20% WL) cultivars were collected. Homogeneous intact berries with pedicels were selected and analyzed as such and following (i) artificial *B. cinerea* inoculation (10^5 spores ml^{-1}) or (ii) mock inoculation (control). After a 5-day incubation at 16 °C, GC-MS analysis revealed significantly higher levels of specific primary and secondary alcohols in inoculated berries, some of which are already reported as correlated with *B. cinerea* infection, while others are not yet mentioned as infection markers. Setting up sensors trained to identify these volatile markers inside dehydration chambers represents a challenging goal for improving the grape dehydration process, enabling the early detection of *B. cinerea* and reducing grape losses through targeted interventions.

Keywords

viticulture, grey mold, dehydration, sensor

S2 - 06

The impact of digitalization in the forestry sector: An analysis of the effects on socio-economic indicators in the Italian context

Francesco Barbarese[1]*, Francesco Carbone[1], Zacharoula S. Andreopoulou[2]

[1]Dipartimento per l'Innovazione dei sistemi Biologici, Agro-alimentari e Forestali (DIBAF), Università degli Studi della Tuscia, via san Camillo de Lellis snc, 01100 Viterbo, Italy
[2]Laboratory of Forest Informatics, Faculty of Forestry and Natural Environment, Aristotle University of Thessaloniki, P.O. Box 247, 54124 Thessaloniki, Greece
*E-mail: francesco.barbarese@unitus.it

Abstract

Digitalization has been revolutionizing nearly all social and economic areas for many years, and the forestry sector is no exception with the introduction of digital tools and the adoption of new ICTs dedicated to it (Heimerl and Raza, 2018; Hong & Chang, 2021; Aguilar & Wen, 2021; Koliouska & Andreopoulou, 2023). This study explores the impact of digitalization on the Italian forestry sector, delving into the relationship between the level of digitalization by region (previously defined by Carbone et al., 2023) and various forestry indicators and parameters.
Utilizing data from the Sinfor platform, Italian regions were classified based on their degree of digitalization, and subsequently, relevant socio-economic indicators were selected. The Shapiro-Wilk test was used to assess the normality of the datasets, followed by Pearson or Spearman correlation tests depending on the data distribution, to examine the associations between the level of digitalization and the selected indicators. Indicators with a correlation coefficient greater than 0.5 and a p-value < 0.05 were further analyzed through linear regression equations.
Our analysis reveals a significant correlation between the level of digitalization in the forestry sector and various socio-economic indicators, including public resources allocated to the sector, the number of forest management plans, the number of woodworking companies, and the area of PEFC certified forest, with values ranging between 0.523 and 0.805. Using regression lines, we predicted that an increase in the level of digitalization from 2.24 to 4 will lead to significant increases in the key areas of the sector mentioned earlier, highlighting the importance of digitalization for sector improvement.
These results emphasize the importance of digitalization in promoting sustainable and effective forest management, providing a foundation for further research and offering insights for the adoption of targeted digitalization policies aimed at maximizing the socio-economic and environmental benefits in the Italian forestry sector.

Keywords

Digitalization; Forestry Sector; Green ICT; Socio-economic Indicators; Digital Platform; Digitalization Policies

S2 - 07

An innovative plant for foods quick-freezing

A. Biglia[1], M. Bilardo[2], C. Messina[1], L. Comba[1], M. Grella[1], D. Ricauda Aimonino[1], E. Fabrizio[2], P. Gay1

[1]Department of Agricultural, Forest and Food Sciences (DiSAFA), University of Turin, Largo Paolo Braccini 2, 10095 Grugliasco (TO), ITALY
[2]TEBE Research Group, Department of Energy (DENERG), Politecnico of Turin, Corso Duca degli Abruzzi 24, 10129 Torino, ITALY
*E-mail: alessandro.biglia@unito.it

Abstract

Reverse Brayton cryocoolers are an option for industrial applications requiring temperatures lower than -50 °C. One application where low temperatures are crucial for food preservation and shelf-life extension is freezing.
We designed an innovative quick-freezing plant based on a nitrogen Brayton cryocooler prototype, which performance was then tested. The prototype is innovative in both the cycle configuration and the thermodynamic parameters. Moreover, nitrogen is an eco-friendly gas.
The prototype was tested at design operating conditions (maximum and minimum pressure of 18.5 and 8 bar respectively, and minimum temperature of -120 °C), obtaining a cooling effect of about 16 kW, and a performance coefficient equal to 0.29, which rises to 1.34 when 55 kW of waste heat, that can be recovered at a temperature lower than 100 °C, is considered. A sensitivity analysis was also done to test the prototype at different thermodynamic operating conditions in terms of minimum temperature and maximum pressure. The innovative quick-freezing plant was used to freeze food products. The physicochemical characteristics of frozen and thawed food products were evaluated to assess the effect of the low freezing temperature, the time-temperature profiles were also monitored during the freezing and thawing processes. A comparison with two other standard freezing methods was conducted, and unfrozen food products were used as a reference.
We discovered that the prototype performed better at higher maximum pressures, and that a minimum temperature of roughly -140 °C was attained. Our research showed that the tested prototype has a lot of zpotential for use in a variety of industrial settings where low temperatures are necessary. The trial campaign findings also demonstrated that the prototype plant could freeze at a rate of 50 °C/h, which is faster than normal plants, thus significantly decreasing the amount of the thawing losses of frozen food products.

Keywords

Brayton cycle, Innovative plant, Thermodynamic performances, time, Food physicochemical characteristics, Food industry

S2 - 08

Evaluation of spot-spray UASSs performance using a lab-method for perennial crops

V. Maritano[1]*, A. Biglia[1], P. Barge[1], E. Mozzanini[1], L. Comba[1], M. Grella[1]

[1]Department of Agricultural, Forest and Food Sciences (DiSAFA), University of Turin (UniTO), Largo Paolo Braccini 2 - 10095 Grugliasco (TO), ITALY.
*E-mail: valeria.maritano@unito.it

Abstract

The interest in using uncrewed aerial spray systems (UASSs) for precise targeted spray applications is increasing.

In this study, we devised a lab-method specifically tailored to simulate spot-spray applications on a small-size surface under controlled conditions, with the intent of mirroring real-world scenarios in a vineyard setting. To replicate the arrangement of plants in rows, pairs of vertical poles (height above the ground level: 0.8 and 2.2 m) were aligned at specific intervals. On the top of each pole was then placed a polystyrene cube (side of 5 cm) hosting, one-per-cube-face exposed, a water sensitive paper (WSP). Three spots of different sizes (3×5, 5x5, and 7.5×5 m) were considered, each covering 1, 2, or 3 vine rows, respectively. A fly path parallel to the row was defined for the smaller spot, while flight routes at a 45° angle to the row orientation were established for the larger ones. Different nozzle types were tested using the commercial drone DJI Agras MG-1P. Spray operational parameters, such as flow rate and flight speed, were set to obtain a spray application rate equal to 100 L/ha. To reach the desired total spray application rate (200L/ha), the application was doubled flying in opposite directions. Results showed that spray coverage (%) and drops impact density (No./cm^2) have not been significantly influenced by spot size, pole height, and pole position (rows). Conversely, significant interactions were found between the nozzle type and WSP positions. Better spray coverage and impact density results were measured on the upper cube-face WSPs, with the XR11001 nozzle exhibiting the highest values (28% and 126 No./cm^2).

The lab-method enabled to evaluate the UASS performance for small-size spot spraying under controlled conditions in a vineyard-like scenario. The designed method could be broadened to other perennial crops to assess UASSs spot-spray.

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Keywords

Uncrewed aerial spray systems, Spot spraying, Lab-method, Spray coverage, Precise targeted application

S2 - 09

Hydraulic-based fixed spray delivery system for pesticide application in vineyards: first spray performance results

Eric Mozzanini[1], Marco Resecco[1], Paolo Marucco[1], Fabrizio Gioelli[1], Marco Grella[1]*

[1]DiSAFA – UNITO (Department of Agricultural, Forest and Food Sciences, University of Turin, Largo Paolo Braccini, 2, 10095 Grugliasco, TO, Italy)
*E-mail: marco.grella@unito.it

Abstract

The hydraulic-based fixed spray delivery system (FSDS) has emerged as a versatile tool derived from irrigation system modifications, serving functions like freeze/frost protection, and conditioning. Its potential extends to pesticide applications in 3D crops, and by also enabling operators to conduct spray applications from outside the treated area, FSDS potentially minimizes their exposure risks. Particularly advantageous in challenging terrains like those of the so-called heroic agriculture, in which spray applications are traditionally done manually, FSDS represents a safer alternative for crop protection. Based on the promising result recently obtained in the apple orchard case, and the specific studies on emitter identification, mixture homogeneity distribution, and cleaning performance evaluation carried out in vineyards, this research delves into the FSDS layout's spray performance comparisons. To this extent, four hydraulic-based FSDS 2-tier layouts were evaluated at the DiSAFA experimental vineyard. The four layouts resulted in combining three emitter types with different emitter densities (number of emitters per row length). For each layout, the spray performance was quantified using a solution of water and Tartrazine (10 g l^{-1}). The canopy deposit was quantified using leaves as samplers and by sampling from nine canopy areas. Also, in-field ground losses were quantified by placing an array of Petri dishes on the ground, transversal to the row, and coincident with the distances used for canopy deposit assessment. Samplers were then washed with deionized water and the solution was analyzed using spectrophotometry technique to quantify the spray deposited per surface unit. The dataset analysis showed a statistically significant effect of layout on mean deposit and ground losses. In general, layouts with a higher emitter density should promote deposition, but the hydraulic-based FSDS tested resulted in lower canopy deposits. The emitter type, density, and layout selected, resulted in the key factors affecting the spray performance of a hydraulic-based FSDS.

Keywords

spraying equipment, innovative sprayers, solid set canopy delivery system, pesticide application equipment, spray performance

S2 - 10

Kinetic modelling of acetamiprid, metalaxyl, S-metolachlor and terbuthylazine dissipation in a full-scale free water surface constructed wetland in Emilia Romagna region

Enrico Buscaroli[1]*, Stevo Lavrnić[1], Attilio Toscano[1], Ilaria Braschi[1]

[1]Department of Agricultural and Food Sciences, Alma Mater Studiorum Università di Bologna. Viale Giuseppe Fanin 44, 40127 Bologna (BO)
*E-mail: enrico.buscaroli2@unibo.it

Abstract

Our research examined the effectiveness of a 3700 m^2 vegetated free water surface (FWS) constructed wetland (CW) in managing agricultural runoff water contaminated with pesticides. The study simulated a 0.1% pesticide runoff event due to an 88 mm rain on an adjacent 12.5 hectares farm in a rural area of the Bologna province, Italy. Acetamiprid, metalaxyl, S-metolachlor, and terbuthylazine were dispersed in 1 cubic meter of water and were admitted into the CW. Over a period of four months, sediment and water samples were collected at various intervals from the CW to assess pesticide concentration. Multiresidue analyses were carried out by liquid chromatography-mass spectrometry. No detectable pesticide traces were found in wetland sediments throughout the period considered, suggesting that active principles remain suspended in the water column either absorbed by organisms or bound to dissolved organic matter. The dissipation of pesticides within the water column was modelled using Single First Order (SFO), First Order Multi-Compartment (FOMC), and Double First Order in Parallel (DFOP) kinetic models, following European Food Safety Authority (EFSA) best data practices. DFOP model showed the best fit to the observed data. The modelled distribution of each pesticide between the biomass and water in the CW showed a strong correlation with environmental indicators such as Kow and bioconcentration factor. Computed DT90 values according to DFOP model were 7.206, 26.64, 5.153, and 6.799 days for acetamiprid, metalaxyl, S-metolachlor, and terbuthylazine, respectively. The wetland was proven effective in treating pesticides-contaminated agricultural runoff water within a reasonable timeframe. Thus, it is confirmed the relevance of said infrastructure within the scope hydraulic and water quality buffer, as well as their role as ecological niches.

Keywords

Agricultural water quality; Pesticides dissipation; Constructed Wetland

S2 - 11

APPLICATION OF A PRECISION AGRICULTURE WORKFLOW IN VITICULTURE FOR CANOPY ANALYSIS USING UAV MULTISPECTRAL AND RGB IMAGERY

Alfonso Valerio Ragazzo[1,2]*, Alessandro Mei[1], Giuliano Fontinovo[1]

[1]Institute of Atmospheric Pollution Research, National Research Council (CNR-IIA),, 00015 Monterotondo, Italy
(alessandro.mei@cnr.it, giuliano.fontinovo@cnr.it, alfonsovalerioragazzo@cnr.it)
[2]Department of Engineering, Unit of Electronics for Sensor Systems, University Campus Bio-Medico di Roma, 00128, Rome, RM, Italy
(a.ragazzo@unicampus.it)
* E-mail: alfonsovalerioragazzo@cnr.it

Abstract

Precision Agriculture (PA) techniques in viticulture stands out as one of the most prominent and growing segments within the Italian agricultural economy. Their critical challenges primarily issued from the lack of extensive application with new technologies and from the fragmentation of numerous small companies that have not the access to specific technologies.
In the last decade there has been a gradual adoption of Unmanned Aircraft Vehicles (UAVs) and sensors for PA purposes, offering rapid and economically accurate methodologies to identify spatial variabilities on plant's geometries and vigor. Microclimate, lighting condition and soil composition may differ within each Production Unit (PU), significantly impacting vegetative geometry and physiological parameters of grapes.
According to this, the aim of this work is to reduce management costs, providing a useful support for winegrowers and optimizing agricultural practices in a multi-temporal context. Indeed, the adoption of specific technologies can strongly promote a sustainable and economical management of vineyards. This work achieves an effective workflow for obtaining detailed information about canopy characteristics, aiming to extract spectral indices responses and metrics such as heights, areas, and volumes. The workflow used for images processing and data analysis concerns licensed and open-source software, employing the usage of script in R language. UAV RGB and multispectral imageries within a single PU have been processed to attain the following issues: (1) spatial-temporal retrieval of canopies' height, area, and volume variations; (2) grapes production/loss estimation; (3) canopy condition assessment based on spectral indices related to biophysical parameters. In conclusion, this work shows how photogrammetry products-derived, such as orthophotos, Digital Surface Models (DSMs), Digital Terrain Models (DTMs), and textured 3D models, can be used to improve the knowledge of canopies' metric, also in relation to biophysical characteristics, enabling change detection analysis across different acquisition times.

Keywords

Precision Agriculture, Unmanned Aircraft Vehicle, photogrammetry, canopy imaging, canopy metrics

S2 - 12

Development of a qPCR method for pathogenic microalga *P. bovis* identification and quantification in bovine milk

Irene Crescioli[1]*, Laura Morello[1]

[1]Istituto di Biologia e Biotecnologia Agraria - Consiglio Nazionale delle Ricerche, Via Edoardo Bassini, 15 – 20133 Milano, Italia
* E-mail: irene.crescioli@ibba.cnr.it

Abstract

Prototheca bovis is an algal pathogen causing refractory mastitis in dairy cattle with increasing incidence worldwide and significant economic impact, as the only suggested sanitary measure to restrict the spread is, so far, culling infected animals. *P. bovis* infects cows throughout the lactation cycle, including dry periods, and exhibits persistence in both the udder and the environment. This study focuses on the development of efficient and cost-effective diagnostic assays utilizing quantitative PCR (qPCR) for the early detection of *P. bovis i*n milk samples. The objective is to provide crucial support for farm management, enabling timely interventions for infection eradication. The proposed qPCR method selectively targets the *β-tubulin* gene of the pathogen (*PbTUBB*) with respect to its non-pathogenic relative *P. zopfii*. In a preliminary validation step, following the cloning of a *PbTUBB* fragment into the plasmid *pJET1.2*, the qPCR assay demonstrated efficient quantification of the target sequence across a wide concentration range. Subsequent application of the technique to detect *PbTUBB* in milk samples from different origins, in conjunction with the use of a commercial DNA extraction kit, revealed its effectiveness in identifying *P. bovis* DNA. This included detection and quantification in experimentally-contaminated milk samples (*P. bovis* range: 40-10,000 cells/mL) and in milk directly obtained from infected cows. Collectively, these findings may represent the foundation for more precise and affordable on-farm disease monitoring and decision-making, facilitated by a reliable diagnostic tool.

Keywords

Prototheca bovis, refractory mastitis, qPCR, diagnostic assay, on-farm Disease Monitoring

S2 - 13

Low-dosage UVB radiation stimulates synthesis of antioxidant polyphenols in *Lactuca sativa* without side effects

Valentina Lazazzara[1]*, Antonella Gori[1,2], Cecilia Brunetti[1,2], Lucia Cavigli[3], Giovanni Marino[1], Matthew Haworth[1], Filippo Micheletti[3], Giovanni Agati[3]

[1]Institute for Sustainable Plant Protection (IPSP), National Research Council, Sesto Fiorentino, 50019, Italy
[2]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Sesto Fiorentino, 50019, Italy
[3]Institute of Applied Physics "Nello Carrara" (IFAC), National Research Council, Sesto Fiorentino, 50019, Italy
* E-mail: valentina.lazazzara@ipsp.cnr.it

Abstract

Horticultural plants used in the production of ready-to-eat (RTE) salads are cultivated under plastic tunnels that reduce the natural UV radiation reaching the crop. Since UV radiation is the main elicitor of plant antioxidant polyphenols, RTE salads usually contain low amount of these beneficial compounds. On the other hand, exposure of plants to high levels of UV radiation during growing can cause reduced biomass and physiological disorders.
Here, we propose the application of low-dose UVB radiation a few days before harvest to enhance the polyphenol content in lettuce (*Lactuca sativa*).
Two-month-old baby leaf lettuce plants were collected and transplanted in 13 cm diameter pots one week before commercial harvest. The plants were irradiated for five consecutive days by UVB LED radiation at 306 nm for 30 min or 1 h, in addition to white LED radiation planned to simulate a 10/14 h light/dark cycle. The effect of the UVB treatments was monitored daily by the Multiplex optical sensor to provide indices of the leaf chlorophyll and epidermal phenolics (EPhen).
EPhen increased linearly with the UVB energy dose, reaching values 1.5-times higher than the initial value after five days of the 1 h per day treatment. The shorter (30 min) daily UVB treatment produced half the enhancement of EPhen than the longer treatment. In the control plants, EPhen increased by 15% over five days. Liquid chromatography coupled with UV-VIS and mass spectrometry detectors revealed a significant increase in polyphenols (i.e., caffeic acid derivatives, and flavonols) in UVB-treated compared to control plants. The chlorophyll index increased during the trial similarly for the UVB-treated and control plants. Moreover, physiological parameters, such as stomatal conductance and photosynthesis rate, were not influenced by UVB radiation. Our results suggest that UVB radiation can enhance the antioxidant polyphenol content in lettuce, thus improving the nutraceutical properties of RTE salads.

Keywords

Lactuca sativa, UVB radiation, non-destructive detection, polyphenol compounds, liquid chromatography

S2 - 14

Investigating the physiological responses of *Cinnamomum camphora* to different irrigation regimes coupled with online monitoring of leaf water content in nursery settings.

Cassandra Detti[1], Antonella Gori[1,2], Lapo Azzini[1], Francesco Paolo Nicese[1], Francesco Ferrini[1,2], Cecilia Brunetti[1,2]

[1]University of Florence, Department of Agriculture, Food, Environment and Forestry, Sesto Fiorentino, 50019 Florence, Italy
[2]National Research Council of Italy (CNR), Institute for Sustainable Plant Protection, Sesto Fiorentino, 50019 Florence, Italy
*E-mail: cassandra.detti@unifi.it

Abstract

The nursery sector, playing an essential role in the Italian economy, faces challenges in sustainable water management.
This study examines the physiological responses to deficit irrigation treatments in the ornamental tree Camphor (*Cinnamomum camphora* (L.) J. Presl) and explores the potential of integrating innovative leaf sensors (leaf water meter, LWM) to efficiently address water consumption issues.
Seven five-year-old potted plants were subjected to three water regimes: well-watered (WW), moderate (MD), and severe (SD) water deficit conditions for 50 days, providing respectively 60% and 30% of water compared to controls (WW); the water deficit was followed by a rewatering for one week.
Leaf dehydration levels (DL) were continuously monitored using the LWM sensor. Additionally, measurements of plant growth and physiological parameters were conducted, including water relations (leaf relative water content [RWC] and water potential [Ψw]), gas exchange (photosynthesis [A] and stomatal conductance [g_s]), and chlorophyll fluorescence (maximum photochemical efficiency of PSII (F_v/F_m).
The results showed that MD and SD plants reduced g_s to avoid water loss, as confirmed by high RWC levels maintained during the water stress progression.
However, differently from SD plants, MD plants did not exhibit a marked reduction in photosynthetic performances, in particular of A and F_v/F_m values. This was also reflected in the plant growth, which was not significantly affected in MD plants compared to WW plants. The isohydric behavior of C. camphora also emerged by the online signal of LWM sensors.
These sensors allowed to monitor the recovery of leaf RWC and Ψw after rewatering, thus confirming its applicability for tracking plant water requirements in nursery settings.
In conclusion, water management in the nursery can be optimized as moderate water deficit did not compromise the growth and quality of Camphor trees. Additionally, employing LWM sensors proved an effective tool for optimizing irrigation tailored to different species.

Keywords

Cinnamomum camphora, LWM sensor, nursery, physiological response, water deficit.

#AISSA under40

S2 - 15

Assessing Carbon Stock in Small Landscape Features: study area of Northeast Italy

Ester Curci[1,2]*, Antonio Tomao[2], Francesco Da Borso[2], Maurizia Sigura[2]

[1]Department of Life sciences, University of Trieste, Address: via Licio Giorgieri, 5 (TS)
[2]Department of Agricultural, Food, Environmental and Animal sciences, University of Udine, Address: via delle Scienze, 206 (UD)
*E-mail: ester.curci@phd.units.it

Abstract

Small landscape features (SLFs) are relevant but often overlooked components of ecosystems, playing a crucial yet poorly understood role in the global carbon cycle. Despite their ubiquity and potential significance, SLFs remain largely understudied within ecosystem science. These features, encompassing a diverse array of natural and semi-natural elements such as hedgerows and riparian buffers, intersect agricultural, urban, and natural landscapes, contributing to biodiversity conservation and carbon sequestration.
This study aims to assess the carbon stock within SLF and its implications for ecosystem services in a study area in the Friuli Venezia Giulia region. Through field surveys and remote sensing techniques, the research examines carbon density and distribution patterns in SLFs across diverse landscape types and management practices. To this aim we adapted and applied the Random Forest model originally developed to estimate carbon stock in forests, trained on the 2015 INFC inventory points. It uses as covariates the Canopy Height Model (CHM), slope percentage, elevation, aspect (degree), and spectral indices like NDVI, NDII, EVI, and GNDVI. The study reveals significant variations in carbon storage among different SLF vegetation types and land-use contexts. The average carbon stock in SLFs resulted 33,17 tC ha^{-1} with a standard deviation of 26,71. In comparison, the estimated carbon stock in regional forests averages 70.95 tC/ha^{-1}. This comparison provides context for understanding the relative contributions of SLFs to regional carbon storage and productivity.
By quantifying carbon stocks in these often-overlooked landscape features, valuable data are provided for land managers and policymakers aiming to enhance carbon sequestration and biodiversity conservation in agricultural landscapes.

Keywords

Carbon Stock, Small Landscape Features, Agricultural Landscape, Ecosystem services, Friuli Venezia Giulia

S2 - 16

Discriminant analysis as a tool to classify grasslands based on near-infrared spectra

Silvia Parrini[1]*, Maria Chiara Fabbri[1], Giovanni Argenti[1], Nicolina Staglianò[1], Carolina Pugliese[1], Riccardo Bozzi[1]

[1]Department of Agriculture, Food, Environment and Forestry, University of Firenze Piazzale delle Cascine 18-50144, Firenze
*E-mail: silvia.parrini@unifi.it

Abstract

Knowledge of the grassland system characteristics is the basis for both the improvement of biodiversity conservation and the management practices. These ecosystems, including artificial and permanent meadows, are difficult to investigate due to their diversity and complexity, even if the monitoring of both quality and origin is primary in livestock perspective.
The present study aims to test the application of discriminant analysis based on principal components to near-infrared spectra derived from fresh herbage samples. Samples originated from i) permanent meadows derived from old alfalfa fields re-colonized by spontaneous species (PMA), ii) permanent meadows originated from old grass-legume mixtures re-colonized by native species (PLM), iii) grass–legume mixtures recently established (GLM) and iv) alfalfa pure stand crops recently established (CAA). Samples (n~150) were collected in the north-central Apennine (Italy), and the species identification was performed for all samples. Three intact and no dried aliquots of each were acquired by Antaris II FT-NIRS (Thermo Fisher Scientific) considering the infrared region (3999 to 9999 cm-1). After, a multivariate exploration of original spectra was applied on 3112 wavenumbers by discriminant analysis of principal components (DAPC) using the factoextra R package. A cross-validation was applied for class assignment where the full dataset was used for model training, and the discriminant functions were extracted based on all samples. The first two components explained 98% of the total variability of the dataset (80.9 % and 17.3 % of variance for PC1 and PC2, respectively).
The DAPC model resulted in an overall assignment success rate of 76.92% for the group of origin. The post-successful assignment of individuals to their original clusters was higher than 80% for CAA and PMA, while a lower value was obtained for GLM and PLM. Considering the highly successful assignment, the DAPC method could allow a faster classification of admixed grasslands.

Keywords

pasture, DAPC, forage, NIRS

S2 - 17

The DRONE4AGRI project: first field results on spray quality using UAV technology in high slope terraced vineyards

Andrea Pagliai[1]*, Daniele Sarri[1], Carolina Perna[1], Celine Russo[1], Niccolò Rimbotti[1], Riccardo Lisci[1], Marco Vieri[1]

[1]DAGRI-Department of Agriculture, Food, Environment and Forestry, University of Florence, Piazzale delle Cascine 15, 50144 Firenze, Italy
*E-mail: andrea.pagliai@unifi.it

Abstract

Unmanned Aerial Vehicles (UAV) can be an advantageous technology for crop protection in viticulture, especially in high slope scenarios. Many studies have been carried out on UAV spraying applications in herbaceous crops. Recently, many authors have focused their interest on UAV pesticide application in arboreal crops. However, conflicting views have emerged regarding the flight paths, the nozzles to be used and the spray volumes.
This study aims to provide further evidence on the flight parameters to be adopted with a commercial drone (Dji Agras-T10) by analysing the spray quality in a high slope terraced vineyard. Particularly, two application rates (50 and 100 l ha^{-1}) and four flight paths (parallel to the canopy, parallel to the inter-row, single pass orthogonal to the vine rows, double pass orthogonal to the vine rows) of the UAV sprayer were compared with a backpack sprayer (Stihl SR430). Coverage (%) and drop density (drops cm^{-2}) were extracted from water-sensitive papers placed on the canopy. Three-way and one-way ANOVAs were performed to examine spray quality within each thesis and to find the best combination of UAV parameters relative to the control, respectively. For all flight paths tested, the 50 l ha^{-1} theses did not provide good coverage and sufficient droplet density. Instead, optimum thresholds in terms of coverage and droplet density are achieved with the 100 l ha-1 trials. Particularly , the combination of 100 l ha^{-1} and the flight path parallel to the canopy didn't differ statistically from the backpack sprayer, thus ensuring a good crop protection potential. In terms of spray homogeneity on the canopy within each thesis, the best performances were obtained with orthogonal flight paths, regardless of single or double passes and application rates. In conclusion, given the results obtained, the drone can be a valid technology for the protection of trees, especially in terraced vineyards on high slopes.

Keywords

Unmanned Aerial Vehicle, Precision Agriculture, Crop Protection, Viticulture, Drone

S2 - 18

Three oenological applications of Digital Twins for assessing Grapevine bunch compactness

Alessandro Zanchin[1]*, Francesco Marinello[1], Diego Tomasi[2], Lorenzo Guerrini[1]

[1]Department of Land, Environment, Agriculture and Forestry, University of Padova
Viale dell'Università 16 - 35020 Legnaro, ITALY.
[2]Consorzio di Tutela del Conegliano Valdobbiadene Prosecco DOCG; 31053 Pieve di Soligo, Italy;
*E-mail: alessandro.zanchin@unipd.it

Abstract

The compactness of the grapevine (*Vitis vinifera*) bunches is an ambiguous feature in the bunch's morphology assessment. Compared to other descriptors, such as the number of berries, the height, the maximum width, and compactness is not based on an objective evaluation method. Because compactness is a qualitative bunch's property, skilled staff usually classify the bunches through visual classification following the Organisation Internationale de la Vigne et du Vin standard.
However, several researchers have stated that the visual approach lacks sensitivity and objectivity because the visual evaluation is affected by personal judgment. The recent scientific literature has proposed alternative indices for classifying the bunch's compactness.
The present research collects the observations from three experimental trials focused on investigating the bunches' morphology through digital twins. Digital twins were rebuilt thanks to the photogrammetry. Hence, a three-dimensional analysis increased the availability of traits for a complete description of the bunches' shape. The results were compared with some objective variables which one is linked to the bunches' compactness: I) the relationship between Pinot Gris clones' descriptors and the susceptibility to the bunch rot, II) obtainment of the most prominent three-dimensional indices to categorize grapevine varieties, III) the relationship between Moscato Giallo 'bunches' morphology and drying performance. The analysis occurred in CouldCompare, retrieving 28 measures and 36 three-dimensional. A feature selection was carried out thanks to an analysis of variance. Hence, the estimated empty volume, the vertical section's size, and the sizes of the top and the bottom horizontal sections proved to be the most prominent features for describing the bunch compactness according to the proposed methodology through three experimental trials. Future comparative analysis might confirm the feasibility of this technique in many divergent contexts.

Keywords

Photogrammetry, Bunch compactness, Bunch morphology, Precision phenotyping

S2 - 19

Does age affect the adaptation of dairy cows managed with a virtual fence system?

Andrea Confessore[1], Manuel K. Schneider[2], Caren Pauler[2], Chiara Aquilani[1], Patricia Fuchs[3], Carolina Pugliese[1], Camilla Dibari[1], Giovanni Argenti[1], Massimiliano Probo[3]

[1]Department of Agriculture, food, environment, and forestry (DAGRI), Università di Firenze, Via delle Cascine 5, Firenze, 50144, FI, Italy
[2]Forage Production and Grassland Systems, Agroscope, Reckenholzstrasse 191, 8046 Zurich, Switzerland
[3]Grazing Systems, Agroscope, Route de la Tioleyre 4, 1725 Posieux, Switzerland
*E-mail: andrea.confessore@unifi.it

Abstract

Virtual Fencing (VF) is an innovative technology for managing herds with great benefits for use in pasture-based systems. In VF systems, animals wear a GPS tracking collar and physical boundaries are replaced by virtual ones. The collars emit an acoustic warning when the animal reaches the virtual boundary, followed by an aversive electrical pulse if the animal crosses it. Although it has been shown that animals rapidly adapt to VF, it is unknown whether adaptability decreases with age. The aim of this study was to investigate the differences in adaptation to VF between young and old dairy cows and whether VF has an effect on their activity behavior and milk yield. The study was conducted in the Swiss lowlands. Twenty lactating Holstein-Friesian cows were equipped with VF collars (Nofence AS, Norway) and grazed in 4 separate strip-grazed paddocks. The herd was divided into 4 groups of 5 animals each, differing in age: two old age groups (O) and two young age groups (Y). After 7 days of training, paddock size was increased by moving a virtual front fence during 4 consecutive grazing periods (P1 to P4). In addition, each cow was equipped with a pedometer (Peacock Technology Ltd., UK) to record daily steps, and time spent standing and lying. Data were analyzed using generalized mixed effects models, which showed that age had no significant effect on the animals' overall response to VF. However, a higher number of acoustic warnings was recorded for young cows in P4. In addition, during training, the duration of acoustic signals decreased more rapidly in O and this cow walked less per day, spent more time lying down and less time standing. Finally, no changes in milk yield were observed. In conclusion, the results indicate that age did not influence the adaptation of cows to VF.

Keywords

Precision Livestock Farming; animal welfare; herd management; Holstein cattle; milk yield

S3 - 01

HIGH-DENSITY LINKAGE MAPPING AND GENETIC DISSECTION OF RESISTANCE TO BROOMRAPE (*OROBANCHE CRENATA FORSK.*) IN PEA (*PISUM SATIVUM L.*)

Chiara Delvento[1]*, Francesco Arcieri[1], Angelo Raffaele Marcotrigiano[1], Marzia Guerriero[1], Valentina Fanelli[1], Maria Dellino[1], Pasquale Luca Curci[2], Harro Bouwmeester[3], Concetta Lotti[4], Luigi Ricciardi[1], Stefano Pavan[1]

[1]Department of Soil, Plant and Food Sciences, Section of Plant Genetics and Breeding, University of Bari Aldo Moro, Bari, Italy
[2]Institute of Biosciences and Bioresources, National Research Council (CNR), Bari, Italy
[3]Plant Hormone Biology Group, Swammerdam Institute for Life Sciences, University of Amsterdam, Amsterdam, Netherlands
[4]Department of Agricultural, Food and Environmental Sciences, University of Foggia, Foggia, Italy
*E-mail: chiara.delvento@uniba.it

Abstract

Pea (*Pisum sativum* L.) is a widely cultivated legume of major importance for global food security and agricultural sustainability. Crenate broomrape (*Orobanche crenata* Forsk.) (Oc) is a parasitic weed severely affecting legumes, including pea, in the Mediterranean Basin and the Middle East.
Previously, the identification of the pea line “ROR12”, displaying resistance to Oc, was reported. Two-year field trials on a segregant population of 148 F7 recombinant inbred lines (RILs), originating from a cross between “ROR12” and the susceptible cultivar “Sprinter”, revealed high heritability (0.84) of the “ROR12” resistance source. Genotyping-by-sequencing (GBS) on the same RIL population allowed the construction of a high-density pea linkage map, which was compared with the pea reference genome and used for quantitative trait locus (QTL) mapping. Three QTLs associated with the response to Oc infection, named *PsOcr-1, PsOcr-2,* and *PsOcr-3,* were identified, with *PsOcr-1* explaining 69.3% of the genotypic variance.
Evaluation of the effects of different genotypic combinations indicated additivity between *PsOcr-1* and *PsOcr-2*, and between *PsOcr-1* and *PsOcr-3,* and epistasis between *PsOcr-2* and *PsOcr-3*. Finally, three Kompetitive Allele Specific PCR (KASP) marker assays were designed on the single-nucleotide polymorphisms (SNPs) associated with the QTL significance peaks. Besides contributing to the development of pea genomic resources, this work lays the foundation for the obtainment of pea cultivars resistant to Oc and the identification of genes involved in resistance to parasitic Orobanchaceae.

Keywords

pea, broomrape, resistance, mapping, breeding

S3 - 02

Downy mildew resistance 6 (DMR6): how to enhance biotic stress tolerance in eggplant through genome editing

Ferrero Martina[1]*, Valentino Danila[1], Milani Anna Maria[1], Comino Cinzia[1] , Lanteri Sergio[1], Acquadro Alberto[1], Moglia Andrea[1]

[1]DISAFA, Plant Genetics, University of Turin, Grugliasco, Italy
*E-mail: martina.ferrero@unito.it

Abstract

The impact of climate change on agricultural production is increasing over the years, causing damages to the environment and severe yield losses because of rising temperatures, water scarcity and modifications in the interactions occurring between crops, pests, and pathogens. Therefore, the availability of biotic and abiotic stress-tolerant plants will be a key point to ensure the world food security in the next future. A significant contribution to this purpose might be provided by genome editing tools, and in particular CRISPR/Cas9, which allows to insert targeted modifications in the plants' genomes offering new opportunities for crop improvement.
Susceptibility (S) genes encode proteins that pathogens can take advantage of during their colonisation process; the disruption of their functionality usually confers to the plant a broad-spectrum and long-lasting tolerance.
Among the S-genes, *Downy Mildew Resistance 6 (DMR6)* encodes an enzyme involved in salicylic acid (SA) degradation, and its inactivation in tomato was demonstrated to increase SA levels, thus conferring disease tolerance to several classes of pathogens, such as bacteria, oomycetes and fungi. Two orthologs of this gene were identified in eggplant's genome, namely *DMR6-1* and *DMR6-2*; *DMR6-1* expression resulted significantly increased upon infection by two oomycetes, *Phytophthora infestans* and *Phytophthora capsici*, suggesting its involvement in biotic stress responses.
The functionality of *DMR6-1* gene was knocked out through CRISPR/Cas9 technology in *Solanum melongena* cv. 'Black Beauty' by applying an *Agrobacterium tumefaciens* mediated co-culture protocol. A large T_0 generation was obtained and Sanger sequencing revealed that one plant carried small deletions in the target region causing frameshift mutations in *DMR6-1* and thus its inactivation. This plant was self-pollinated and a T_1 generation was obtained, with the mutation fixed in the genome. Detached leaf assays and molecular analyses performed on T_1 individuals showed an increased tolerance to infection caused by *P. infestans* and *P. capsici* in the mutants', if compared to wild-type plants.

Keywords

eggplant, DMR6, S-genes, Phytophthora, stress tolerance

S3 - 03

The reference-free pangenome of Arabidopsis thaliana

Lia Obinu[1,2]*, Andrea Guarracino[3], Urmi Trivedi[2], Andrea Porceddu[1]

[1]Department of Agricultural Sciences, University of Sassari, Viale Italia 39A, 07100, Sassari, Sardinia, Italy
[2]Edinburgh Genomics, Ashworth Laboratories, Charlotte Auerbach Road, The King's Buildings, The
University of Edinburgh, EH9 3FL, Edinburgh, Scotland, United Kingdom
[3]Department of Genetics, Genomics and Informatics, University of Tennessee Health Science Center, 71 S Manassas St, Memphis, 38163, Tennessee, US
*E-mail: lobinu@uniss.it

Abstract

The unfolding biodiversity crisis threatens ecosystems health, species adaptability, genetic diversity, and food security. To address these challenges, exploring the vast world of biodiversity and agrobiodiversity is crucial.
Our study focuses on Arabidopsis thaliana, a model plant in genomics. We've created a "pangenome" - a collection of 93 genomes belonging to different individuals within this species, with the aim of understanding its genetic variation in terms of genes and pseudogenes. Genes are inheritable genetic units that encode proteins and carry information about specific traits. Pseudogenes, structurally similar to genes but not encoding proteins, offer insights into mutation and evolution.
The pangenome graph was built using the reference-free method Pan-genome Graph Building (PGGB). Unbiased pangenomes are constructed aligning all included genomes to all others. This approach not only overcomes the limitations of studies based on single reference genome but also unveils unprecedented levels of diversity, surpassing previously developed pangenome methods that rely on progressive alignments to a reference genome.
Analyses on diversity and variability are being conducted using ODGI tools.
We categorise genes and pseudogenes as "core" (shared across all individuals), "softcore" (shared by at least 80% of individuals), "dispensable" (shared by less than 80%), and "private" (unique to one individual). Non-core genomic regions often contain features which confer unique traits to specific individuals or group of individuals.
Preliminary findings show core genes and pseudogenes making up approximately 60% and 26% of the total, underscoring significant variability within the species. Ongoing research aims to pinpoint genes and pseudogenes that confer unique traits (i.e. contained in the dispensable or private genome), aiding plants adaptation and survival in various environments.
Understanding genetic diversity in this way can lead to breakthroughs in developing new crop varieties, fighting plant diseases, adapting to climate change, and improving our food systems for a more resilient future.

Keywords

pangenome, variation graph, PGGB, biodiversity, agrobiodiversity

S3 - 04 Development of a biotech toolbox for bean research

Dario Paolo[1]*, Franca Locatelli[1], Eleonora Cominelli[1], Massimo Galbiati[1], Silvia Megna[1], Timothy G. Porch[2], Alessia Losa[3], Carlo Pozzi[4], Francesca Sparvoli[1]

[1]Istituto di Biologia e Biotecnologia Agraria - Consiglio Nazionale delle Ricerche, Via Edoardo Bassini 15 – 20133 Milano, Italia
[2]Tropical Crops and Germplasm Research - USDA, 2200 Av. Pedro Albizu Campos – 00680 Mayaguez, Puerto Rico
[3]Centro di ricerca Genomica e bioinformatica – Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria, Via Paullese 28 – 26836 Montanaso Lombardo (LO), Italia
[4]Dipartimento di Scienze Agrarie e Ambientali - Produzione, Territorio, Agroenergia - Università degli Studi di Milano, Via Celoria 2 – 20133 Milano, Italia
*E-mail: dario.paolo@cnr.it

Abstract

Research on common bean genetics and molecular biology faces challenges due to its complex genome, high genetic diversity (within and between Mesoamerican and Andean gene pools), and phenotypic plasticity. Hindered by limited forward genetic methods, the use of low-efficiency protocols (biolistic transformation) and recalcitrance to in vitro regeneration, identifying key genes and traits remains difficult. Among the tools developed for this purpose we count two EMS-mutagenized populations for an approach of TILLING (Targeting Induced Local Lesions In Genomes); we have so far exploited this in the study of the domestication of common bean, using a previously described population in the *BAT93* genotype. Moreover, a newly developed population in the *MECCEARLY* genotype will be used to identify genes involved in the accumulation of nutritional compounds (starch, phosphate, minerals) and antinutritional/bioactive ones (phytic acid, raffinosaccharides, trypsin inhibitor). In parallel with these mutagenesis-based methods, we are working on the improvement of in vitro protocols and the development of next-generation vectors based on those already tested in other species with low regenerative potential (such as wheat), which would increase the efficiency of transformation and regeneration of bean embryonic axes after biolistics. Altogether, these efforts could be crucial in the frame of global food security, for enhancing crop productivity, genetic diversity and nutritional quality.

Keywords

common bean, TILLING, biolistics, regeneration, nutritional value

S3 - 05

Exploring the genetic diversity in Mediterranean fig (*Ficus carica L.*) varieties

Gabriele Usai[1]*, Marco Castellacci[1], Alberto Vangelisti[1], Samuel Simoni[1], Lucia Natali[1], Andrea Cavallini[1], Flavia Mascagni[1], Tommaso Giordani[1]

[1]Department of Agriculture, Food and Environment (DAFE), University of Pisa, Via del Borghetto 80, 56124 Pisa, Italy
*E-mail: gabriele.usai@agr.unipi.it

Abstract

Genome-wide association studies (GWAS) represent a significant methodological advancement that has revolutionised crop breeding. This methodology can be applied to any plant species, including fruit trees. Among these, the fig tree (*Ficus carica* L.) holds the potential for increased economic relevance due to its fruit nutritional and nutraceutical characteristics, along with its ability to adapt to unfavourable environmental conditions, such as marginal soils and drought. Here, we present work-in-progress data generated during the FIGGEN project, part of the PRIMA programme, which aims to genotype and phenotype Mediterranean fig varieties. First, we generated a new haplotype-phased assembly of the fig genome using state-of-the-art methods. The assembly represented approximately 98% of the estimated 356 Mb genome. Transcriptomics data analysis, protein alignment, and de novo gene calling determined over 33,000 protein-coding genes per haplotype, 82% of which were functionally annotated. Overall, we genotyped and phenotyped 286 fig varieties, comprising 61 from Spain, 110 from Tunisia, and 115 from Turkey. Phenotypic data, including morphological and pomological traits, were collected and statistically analysed, revealing significant variability between cultivars. Genotyping and subsequent analysis are underway, leveraging over 1.3 million SNPs to assess genetic variability and population structure. The integration of genotypic and phenotypic data will enable GWAS analysis to identify molecular markers associated with key traits such as fruit quality and environmental adaptation. This comprehensive approach will facilitate targeted genetic improvements in fig, increasing economic relevance and agricultural sustainability.

Keywords

fig tree, fig genome, genome assembly, genetic variability

S3 - 06 Cows'resilience of two intensive farms in Lombardy

Andrea Delledonne*[1], Chiara Punturiero[1], Alessandro Bagnato[1], Maria Giuseppina Strillacci[1]

[1]Department of Veterinary Medicine and Animal Science, University of Milan, via Dell'Università, 6, Lodi
*E-mail: andrea.delledonne@unimi.it

Abstract

The resilience of farm animals is related to their ability to cope with environmental stressors which, by reducing animal productivity, longevity and welfare, reduce the economic viability and sustainability of livestock production. Resilience to stressors is expected to be of larger impact in highly productive farmed cows, such as Friesian Holsteins. A new way of inferring resilience bases on the capability to measure longitudinal data on physiological traits, such as daily milk yield. The aim of this study was to use resilience indicators on almost 900 cows, in two intensive farms, equipped with a total of 11 AMS. Resilience indicators were the natural logarithm of the variance (LnVar) and the autocorrelation, calculated from the residuals of the best-fitting model interpreting the lactation curves of each cow for each parity. First results show a high variability of LnVar, spanning from 0.2 to 4.1 (mean 2.5, sd 0.5) while for the autocorrelation a range 0.3-0.9 was found (mean 0.6, sd 0.1). Furthermore, we observed that the resilience decreases with parity. To validate results we are coupling resilience indicators with EBVs, Milk Somatic Cell Counts and pharmacological treatments recorded by farmers. As expected, low correlations are emerging due to the complex nature of resilience. Concluding, our preliminary results are in line with those emerged in literature and bring new knowledge in this relatively new field of research. This study was carried out within the Agritech National Research Centre and was funded by the European Union Next-GenerationEU (PIANO NAZIONALE DI RIPRESA E RESILIENZA (PNRR) - MISSIONE 4 COMPONENTE 2, INVESTIMENTO 1.4 - D.D. 1032 17/06/2022, CN00000022). This manuscript expresses the views and opinions of the authors, and neither the European Union nor the European Commission can be held responsible for them.

Keywords

Resilience, Lactation curve, Automatic Milking System

S4 - 01

Sustainable Fertilization: First Evidence into the Combined Use of Natural Nano-Hydroxyapatite and P-Solubilizing Bacteria in *Hordeum vulgare*

Laura Pilotto[1,2]*, Monica Yorlady Alzate Zuluaga[3], Francesca Scalera[4], Clara Piccirillo[4], Luca Marchiol[1], Marcello Civilini[1], Youry Pii[3], Stefano Cesco[3], Guido Fellet[1]

[1]Department of Agrifood, Environmental and Animal Sciences, University of Udine, Udine (I)
[2]Department of Life Sciences, University of Trieste, Trieste (I)
[3]Faculty of Science and Technology, Free University of Bozen/Bolzano, Bolzano (I)
[4]Institute of Nanotechnology CNR-NANOTEC, Monteroni, Lecce (I)
*E-mail: pilotto.laura@spes.uniud.it

Abstract

Introduction
Agriculture is crucial for humanity's survival, but it faces several sustainability challenges (Shah et al., 2024). Therefore, it is necessary to create new agronomic practices that ensure food security and protect ecosystem services. Nanomaterials represent a promising tool for sustainable farming (Babu et al., 2022). Nano-hydroxyapatite (nHAP) obtained from animal bones could represent a novel phosphorus (P) fertilizer, recovering a non-renewable resource from waste, as well (Piccirillo, 2023). However, it can result poorly soluble in water and soil (Ahmed et al., 2021; Piccirillo, 2023).

Materials and methods

A greenhouse pot trial was conducted to test the effects of two types of nHAP produced via thermal treatment of chicken bones at 300°C or 700°C, in conjunction with *Pseudomonas alloputida*, a soil P-solubilizing bacteria (PSB), on *Hordeum vulgare*. Eight treatments were applied: (i) unfertilized soil (Ctrl), (ii) Ctrl+PSB, (iii) conventional triple superphosphate (TSP), (iv) TSP+PSB, (v) $nHAP_{300}$, (vi) $nHAP_{300}$+PSB, (vii) $nHAP_{700}$, and (viii) $nHAP_{700}$+PSB. P-dose given: 80 kg ha^{-1}. At the tillering stage, barley plants were harvested. Biomass, P-content in plants' tissues, and bioavailable P in soil were detected at the end of the experiment.

Results

Results indicate that: i) both types of nHAP promoted the enhancement of the total biomass compared to conventional fertilizer (fig 1A); ii) $nHAP_{300}$-PSB resulted in higher availability of P compared to TSP (fig 1B); iii) cations associated with nHAP structure supplied additional nutrients, primarily accumulating in root tissues.

Conclusions

The study tested nano-hydroxyapatite (nHAP) derived from waste chicken bones as a potential fertilizer compared to traditional TSP fertilizer. Utilizing waste materials aligns with the principles of the European Green Deal, promoting a circular economy. Results showed promising performance of nHAP but further research across crop cycles is needed to fully evaluate their impact on yield quality.

Keywords

Agriculture sustainability, Nano-enabled agriculture, Nutrient Use Efficiency, Nano-hydroxyapatite

S4 - 02

Virus-Induced Gene-Silencing as tool for triggering RNAi for weed control

Noemi Di Vita[1]*, Andrea Milani[1], Loredana Moffa[2], Luca Nerva[2], Walter Chitarra[2], Serena Varotto[3], Silvia Panozzo[1]

[1]Institute for Sustainable Plant Protection (IPSP), National Research Council of Italy (CNR), 35020, Legnaro (PD), Italy
[2]Viticulture and Enology Research Center of the Council for Agricultural Research and Analysis of Agricultural Economics (CREA-VE), 31015, Conegliano (TV), Italy
[3]Department of Agronomy Food Natural Resources, Animal and Environment (DAFNAE) Agripolis, University of Padova, 35020, Legnaro (PD), Italy
*E-mail: noemi.divita@ipsp.cnr.it

Abstract

The use of herbicides is the most common weed control tool in modern agriculture. The repeated use in time and space of herbicides targeting the same pathway has led to the evolution of many herbicide-resistant weed populations. At the same time, the lack of new herbicides on the market, the legislation restrictions, and the increasing demand from the EU to reduce chemicals in agriculture are leading to development of new technologies for weed control. One promising technology are bio-herbicides based on RNA interference (RNAi) mechanism.
As the first step, this study aims to identify gene silencing targets for the control of *Amaranthus hybridus*, a summer noxious weed that has developed resistance to many herbicide site of actions, particularly to the most frequently used for its control in soybean.
One of the most effective approaches of initiating post-transcriptional gene silencing is through virus-induced gene-silencing (VIGS). Two target genes were explored: acetolactate synthase (ALS), a target of a widely used herbicide site of action, and phytoene desaturase (PDS), known to induce a bleached phenotype. The mRNA sequences of the two target genes were amplified by PCR and the resulting products were cloned into TRV-RNA2 plasmid and transferred into *Agrobacterium tumefaciens* for agro-infiltration. The transformation was performed on leaves of *A. hybridus* and *Nicotiana benthamiana*, a model species used as positive control.
The TRV-PDS system in *N. benthamiana* provided a bleaching effect, while we are testing different ALS targets to obtain a phenotype or a decreased expression. The same system is being developed for *A. hybridus*.
The TRV-based VIGS system will help us to identify the optimal silencing targets for the development of a new RNAi-based technology that could represent a non-chemical potential for integrated weed management in crop fields.

Keywords

RNA interference; VIGS; acetolactate synthase; phytoene desaturase; Amaranthus hybridus

S4 - 03

Bacillus and microbial consortia as alternatives for improving plant health

Carmen Cimminella[1,3]*, Rachele Isticato[1, 3], Stefany Castaldi[1], Marina Papaianni[2], Gelsomina Manganiello[2], Sheridan L. Woo[2,3]

[1]Department of Biology, University of Naples Federico II, 80126 Naples, Italy
[2]Department of Agricultural Sciences, University of Naples Federico II, 80055, Portici, Italy
[3]Department of Pharmacy, University of Naples Federico II, 80131 Naples, Italy
[3]National Biodiversity Future Center (NBFC), 90133 Palermo, Italy.
*E-mail: carmen.cimminella@unina.it

Abstract

Microorganisms are crucial for preserving environmental resources and consumer well-being. Their interactions with soil, plants and other organisms are essential in agricultural production. Strains belonging *Bacillus* genera are rhizobacteria, able to provide plants benefits and promoting plant growth. With EU restrictions on chemical products for disease control, research for sustainable alternatives has become imperative.

The aim of this work was to develop an innovative formulation including different *Bacillus* isolates applied singly or in microbial consortia, to control *Pseudomonas syringae* pv *tomato*, a bacterial pathogen causing severe crop losses. Bacteria were isolated from rhizosphere samples of *Juniperus sabina* plants in saline ecosystem and identified as *Bacillus gibsonii* RHF15, B. *vallismortis* RHF10, B. *amyloliquefaciens* RHF18. *Bacillus* RHF10 and RHF18, emerged as promising plant growth promoting rhizobacteria (PGPR). Antibacterial properties of these microorganisms were assessed *in vitro* by dual culture assays, then in planta on tomato artificially infected with the *P. syringae. Bacillus* spp. were applied to the plants by a combination of soil watering and foliar spray, or by foliar spraying alone.

The evaluation of the disease was expressed through the Disease Severity (DS%) and Disease Incidence (DI%) indices. Results showed that the method of application can affect the effectiveness of treatments. RHF15 applied by foliar spray determined a 10% decrease of DS compared to the infected untreated control. On the other hand, RHF10 and RHF18 determined 10% reduction of DS when applied by soil watering and foliar spray. Similar trends were observed in the DI% values. These results suggest a potential endophytic activity of RHF10 and RHF18, as they showed better results when applied to the soil. Further analyses will be conducted to confirm this hypothesis. Furthermore, all tested microorganisms resulted compatible with each other when cultured together, suggesting their possible use in consortia to enhance the efficacy of biological applications.

Keywords

Bacillus spp., Pseudomonas syringae pv tomato, biological control agents, Tomato

S4 - 04

EVALUATION OF BIOSTIMULANT AND BIOCIDAL ACTIVITY OF FOUR *NOSTOC* STRAINS FOR POTENTIAL AGRICULTURAL EXPLOITATION

Gaia Santini*, Leonardo Cutrò, Marcenette Lucia Biagi Arroyo, Natascia Biondi, Giacomo Sampietro, Patrizia Sacchetti, Liliana Rodolfi

Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Piazzale delle Cascine, 18, 50144, Florence, Italy
*E-mail: gaia.santini@unifi.it

Abstract

One of the greatest challenges of our times is to increase agricultural yields to satisfy the food demand of a growing world population, without causing further harm to the environment. Since in the past century the use of agrochemicals has caused multiple ecological damages, the search for sustainable sources of growth promoters and plant protection substances is crucial. Thanks to their well-known bioactivity and intraspecific diversity, cyanobacteria represents one of the most promising and largely unexplored sources for biobased agricultural products. In this work, bioactivity of four cyanobacterial strains belonging from the genus *Nostoc* was determined on different target organisms of agricultural interest. The strains were cultivated in bubbled tubes under the same cultivation conditions for growth evaluation and biomass production. Then, hydrophilic (HE) and lipophilic (LE) extracts obtained from the biomasses were tested at different concentrations in biostimulation assays on *Arabidopsis thaliana* and in assays on phytopathogenic fungi, bacteria and insects. Moreover, toxicity on *Artemia salina* was determined. Overall, HE showed higher biostimulant activity, while LE were more active against phytopathogens. The strain with the highest biostimulant activity on *A. thaliana* was F&M-C98, while FACHB261 and PTA251 had detrimental effects on plants. F&M-C98 presented both bacteriostatic, antifungal and insecticidal activity. Our results encourage further study to determine the potential of *Nostoc* species for use in agriculture, ideally combining the various activities to have multiple effects. In the next steps of research, the characterization of the extracts and the evaluation of toxicity will be of primary importance.

Part of this study was carried out within the Agritech National Research Center and received funding from the European Union Next-GenerationEU (PIANO NAZIONALE DI RIPRESA E RESILIENZA (PNRR)-MISSIONE 4 COMPONENTE 2, INVESTIMENTO 1.4 – D.D.1032 17/06/2022, CN00000022). This manuscript reflects only the authors' views and opinions, neither the European Union nor the European Commission can be considered responsible for them.

Keywords

Nostoc, cyanobacteria, bioactivity, biostimulation

S4 - 05

Resistance against invasion: the role of the endophytic community against *Xylella fastidiosa* in olive tree

Marzia Vergine[1]*, Luigi De Bellis[1], Andrea Luvisi[1]

[1]Department of Biological and Environmental Sciences and Technologies, University of Salento, Lecce, Italy.
*E-mail: marzia.vergine@unisalento.it

Abstract

Endophytes are a symbiotic group of microorganisms comprising bacteria and fungi that inhabit various sites within plants, and their interactions with host plants contribute significantly to plant growth promotion and stress tolerance.
We investigated bacterial and fungal endophytic communities of olive trees (*Olea europaea* L.) exhibiting asymptomatic characteristics, although sampled in groves heavily affected by *Xylella fastidiosa* subsp. pauca. We aimed to characterize microbiota in genotypes displaying differential responses to the pathogen, examining the relationships between bacterial and fungal genera separately and together to unravel the intricate correlations among the identified Operational Taxonomic Units (OTUs).
Our results underscored the predominant role of fungal endophytes over bacterial ones and identified specific microbial taxa exclusively associated with asymptomatic genotypes.
The findings indicated the presence of resistant genetic resources, adapted to withstand years of pathogen pressure, in association with microbial genera such as *Burkholderia, Quambalaria, Phaffia,* and *Rhodotorula*. These findings represent a crucial starting point in understanding plant defence strategies against *X. fastidiosa* subsp.pauca in the infected areas.

Keywords

Ecological function, Metabarcoding, Olive cultivars, Phaffia, Rhodotorula

S4 - 06

The synergistic action of FA and CDPH to correct Fe deficiency in plants

Giacomo Rodegher[1]*, Serena Zanzoni[2], Anita Zamboni[1], Zeno Varanini[1], Stefano Ambrosini[1]

[1]Department of Biotechnology, University of Verona, via Strada Le Grazie 15, Verona, Italy
[2]Technological Platform Centre, University of Verona, Piazzale L. A. Scuro 10, Verona, Italy
*E-mail: giacomo.rodegher@univr.it

Abstract

In recent years, biostimulants have been developed as a low-impact tool for agriculture, opening different scenarios in the re-cycling industrial circuit and improving nutrient use efficiency, abiotic stress tolerance and crop production quality. With these premises, the application of fulvic acid (FA) and collagen-derived protein hydrolysate (CDPH) was tested during cucumber plant recovery from Fe deficiency, evaluating their biostimulant effects on plant phenotype and physiology. FA and CDPH were applied individually and together (MIX) to assess the possible presence of synergistic or antagonistic effects exerted by the two biostimulants on Fe-starved cucumber plants under controlled conditions in hydroponic systems. After 7 days of Fe starvation, plants were resupplied with $FeCl_3$. Non-treated plants were used as controls and resupplied with Fe-EDTA. Activities of the proton pump and the root Fe^{3+} reducing capacity were measured. In addition, ICP-MS analyses were performed on the collected samples to provide data on Fe accumulation. Furthermore, Real-Time RT-PCR experiments of key genes involved in Fe acquisition (*CsIRT, CsFRO* and *CsHA*) were performed. Data confirmed that shoot and root biomasses were increased when plants were treated with the MIX of the two biostimulants. Moreover, FA, CDPH, and MIX promoted the acidification of external media and the Fe^{3+} reduction by roots, whereas only FA and MIX treatments showed greater Fe accumulation in the shoot tissue when compared to CDPH and Fe-EDTA. The expression of *CsIRT1* and *CsFRO1* was enhanced in MIX. Moreover, expression analysis for the *CsHA3* gene revealed a higher level of expression in the treatments with CDPH delivered alone. Considering that the MIX displayed a synergic effect of the two biostimulants, we evaluated their possible interaction in the solution using circular dichroism (CD) and isothermal titration calorimetry (ITC) analyses, which have shown an energetically favourable and entropically driven interaction in the nutritive solution, also confirming that the two products reacted together spontaneously. Taken together, the obtained data indicate a clear synergistic effect of the two biostimulants that may be advantageous in the recovery of cucumber plants from Fe deficiency and could give information for the optimization of new biostimulant formulations.

Keywords

Fe-deficiency, biostimulants, sustainable agriculture

S4 - 07

Halotolerant plant growth promoting *Bacillus* strains Bm1, E1, and F1 mitigate salt stress in *Phaseolus vulgaris*

Rihab Djebaili[1]*, Giovanni Pascucci[1], Beatrice Farda[1], Enrico Sabbi[1], Loretta G. Pace[1], Marika Pellegrini[1]

[1]Department of Life, Health and Environmental Sciences, University of L'Aquila, Via Vetoio, Coppito, 67100 L'Aquila, Italy
*E-mail: rihab.djebaili@univaq.it

Abstract

Salinity is a significant issue that affects agricultural productivity, particularly in arid and semi-arid soils. This stress reduces soil fertility and hinders the normal development of plants, thereby affecting crop productivity. To obtain a sustainable management of saline soils, it is necessary to use salt-tolerant symbiotic bacteria with plant growth-promoting (PGP) abilities.

In this study, *Bacillus* strains were isolated from saline soils in Monte San Biagio (Latium, Italy). Bacterial strains were selected based on salt tolerance (up to 5%) and characterized for PGP traits. The consortium formed by the most promising strains was tested *in vitro* and *in planta* on *Phaseolus vulgaris*. The consortium was applied by soaking the seeds for 20 minutes. Under greenhouse, a 5% of salinity stress was applied, testing the consortium ability to induce tolerance in plants by plant growth and development parameters monitoring (shoot and root length, total chlorophyll content, proline accumulation).

Most of the tested strains showed good PGP activities. Strains BM1, E1, and F1 were selected based on phosphate solubilization (E1 and F1 =25,53 μg PO_4^{3-} mL^{-1} in average), indoles (25,2 μg mL^{-1} IAA equivalents in average), siderophores (F1=1,4%), and ammonia production, and 1-aminocyclopropane-1-carboxylate deaminase (ACC) activity. The consortium presented good association *in vitro* with *P. vulgaris*: scanning electron microscopy revealed that *Bacillus* strains (BM1, E1, and F1) have good adhesion and colonization abilities. Inoculation with the consortium had a positive effect on plant growth parameters. The shoot and root lengths, chlorophyll contents, and proline accumulation in the treated group were higher than those in the control ($p < 0.05$). These findings suggest that seed priming with halotolerant *Bacillus* strains can mitigate the negative effects of salt stress and promote the normal growth and development of *P. vulgaris* plants.

Keywords

Salinity; microbial-based inoculants; Green beans; Gram positive bacteria; Sustainable Agriculture

S4 - 08

GENOTYPE-BY-GENOTYPE INTERKINGDOM CROSS-TALK BETWEEN SYMBIOTIC NITROGEN FIXING *SINORHIZOBIUM MELILOTI* STRAINS AND *TRICHODERMA* SPECIES

Francesca Vaccaro[1], Iacopo Passeri[1], Nur Ajijah[2], Priscilla Bettini[1], Pierre Emmanuel Courty[3], Klaudia Dębiec-Andrzejewska[4], Namrata Joshi[2], Łucja Kowalewska[5], Robert Stasiuk[4], Marcin Musiałowski[4], Kumar Pranaw[2,6], Alessio Mengoni[1]*

[1]University of Florence, Florence, Italy
[2]Department of Environmental Microbiology and Biotechnology, Institute of Microbiology, Faculty of Biology, University of Warsaw, Poland
[3]Agroécologie, INRAE, Institut Agro, Univ. Bourgogne, F-21000 21000 Dijon, France
[4]Department of Geomicrobiology, Institute of Microbiology, Faculty of Biology, University of Warsaw, Poland
[5]Department of Plant Anatomy and Cytology, Institute of Plant Experimental Biology and Biotechnology, Faculty of Biology, University of Warsaw, Poland
[6]School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, India
*E-mail: alessio.mengoni@unifi.it

Abstract

In the understanding of the molecular interaction between plants and their microbiome, a key point is to identify simplified models of the microbiome including relevant bacterial and fungal partners which could also be effective in plant growth promotion. Here, as proof-of-concept, we aim to identify the possible interactions between symbiotic nitrogen-fixing rhizobia and soil fungi (*Trichoderma* spp.), hence shed light on synergistic roles rhizospheric fungi could have in the symbiotic nitrogen fixation with host plants.
We selected 4 strains of the model rhizobium Sinorhizobium meliloti and 4 Trichoderma species (*T. velutinum, T. tomentosum, T. gamsii* and *T. harzianum*). In an experimental scheme of 4 x 4 strains x species combinations, we investigated the rhizobia physiological and transcriptomic responses elicited by fungal spent media, as well as spent media effects on rhizobia-host legume plant (alfalfa, *Medicago sativa* L.) symbiosis.
Fungal spent media had large effects on rhizobia, specific for each fungal species and rhizobial strains combination, indicating a general rhizobia genotype x fungal genotype interaction. Differential expression of a high number of genes was shown in rhizobia strains. Moreover, changes in rhizobia exopolysaccharide and auxin production were identified in response to fungal spent media. Different rhizobium-fungus combinations were also shown to have synergistic effects on alfalfa symbiotic phenotypes.
Our results provide a first insight into interactions involving nitrogen-fixing rhizobia and rhizospheric fungi, highlighting the panoply of genes and genotypic interactions (fungus, rhizobium, host plant) which may concur to plant symbiosis.

Keywords

Alfalfa, mutualism, symbiotic nitrogen fixation, genotypic interactions, plant growth promotion

S4 - 09

Rumen ecology detailed study using quebracho tannin as fermentation stressing factor

Federica Scicutella[1]*, Susana Alves[2], Rui J. Bessa[2], Matteo Daghio[1], Federica Mannelli[1], Adja Lira Medeiros[1], Carlo Viti[1], Arianna Buccioni[1]

[1]Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali. University of Florence, Piazzale delle Cascine 18, 50144 Firenze, Italy
[2]Faculdade de Medicina Veterinária, Universidade de Lisboa, Avenida da Universidade Técnica, Lisboa, 1300-477, Portugal
*E-mail: federica.scicutella@unifi.it

Abstract

The understanding of gastrointestinal physiology helps to develop feeding strategies aimed at improving the sustainability and quality of the animal production chain. Tannins are secondary plant metabolites characterized by antimicrobial properties and they can be added to the diet as rumen fermentation modulators. The rumen microbial community is predominantly affected by diet. The aim of this in vitro trial was to study the relationship among microbiota, fatty acids, and dimethyl acetals profile that are efficient biomarkers of rumen ecology. Two doses of quebracho tannin (55mg/100g on DM and 166mg/100g on DM) were added to the feed formulated for dairy ewes. The feeds were fermented with ovine rumen liquor for 24 hours.

Data highlighted the effect of tannin on the rumen biohydrogenation process of C18-carbon chain: C18:1c9, C18:2n6, and C18:3n3 increased while C18:0, C18:1t9, C18:1t11, C18:1t12, C18:1c11 decreased when 166mg/100g on DM of tannin was added to the feed. Similarly, the dimethyl acetals profile was affected by the presence of the highest level of quebracho tannin: DMA-C14:0 increased and DMA-C13:0, DMA-iC14:0, and DMA-iC15:0 concentration decreased. The microbial community ratio was changed by tannin feed inclusion, and at the genus level, more bacteria abundances varied. Among genera more representative (abundance >1%), *Actinobacillus* (P=0.0013), *Butyrivibrio* (P=0.0058), *Escherichia_Shigella* (P<0.0001), *Lachnospira* (P<0.0001), *Manheimia* (P<0.0001), *Neisseria* (P<0.0001), *Pseudobutyrivibrio* (P<0.0001), and *Succinivibrio* (0.0003) increased with 166mg/100g on DM of tannin inclusion. Whilst *Comamonas* (P<0.0001), *Faecalibacter* (P=0.0008), *Fusobacterium* (P<0.0001), and *Prevotella* (P=0.0092) decreased. The results of this study confirm that fatty acids, and dimethyl acetals could be an efficient tool to understand rumen ecology.

Keywords

fatty acid, microbiota, dimethyl acetals, in vitro, biohydrogenation

S4 - 010

Solubilization of phosphorite by phosphate-solubilizing bacteria

S. Marcone[1]*, E. Ingenito[2], V. Cozzolino[1], S. Lanzuise[1], R. Marra[1]

[1]Department of Agricultural Sciences, University of Naples "Federico II", 80055 Portici, Italy
[2]Fertilidea S.r.l.,80045 Pompei, Italy
*E-mail: sonia.marcone@unina.it

Abstract

Rock phosphate is an inorganic source of phosphorus (P), that represents one of the major nutrients essential to plant growth. However, rock phosphate-based fertilizers are non-renewable source of P and can precipitate after the application forming no bioavailable complexes. An improvement of P solubilization can be achieved using phosphate-solubilizing microorganisms (PSMs). These include species of bacteria (*Bacillus, Pseudomonas and Rhizobium*) and fungi (*Penicillium, Aspergillus* and *Trichoderma*). The aim of this study was the selection and characterization of different bacterial species (*Bacillus pumilus, B. subtilis, B. megaterium, B. amyloliquefaciens* and *Pseudomonas putida*) in order to evaluate their ability to increase P solubilization from rock phosphate. First, solubilization activity was assessed qualitatively on plates using calcium phosphate as source of P. Bacterial cultures were spotted on plates and after incubation at 28°C for 7 days the halo formation was taken as qualitative indicator of P-solubilizing ability. On agar plates, *B. pumilus* and *P. putida* were able to solubilize inorganic P. Then, strains were further analysed in liquid medium containing insoluble phosphorite as P inorganic source at 10 or 20 g/L, and incubated in a rotary shaker at 170 rpm for 7 days at 30 ± 2°C. Our results showed that *B. megaterium, B. pumilus* and *P. putida* gave the highest P solubilization at 10 g/L phosphorite compared to the control (+ 96%, 98% and 99%, respectively). Moreover, P solubilization was accompanied by a significant drop in pH from 7.9 to 4.8, possibly due to the production of organic acids by the bacteria. Future experiments will be carried out to examine in detail the mechanisms used by the selected bacteria to improve P solubilization and their plant growth promotion activity. This will have implications for biotechnological exploitation of microbes to alleviate P limitation in agricultural applications reducing dependence on synthetic chemical fertilizers.

Keywords

phosphorite, microbial solubilization, inorganic fertilizers, Bacillus, Pseudomonas

S4 - 11

Novel potential biopesticide combining lignin and beneficial fungi

Annabella Pappalardo[1]*, Stefania Lanzuise[1], Sandro Parlanti[2], Sheridan Lois Woo[3], Francesco Vinale[4]

[1]Department of Agricultural Sciences, University of Naples Federico II, 80055 Portici, Italy;
[2]Versalis S.p.A., 20097 San Donato Milanese (MI), Italy
[3]Department of Pharmacy, University of Naples Federico II, 80131 Naples, Italy
[4]Department of Veterinary Medicine and Animal Production, University of Naples Federico II, Naples, Italy;
*E-mail: annabella.pappalardo@unina.it

Abstract

Bioethanol production generates a by-product named "ligninic biomass" that is frequently burned to recover energy. The potential valorisation of this organic by-product could be achieved by applications in agriculture, contributing to the beneficial restoration of carbon stock in soils. This strategy is in line with the latest European policies on circular economies and valorisation of wastes and by-products from industrial processes. Moreover, lignin from diverse sources has already been tested as a plant biostimulant and as biopesticides for the suppression of soil-borne pathogens. At the moment, a biopesticide based on lignin is not available on the market.
In this study, the effect of ligninic materials alone and in combination with fungal antagonists *Trichoderma* spp. and *Clonostachys* spp. was tested for the control of the soil-borne plant pathogen *Sclerotium rolfsii*. A 100% inhibition in pathogen growth was recorded six days after treatment by using concentrations of 400 and 800 gr/L of lignin.
Two *Trichoderma* species were selected as biological control agents to incorporate in the substrate enriched with 10 gr/L of lignin producing a bioformulation able to inhibit the growth and mycoparasitize *S. rolfsii.* Furthermore, the possibility to produce a biopesticide was investigated.
Both *Trichoderma* and *Clonostachys* were able to use the ligninic biomass as a sole carbon source and to produce spores on the material. In particular, 10^6 fungal-spores/mL were produced by two *Trichoderma* species and by *Clonostachys* only after one week from inocula.
In conclusion, the combination of lignin with selected beneficial fungi is a potential tool for biocontrol of soil-borne plant pathogens (*i.e. S. rolfsii*) and new bioformulations could be readily and economically developed.

Keywords

sustainable agriculture, beneficial microorganism, soilborne disease, lignin, biostimulant

S4 - 12

EVALUATING THE INFLUENCE OF LIGHT-DARK CYCLES ON THE GROWTH OF THE DINOFLAGELLATE *Durusdinium glynnii*

Deyvid Willame Silva Oliveira[1]*, Barbara de Cassia Soares Brandão[1], Ingrid Mirelly Thó de Aguiar[1], Jéssika Lima de Abreu[1], Carlos Yure Barbosa de Oliveira[2], Alfredo Olivera Gálvez[1]

[1]Department of Fishing and Aquaculture, Federal Rural University of Pernambuco, Street Dom Manuel de Medeiros, Dois Irmãos, 52171-900, Recife/PE Brazil.
[2]Center for Biological Sciences, Department of Botany, Federal University of Santa Catarina, UFSC Campus Trindade, Trindade, 88040-900, Florianópolis/SC Brazil.
*E-mail: deyvid.oliveira@ufrpe.br

Abstract

Recent advancements in dinoflagellate cultivation hold significant importance for humanity as these organisms offer crucial bioactive compounds for applications in aquaculture. While historically studied primarily in ecology, there is a growing interest in exploring their cultivation methods, particularly due to the production of potent antioxidants, like peridinin, and biostimulant symbioimines. In light of the scarcity of research on the topic, this study aims to assess the impact of different light-dark cycle patterns on the growth of the novel dinoflagellate *Durusdinium glynnii*.
The experiment involved five treatments (Light:Dark): 24:0 (control), 16:8, 8:16, 12:12, and 0:24, each replicated thrice. An initial cell density of 5 x 10^4 cells mL^{-1} was maintained using f/2 medium. Daily cell counts were conducted to evaluate growth parameters, with final yields estimated for each treatment upon reaching the stationary phase of the sigmoid growth curve. Statistical analysis was performed to interpret the results (*p*-value: 0.05).
The treatment utilizing a 16:8 light-dark cycle demonstrated the highest growth, reaching a maximum cell density (MCD) of 81.24±2.34a x 10^4 cells mL^{-1} and a biomass productivity (Y) of 25.83±1.56a mg L^{-1} day^{-1}, significantly differing from other treatments [(24:0 - MCD 51.91±1.78b x 10^4 cells mL^{-1} and Y 19.18±1.56b mg L^{-1} day^{-1}), (8:16 - MCD 18.70±4.14c x 10^4 cells mL^{-1} and Y 11.22±2.01c mg L^{-1} day^{-1}), (12:12 - MCD 48.73±2.15b x 10^4 cells mL^{-1} and Y 15.49±2.23b mg L^{-1} day^{-1}), (0:24 - MCD 5.34±0.11d x 10^4 cells mL^{-1} and Y 0.35±0.01d mg L^{-1} day^{-1})]. Notably, cell density was sustained in the 0:24 treatment, indicating species survival in darkness after 18 days, with a predominance (88.3%) of individuals with the cocoid cell morphotype.
In conclusion, the 16:8 light-dark cycle proves most conducive to cultivating *Durusdinium glynnii*, potentially pivotal for future aquaculture endeavors. Further investigations should explore additional influencing factors.

Keywords

dinoflagellate cultivation; bioactive compounds; peridinin; symbioimines; circadian cycles

S4 - 13

The impact of plant genotype, starter fertilization and a seed-applied biostimulant on native root-associated mycorrhizal and bacterial communities in maize

Gergely Ujvári[1]*, Arianna Grassi[1], Irene Pagliarani[1], Alessandra Turrini[1], Monica Agnolucci[1]

[1]Department of Agriculture, Food and Environment, University of Pisa, Via del Borghetto 80, 56124 Pisa (PI)
Present address: Department of Agriculture, Food, Environment and Forestry, University of Florence, Via della Lastruccia 14, 50019 Sesto Fiorentino (FI)
*E-mail: gergely.ujvari@unifi.it

Abstract

The sustainable intensification of maize cropping systems, applying a variety of tools available in crop genetics, fertilization and microbial inoculation, may reduce agricultural environmental impact. However, little is known about the effects of such techniques on the native root-associated microbiota, which is pivotal for preserving soil fertility and health. In this study, we investigated whether maize hybrids differing in their early vigor, nitrogen (N) and phosphorus (P) starter fertilization and a seed-applied biostimulant (containing *Bacillus amyloliquefaciens* IT-45) shape the communities of native rhizosphere bacteria and root-colonizing arbuscular mycorrhizal fungi (AMF).
A factorial growth chamber experiment was set up with two maize genotypes in natural soil. Mycorrhizal colonization was evaluated with root staining. The diversity and composition of rhizosphere bacterial and root-colonizing AMF communities were assessed by PCR-DGGE of the 16S and 18S rDNA, respectively, and subsequent amplicon sequencing.
Cluster analysis showed that the biostimulant treatment affected the rhizosphere bacterial communities of the ordinary hybrid more than that of the high early vigor hybrid. Moreover, the biostimulant treatment was associated with the recruitment of potentially beneficial bacteria in the rhizosphere of emerging plantlets of the ordinary maize. However, based on our data, maize genotype was the major driver of rhizosphere microbiota assembly.
Regarding the mycorrhizal symbionts, starter fertilization resulted in a reduction of root colonization by AMF. Although the biostimulant alone had moderate effects on AMF colonization and AMF community diversity, the combined treatment with biostimulant and starter fertilization induced a consistent decline in both colonization and biodiversity indices. In addition, the effect of the two factors were modulated by maize genotype.
Our results may contribute to the understanding of how specific cropping practices may impact root-associated microbial communities and to the successful implementation of innovative tools in sustainable and resilient agroecosystems.

Keywords

maize, biostimulant, Bacillus amyloliquefaciens IT-45, arbuscular mycorrhizal fungi, rhizosphere bacteria

S5 - 01

Role of *Phytophthora* species in the lack of seedling recruitment in *Quercus suber* forests

Andrea Brandano[1]*, Giles Hardy[2], Antonio Deidda[1], Bruno Scanu[1]

[1]Department of Agricultural Science, University of Sassari, Viale Italia 39/A, 07100, Sassari
[2]Phytophthora Science and Management, Centre for Climate Impacted Terrestrial Ecosystems, Harry Butler Institute, Murdoch University, Perth, WA 6150, Australia
*E-mail: abrandano@uniss.it

Abstract

Cork oak forests are one of the most important ecosystems in the Mediterranean regions, recognised as one of the world's greatest hotspots for biodiversity conservation. In Sardinia, cork oak covers more than the 80% of the national distribution, and it play a relevant ecological and socio-economic role, representing the second most important production chain of the region. However, the sustainability of this forest ecosystem is under threat due to severe decline process, climate change and lack of natural regeneration. The oomycetes *Phytophthora* spp. have been associated with oak decline, with *P. cinnamomi* being the most widespread species. Besides killing adult trees, *Phytophthora* can in turn act as damping-off pathogen affecting the natural regeneration. The aim of this study is to explore the diversity of *Phytophthora* spp. occurring in Sardinian oak forests and to investigate the variation in early survival of oak seedlings to *Phytophthora* infections. To achieve this, soil and root samples from oak seedlings showing symptoms of *Phytophthora* infection were baited using fresh oak leaves. The susceptibility of germinating acorns to *Phytophthora* infections was tested by dipping growing taproot in a zoospores suspension. In the field, acorns germination and seedlings survival rates were monitored over one growing season in randomly selected plots through *Phytophthora* infested and disease-free sites. The results of this work showed that *Phytophthora* is impacting on oak seedling recruitment, with considerable post-emergent damping-off occurring on diseased sites.
These observations have potential devastating long-term impact on oak forests that are succumbing to Phytophthora but with no recruitment, which based on the modelling projections of a warming climate, with increasing frequencies of heavy rain events and prolonged droughts, will enhance the vulnerability of this important ecosystem to the climatic extremes.

Keywords

natural regeneration, cork oak, oak decline, seedlings, damping-off

S5 - 02

Flavescence dorée phytoplasma ecology in Tuscany vineyards (Italy)

Marco Carli[1,2], Athos Pedrelli[1,3], Lorenzo Cotrozzi[1], Alessandra Panattoni[1], Michela Moriconi[1], Pietro Bianco[1], Piero Braccini[4], Domenico Rizzo[4] and Cristina Nali[1]

[1]Department of Agriculture, Food and Environment, University of Pisa, Pisa, Italy
[2]Department of Agriculture Technologies, Food, Environment and Forestry, University of Florence, Florence, Italy
[3]Department of Biological and Environmental Sciences and Technologies, University of Salento, Lecce, Italy
[4]Regional Phytosanitary Service, Laboratory of Phytopathological Diagnostics and Molecular Biology, Pistoia, Italy

Abstract

"Flavescence dorée" (FD) is the most threatening grapevine yellow disease in Europe, with severe FD outbreaks reported in major viticulture areas, including Tuscany (Central Italy). Symptoms are indistinguishable from the ones caused by Bois Noir (BN), which are characterized by reddening/yellowing and downward curling of leaves, uneven lignification, and desiccation of berries. This study aims to investigate the presence of FD in Chianti Classico area (Tuscany) and study the diffusion and the genetic diversity of the associated phytoplasma not only in symptomatic grapevines but also in the vineyard ecosystem.

Seven vineyards selected in collaboration with the Regional Phytosanitary Service of Tuscany. Leaf samples were retrieved from *Vitis vinifera* cv. Sangiovese (VV) and from *Clematis vitalba* (CV) and Alnus glutinosa (AG) at the edges of the vineyards. *Scaphoideus titanus* (ST) and *Dictyophara europaea* (DE) were collected with chromotropic traps placed inside the vineyards and in the nearby forest border. A total of 276 samples were collected (218 VV, 24 ST, 20 DE, 10 CV, and 4 AG). Samples of VV displayed the characteristic leaf symptoms whereas CV and AG exhibited no alteration showing a normal green colour. The qPCR assays reported FD presence in 47% of VV, 60% of CV, 100% of AG, 33% of ST, and 30% of DE whereas only 2% of VV resulted positive to BN. Molecular characterization of 16S RNA and *secY-map* sequences identified (i) FD-3 genotype M51 in *VV* (62%), in *CV* (100%), and in *DE* (100%); (ii) FD-1 genotype M50 in *VV* (36%), and in *ST* (100%); (iii) FD-2 genotype M54 in *VV* (2%), and in *AG* (25%); (iv) FD-1 genotype M113 in *AG* (75%). Obtained results reinforced evidence of an increasing FD epidemiological complexity, confirming that other plant hosts and insects could be involved in the diffusion of FD in the vineyard.

Keywords

genetic clusters; insect vectors; molecular characterization; plant hosts; RFLP

S5 - 03

OZONATED WATER STIMULATES PLANT DEFENCE MECHANISMS AND CONTAINS THE SPREAD OF PATHOGENS IN (EDIBLE) FLOWER SPECIES

Claudia Pisuttu[1]*, Giacomo Lorenzini[1], Lorenzo Mariotti[1], Cristina Nali[1], Elisa Pellegrini[1]

[1]Department of Agriculture, Food and Environment, University of Pisa, Via del Borghetto 80, Pisa, 56124, Italy
*E-mail: claudia.pisuttu@agr.unipi.it

Abstract

Ozonated water (OW) is considered an innovative approach to manage plant pathogens in pre- and post-harvest. When bubbled into water, ozone dissolves partially forming reactive oxygen species, which exert positive effects in the containment of microorganisms and/or in the reduction of contaminants. The OW can be applied as soil drench during the irrigation or sprayed on leaves, and its use avoids the release of chemical residues by appearing safe, sustainable and appropriated for organic agriculture. Here, OW was tested on two species of edible flowers, *Begonia hybrida* and *Dianthus chinensis*, affected by *Botrytis cinerea* and *Erysiphe buhrii* (causal agent of grey mold and powdery mildew, respectively), to evaluate the in vivo antifungal effects and screen plant defence mechanisms. The greenhouse experimental trials lasted two and four weeks for the *B. hybrida/B. cinerea* and *D. chinensis/E. buhrii* pathosystems, respectively; the fungal pathogens were inoculated through foliar spraying of conidia suspensions (10^5 conidia mL^{-1}) and covered with plastic bags for 12 h, then a pot irrigation supplemented with OW (400 ppb) was provided (10 m^3 ha^{-1}). After the inoculation, B. hybrida OW-irrigated plants showed the early activation of the ethylene-jasmonic acid mediated response (+33 and +47%, respectively, in comparison to controls), while salicylic and abscisic acids increased in *D. chinensis* ones (+70 and +80%, respectively). At the end of the experiments, OW resulted effective in reducing the incidence of symptoms (brown spots and soft tissues) associated to *B. cinerea* in *B. hybrida* petals (-30%, in comparison to untreated plants) and the *E. buhrii* colonies on leaves and floral calyxes of *D. chinensis* (-45%). These preliminary data suggest the potential of OW in fungal pathogens containment in edible flowers.

Keywords

eco-friendly technique, disease management, signaling molecules, phytohormones, early response

S5 - 04

Insights into the role of the C4 protein of the geminivirus TYLCSV in transgenic tomato plants

Camilla Sacco Botto[1]†, Silvia Rotunno[1]†, Laura Miozzi, Slavica Matić, and Emanuela Noris1*

[1]Institute for Sustainable Plant Protection, National Research Council of Italy (CNR), 10135 Torino, Italy.
*E-mail: silvia.rotunno@ipsp.cnr.it
† These authors contributed equally to this work.

Abstract

We previously reported that tomato yellow leaf curl Sardinia virus (TYLCSV), a begomovirus belonging to the *Geminiviridae* family, confers enhanced tolerance to drought in tomato plants. This higher resilience has been attributed to the virus-encoded C4 protein, of small and highly variable protein, to which a multitude of roles have been attributed, from virus movement to RNA silencing suppression, symptom development, and plant defense. Indeed, transgenic tomato plants overexpressing the TYLCSV C4 protein showing morphological defects were resistant to drought and fungal attack. To define the molecular basis potentially responsible for the phenotype of C4 plants, an RNA-Seq analysis was carried out comparing plants overexpressing C4 with wild-type individuals.
Differential expression (DE) analysis, followed by Gene Ontology and KEGG pathway enrichment analysis revealed the impact of C4 protein on the metabolism of nucleotides, starch, glucose, cell wall components, fatty acids, and plant hormones and on pathogen interaction. Additionally, we conducted biomolecular analyses using RT-qPCR to study the expression of key genes known to be involved in cell wall-related pathways.
This work contributes to shed light on the intricate interplay between geminiviruses and tomato plants under abiotic and biotic stresses.

Keywords

geminivirus; transcriptome; RT-qPCR; cell wall; plant pathogen interaction

S5 - 05

Effect of synthetic and organic fertilizers on microbiome biodiversity of rhizospheric soils in *Corylus avellana* plants through a metagenomics approach

Angela Maffia[1]*, Adele Muscolo[1], Thomas Wood[2], Kostya Kanyuka[2], Riccardo Scotti[3],Giuseppe Celano[4]

[1]Department of AGRARIA, 'Mediterranea' University of Reggio Calabria, Feo di Vito, 89122 Reggio Calabria
[2]NIAB, Crop Pathology, 93 Lawrence Weaver Road, Cambridge, United Kingdom
[3]CREA Research Centre for Vegetable and Ornamental Crops, Via Cavalleggeri 51, 84098 Pontecagnano Faiano, Italy.
[4]Department of FARMACIA, University of Salerno, Via Giovanni Paolo II, Fisciano (SA) 84084.
*E-mail: angela.maffia@unirc.it)

Abstract

Worldwide, consumer demand for hazelnuts, both fresh and processed, is increasing. Despite numerous studies to improve hazelnut productivity, microbiological aspects, essential for soil fertility, have often been neglected. Excessive use of synthetic fertilizers contributes to the degradation of soil fertility and decreased biodiversity and microbiome balance. Fungi and soil bacteria play a key role in organic matter decomposition and soil biogeochemical cycles.
However, most of these microorganisms, approximately 97 percent, are not culturable in the laboratory, making understanding them extremely complex. Metagenomics is an approach, which allows the direct extraction of DNA from soil, provides a detailed view of soil biodiversity and its microbial structure and functions, overcoming the limitations of the traditional culture approach.
We utilised a metagenomics approach to investigate the taxonomic and functional identification of microorganisms comprising the rhizosphere of 2-year-old hazelnut plants var. *Corylus avellana* treated in pots with different fertilizers: synthetic NPK, composted olive pomace, and a new fertilizer obtainedfrom agro-industrial waste composed as follows: elemental residue S from the hydrocarbon refining process and stabilized with added bentonite clay and without composted olive pomace. We targeted 16S rDNA for bacteria and ITS2 for fungi for sequencing with Illumina short-read technology.
A bioinformatic analysis has provided valuable insights into the nuanced responses of soil microorganisms to distinct fertilizer inputs. Taxonomic scrutiny revealed a notable augmentation in the abundance of beneficial microorganisms, such as the bacterial genera *Thiobacillus, Anaeromyxobacter, Pseudoxanthomonas,* and the fungal genus Thermomyces, particularly in response to organic fertilizers. Furthermore, assessments of species richness and evenness, as determined by Chao1 and Shannon index respectively, underscored the positive impact of organic fertilizers on enhancing soil microbial biodiversity.These findings shed light on the importance of employing organic fertilization practices to foster a more diverse and resilient soil microbial community, with potential implications for sustainable agricultural.

Keywords

Metagenomics, Fungi, Bacteria, Corylus avellana, soil fertility, bio-fertilizers

S5 - 06

Co-inoculation approach combining lactic acid bacteria and yeasts to enhance the production of Nocellara del Belice green split table olives

Davide Alongi[1]*, Antonino Pirrone[1], Valentina Craparo[1], Enrico Viola[1], Venera Seminerio[1], Micaela Carusi[1], Luca Settanni[1], Nicola Francesca[1], Giancarlo Moschetti[1], Antonio Alfonzo[1]

[1]Department of Agricultural, Food and Forest Sciences (SAAF), University of Palermo, Viale Delle Scienze Bldg. 5, Ent. C, 90128, Palermo, Italy
*E-mail: davide.alongi@unipa.it

Abstract

Table olives represent a very popular fermented food of the Mediterranean basin and are extensively produced in Greece, Italy, and Spain. In Sicily (south Italy) split green table olives hold particular significance. Traditionally these olives undergo spontaneous fermentation, but this method carries the risk of product spoilage due to undesirable microorganisms. To address this challenge, driven fermentation using selected starter strains offers a solution, ensuring a safer and more predictable production process.
Consequently, three distinct experimental productions of Nocellara del Belice split table olives were carried out. In the control trial, a commercial strain of *Lactiplantibacillus pentosus* OM13 was singly inoculated (referred to as OS3). Meanwhile, in the OS1 and OS2 trials, *L. pentosus* was co-inoculated with *Candida boidinii* and *Candida norvegica*, respectively. The strains *C. boidinii* LC1 and *C. norvegica* OC10 were previously selected for their bioprotective properties. Throughout the 90-day fermentation process, parameters such as pH, salinity, and microbiological populations were monitored. Subsequently, the olives underwent evaluation for color and pulp consistency, followed by sensory analysis.
The fermentation process was dominated by the inoculated microorganisms, mainly lactobacilli and yeasts (> 6 Log CFU/mL). In the co-inoculated trials, there was a marked reduction of undesirable populations. Brine acidification occurred rapidly, with pH values reaching 4.5 within 21 days. The co-inoculation technique resulted in a microbiologically safe product, maintaining colour integrity and achieving higher flesh hardness than the control trial. Sensory analysis revealed significant differences in taste, texture, saltiness and overall flavor, with no discernible odours or off-flavours. This strategic approach holds promise for enhancing the quality of split table olives.
The contribute was made with the co-financing of the European Union-FESR or FSE, PON Research and Innovation 2014–2020-DM 1062/2021. Ministry of University and Research in Italy, CUP B7521002300001.

Keywords

table olives, fermentation, lactic acid bacteria, yeast, bioprotection

S5 - 07

Towards Sustainable Energy: Biohydrogen Production from Dairy Waste with *Rhodopseudomonas palustris* 42OL

Luca Bernabò*[1], Giulia Daly[1], Alessandra Adessi[1]

[1]Department of Agriculture, Food, Environment and Forestry, University of Florence, Italy.
*E-mail: luca.bernabo@unifi.it

Abstract

The current global energy demands heavily rely on non-renewable fossil fuels, including coal, oil, and natural gas. However, the finite nature of these resources necessitates the exploration of alternative energy sources. Hydrogen has emerged as a promising alternative energy carrier with the potential to address future energy challenges. Despite this, the development of efficient methods for hydrogen generation without fossil fuels is still in its infancy.
Biological hydrogen production shows promise due to its high yield and the opportunities to utilize various types of organic waste, aligning with circular economy objectives. Additionally, biological hydrogen production offers the potential to treat organic effluents safely before discharging them into the environment. Among organic waste streams, particular attention is paid to dairy residues, which pose challenges due to their high COD levels and the potential risk for eutrophication if directly discharged into water bodies.
Purple non-sulfur bacteria (PNSBs) are promising candidates for biohydrogen production through photo-fermentation, utilizing light energy and organic compounds, predominantly organic acids. Among PNSBs, *Rhodopseudomonas palustris* stands out for its metabolic flexibility and rapid growth, making it ideal for large-scale photobiological hydrogen production systems.
This study aimed to evaluate the potential for biohydrogen production from dairy wastewater using the PNSB *Rhodopseudomonas palustris* 42OL. The effluent was preliminary dark-fermented with a co-inoculum of lactic acid bacteria (LAB) to enrich it in lactic acid. Subsequently, lactic acid was converted to hydrogen by the photofermentation process. The photofermentation was conducted using a 5-liter bioreactor, illuminated with LED lights at a maximum intensity of 400 µmol (photons) m^{-1} s^{-1}. The experiment lasted for 14 days and it resulted in the total production of 1830 mL of H_2. The maximum production rate was 29.7 mL H_2 h^{-1}, and it was achieved at 117 h from the beginning of the experiment.
Through this research, we seek to address existing knowledge gaps and drive the transition towards a more sustainable energy production model.

Keywords

biological hydrogen production, circular economy, dairy residues, Rhodopseudomonas palustris

S5 - 08

Description of Ewiss cheese, a new ewe's milk cheese processed by Swiss cheese manufacturing techniques: microbiological, physicochemical and sensory aspects

Giuliana Garofalo[1]*, Tansu Taspinar[2], Gabriele Busetta[1], Salvatore Mastrangelo[1], Baldassare Portolano[1], Maria Teresa Sardina[1], Huseyin Erten[2], Raimondo Gaglio[1], Luca Settanni[1]

[1]Department of Agricultural, Food and Forest Sciences, University of Palermo, Viale delle Scienze, Bldg. 5, 90128 Palermo, Italy
[2]Department of Food Engineering, Faculty of Engineering, Cukurova University, Adana 1250, Turkey
* E-mail: giuliana.garofalo01@unipa.it

Abstract

Typically, Swiss-type cheese is made from cow's milk. However, in the present work an attempt to expand the sheep supply chain and product offering in this field was made by developing a new type of cheese using Swiss-type cheese technology. The cheese was manufactured under industrial conditions, and fermentations were carried out using freeze-dried commercial starters that are traditionally used in the production of Swiss cheese. Two experimental "Ewiss cheese" (EC) products were produced using raw milk (RM-EC) and pasteurized milk (PM-EC), respectively. No statistical differences ($p > 0.05$) were found for the levels of lactic acid bacteria (LAB) during all steps of cheese making. Undesired microbiological groups were found only in the curd of raw milk cheese in the range of 10^4-10^5 CFU/g, but reaching undetectable levels in the cheese at the end of ripening (9 months). RM-EC and PM-EC were characterized by 76% and 68% of dry matter, respectively. These cheeses contained 29.30% and 34.36% of protein, and 51.31% and 50.38% of fat, respectively. Textural analysis showed differences in terms of hardness, chewiness, and gumminess between the experimental cheeses. The main fatty acids in the cheeses were palmitic acid, myristic acid, oleic acid, and capric acid. Among the organic acids, RM-EC had higher concentrations of lactic acid, while PM-EC was higher in propionic acid. The ewe's cheeses emitted forty-six volatile compounds, including acids, aldehydes, ketones, esters, alcohols, and other compounds. PM-EC was characterized by the main compounds of Swiss-type cheese: acetic acid, butyric acid, ethyl butyrate, ethyl caproate, propanoic acid, and tetramethylpyrazine. Sensory evaluation showed that the PM-EC was the most preferred by the judges. This research has enabled the development of new ewe's milk products, which could stimulate the valorization of a sector that has been long neglected and still has a large margin of improvement.

Keywords

ewe's cheese, novel dairy products, Swiss-type cheese, microbiological safety, sensory evaluation

S5 - 09

Semi-characterization of polysaccharides extracted from *Scenedesmus* sp. strain isolated from desert environment, Southeast of Algeria

Karima Guehaz[1]*, Zakaria Boual[1], Giulia Daly[2], Matilde Ciani[2], Fatma Zohra Chakou[1], Hakim Belkhalfa[3], Alessandra Adessi[2]

[1]Laboratory for the Protection of Ecosystems in Arid and Semi-Arid Zones, FNSV, Kasdi Merbah University, Ouargla, Algeria.
[2]Department of Agriculture, Food, Environment and Forestry, University of Florence, Italy.
[3]Scientific and Technical Research Center in Physicochemical Analysis, Ouargla 30000, Algeria
*E-mail: gagakarima@gmail.com

Abstract

In contemporary biotechnological research, microalgae stand as potent organisms due to their multifaceted applications and inherent biological properties. Microalgae, characterized by their microscopic size and taxonomic diversity. Their significance stems from their diverse biochemical composition, which encompasses valuable compounds such as lipids, proteins, carbohydrates, pigments, and bioactive molecules. These versatile organisms have captivated researchers' attention as renewable sources for biofuel production, nutraceuticals, pharmaceuticals, wastewater treatment, and carbon sequestration. However, despite their immense potential, much of the microalgal biodiversity remains unexplored.
This study aimed to explore a new environment for the isolation of microalgae, and the characterization of polysaccharides, briefly, *Scenedesmus* sp. was isolated from Temassine Lake, Ouargla-Algeria, the strain was cultured in f/2 medium in standard culture condition. Polysaccharides were extracted by hot water extraction from the dried biomass, and where characterized for their composition. FT-IR analysis have revealed specific functional groups of carbohydrates, SEM-EDX analysis has demonstrated the microstructure of the polysaccharide and the elemental composition, specifically the presence of sulfate. The monosaccharide composition was analyzed by HPLC-Dionex, the polysaccharide consisted mainly of fucose 27.15%, galactose 21.76%, xylose 18.75%, glucose 11.69%, rhamnose 8.11%, and traces of glucosamine, arabinose glucuronic acid and galacturonic acid (<2%).
This study is a step toward the full characterization of a polysaccharide derived from *Scenedemus* sp. strain isolated from a desert environment, south of Algeria, and for the evaluation of its biological properties.

Keywords

Scenedesmus sp., polysaccharide, characterization, desert environment

#AISSA under40

S5 - 10

Novel microbial-based biostimulants for sustainable agriculture

Giuseppina Magaraci[1]*, Ida Romano[1], Marisa Amato[1], Olimpia Pepe[1,2], Valeria Ventorino[1,2]

[1]Department of Agricultural Sciences, Division of Microbiology, University of Naples Federico II, Naples, Piazza Carlo di Borbone 1, Portici (NA), Italy
[2]Task Force on Microbiome Studies, University of Naples Federico II, Naples, Italy
*E-mail: giuseppina.magaraci@unina.it

Abstract

Biostimulants play a pivotal role in ensuring crop yield and nutritional quality, offering a sustainable alternative to chemical fertilizers. Specifically, biofertilizers contain live microorganisms capable of colonizing the plant rhizosphere, enhancing nutrient availability, and promoting plant growth.
This research focuses on developing novel microbial-based biostimulants and *assessing* their effectiveness on maize plants.
Three bacterial strains, *Bacillus megaterium* EL5, *Azotobacter chroococcum* 76A, and *Kosakonia pseudosacchari* TL13, were selected based on their plant growth-promoting activities. Antagonism tests were performed to ensure the absence of antimicrobial activity among the three selected strains, followed by microbial biomass production through liquid-state fermentation.
Two different formulations, freeze-dried and hydrogel, were developed and experimental tests were conducted to evaluate the effectiveness of the innovative microbial-based biostimulants on maize plants cultivated under controlled growth conditions, encompassing scenarios of both optimal irrigation and water stress. Biometric indices were evaluated, affirming the efficacy of both freeze-dried and hydrogel formulations. In addition, q-PCR analyses were conducted to quantify target genes associated to nitrogen (*nif*H, *nar*G, and *nir*K) and phosphorus (*pho*D and BPP) biogeochemical cycles, along with the 16S rRNA gene to assess total bacterial population. The results indicated a significant impact of biostimulants on the soil microbial community increasing the copy numbers of target genes. These results highlighted the crucial role of this microbial consortium in augmenting two fundamental soil activities making the selected bacterial strains promising candidates for the development of new biofertilizers and contributing substantively to the paradigm of sustainable agriculture.

Keywords

sustainable agriculture, biostimulant, microbial application, microbial consortia

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S5 - 11

Enzymatic approach to improve the nutritional and functional feature of *Tenebrio molitor*

Michela Verni[1], Giacomo Squeo[2], Francesco Caponio[2], Giuseppe Perri[2], Luigi Macchia[3], Carlo Giuseppe Rizzello[1], Erica Pontonio[2]*

[1]Department of Environmental Biology, "Sapienza" University of Rome, Rome, Italy
[2]Department of Soil, Plant, and Food Sciences, University of Bari Aldo Moro, Bari,Italy
[3]Department of Allergology and Clinical Immunology, University of Bari Aldo Moro,Bari, Italy
*E-mail: erica.pontonio@uniba.it

Abstract

With a growing world population, increasingly demanding consumers, and a limited amount of agricultural land, finding new alternative protein sources is one of the most interesting goals for human and animal nutrition and health. The edible insects and their derivatives perfectly fit in this framework as an alternative protein source for humans. As most protein-containing foods, insects can also induce IgE-mediated allergic reactions in sensitive human and, although further investigation are needed, the process used to prepare the ingredient might affect the composition and bioavailability of protein thus modulating the effect on humans. The present project aimed at optimizing a bio-technological protocol by using an enzymatic cocktail (Flavourzyme ® and Alcalase®) for the enhancement of the nutritional (protein digestibility, amino acids and peptides concentration and profile) and functional (bioactive compounds) features of *Tenebrio molitor flour*. Both culture-depended and -independent approaches (NGS, new generation sequencing) have been used to define the insect microbiota. An integrated approach, including chromatographic and electrophoresis analysis have highlighted the role of the enzymatic treatment in the improvement of peptide (up to 600 mg/g) and free amino acids (up to 140 mg/g) concentration as well as the *in-vitro* protein digestibility (20% higher than untreated flour) and antifungal activity (up to 66%). To understand the role of the enzymatic treatment on the degradation of protein responsible for the IgE-mediated response, extracts of the enzymatically treated flour (during treatment) have been applied on volunteers (with and without shellfish allergy) skin.
The insect flour prior and after 3 and 6 h of enzymatic treatment has been used to fortify bread which, according to Regulation CE n.1924/2006, can be considered as "source" and with "high content" of proteins and are characterized by improved nutritional indices.

Keywords

Tenebrio molitor, proteolysis, nutritional properties, fortified bread

S5 - 12

Shiga toxin-producing Escherichia Coli (STEC) screening in Trentino Traditional Dairy farms

Giorgia Secchi[1,2]*, Andrea Mancini[1,2], Gabriele Iussig[3], Erika Partel[3], Massimiliano Mazzucchi[3], Ingrid Roner[3], Nicola Sandri[3], Nicola Cologna[4], Marco Ramelli[4], Marco Nardelli[4], Elena Franciosi[1,2]

[1]Fondazione Edmund Mach, Research and Innovation Centre (CRI), Via E. Mach,1, 38098 San Michele all'Adige (TN), Italy
[2]ONFoods-Research and innovation network on food and nutrition Sustainability Safety and Security - Working ON Foods, Safety and Security - Working ON Foods, 43121 Parma, Italy
[3]Fondazione Edmund Mach, Technology Transfer Centre (CTT), Via E. Mach,1, 38098 San Michele all'Adige (TN), Italy
[4]Trentingrana Consorzio dei Caseifici Sociali Trentini s.c.a, Via Bregenz,18, 38121 Trento, Italy
*E-mail: giorgia.secchi@fmach.it

Abstract

Ruminants are a major reservoir of Shiga toxin-producing *Escherichia coli* (STEC) strains, zoonotic Gram-negative bacteria that pose a significant risk to public health and food safety. Although the consumption of raw milk cheese is healthy, contamination with pathogens such as STEC can occur due to poor hygiene practices at the farm level. STEC is a significant threat to human health due to its ability to cause gastroenteritis hemorrhagic colitis and hemolytic uremic syndrome. Therefore, it is important to limit this pathogen along the food chain. The aims of this preliminary study were to evaluate the presence of STEC and its correlation with milk quality in Trentino dairy farms. The pathogen's presence was screened monthly in 15 farms; bulk milk samples, milking filters, and environmental samples by overboot swabs were collected. Milk samples were analyzed for total bacterial count, lactobacilli, lactococci, coliforms, hemolytic streptococci, and *Prototheca* spp. Milking filters and environmental samples were enriched with selective different antibiotics; then they were analyzed by multiplex-PCR for gene detection. The positive enrichments were subcultured on Sorbitol MacConkey agar and positive colonies were isolated as putative STEC. After an incubation, the isolates were tested by multiplex-PCR analysis. Preliminary results on the monthly monitoring of these farms, from the summer of 2023 to autumn of 2023, showed no positive correlation between the presence of Shiga toxin-producing genes and coliforms count (mean 1.48 log CFU/mL, range 0.97 to 2.63 log CFU/mL). Moreover, many of the environmental samples are negative despite having a positive presence in filters. Overall, more than 300 isolates are worth further investigation in order to perform Whole Genome sequencing (WGS). This study was carried out within the ONFoods² and received funding from the European Union Next-GenerationEU (PNRR-MISSIONE 4 COMPONENTE 2, INVESTIMENTO 1.3–D.D. 1550 11/10/2022, PE00000003).

Keywords

Food safety, Health, Dairy safe, Milk quality

S5 - 13

Sourdough Fermentation for the Valorization of Sorghum Flour: Microbiota Characterization, Metabolome Profiling and Bread-Making

Michela Verni[1]*, Andrea Torreggiani[1], Elisa Brasili[1], Carlo Giuseppe Rizzello[1]

[1]Department of Environmental Biology, "Sapienza" University of Rome, Piazzale Aldo Moro 5, 00185 Rome, Italy
*E-mail: michela.verni@uniroma1.it

Abstract

Due to a large adaptability to different cultivation conditions and limited input compared to other cereals, sorghum is considered an emerging crop. Its antioxidant properties, high fiber content and low glycemic index also make it a valuable addition to a healthy diet, nevertheless, the presence of antinutritional factors and the lack of gluten, hamper its use as food ingredient. This study aimed at investigating the impact of sourdough fermentation on sorghum nutritional quality. Lactic acid bacteria dominating sorghum flour and sourdough were identified by culture-dependent analysis revealing *Lactiplantibacillus plantarum* as the predominant species found in the mature sourdough, whereas *Weissella cibaria* and *Weissella paramesenteroides* were the species isolated the most from sorghum flour and after the first refreshment. Among yeasts, *Saccharomyces cerevisiae* was the most prevalent. An integrated approach combining chromatographic and NMR spectroscopic techniques was used to evaluate lactic acid bacteria pro-technological and functional performances as starters in sorghum type-II sourdoughs. The metabolic profile of the strains mainly grouped together *W. cibaria* strains and *W. paramesenteroides* AI7 which distinguished for the intense proteolysis but also for the presence of compounds particularly interesting from a physiological perspective (allantoin, glutathione, γ-aminobutyric acid and 2-hydroxy-3-methylbutyric acid), whose concentration increased during fermentation in a species- or strain-specific matter.

Exopolysaccharides-producing strains were also employed as starters in sorghum fermentation. The optimization process allowed to obtain a type II sourdough enriched in exopolysaccharides used as ingredient in gluten free breads. The presence of exopolysaccharides markedly improved bread rheological characteristics and their staling rate was lower compared to control breads. Moreover, the high amount of sorghum determined a high fiber content, often limiting factor in gluten free products. Overall, these results set the basis for future industrial development but, most of all, they represent an effective strategy to valorize a cereal crop whose cultivation offers numerous agronomical and environmental benefits.

Keywords

White sorghum, sustainability, sourdough, lactic acid bacteria

S6 - 01

How to reduce failure in urban tree planting programs

Sebastien Comin[1]*, Alessio Fini[1], Irene Vigevani[2], Denise Corsini[1], Francesco Ferrini[2]

[1]Department of environmental and agricultural science, University of Milan
[2]Department of environment, agricultural and food science, University of Florence
*E-mail: Sebastien.comin@unimi.it

Abstract

Transplanting, in extensive urban tree planting programs, if not properly carried out and managed can lead to premature failure of new planting, up to 33 %. The idea behind the project is to find a way to reduce transplant stress and improve trees survival and rooting. The goal of this work was to assess the effects of three different nursery production methods on the growth and the physiology of two tree species, chosen for their different mechanisms against water stress and transplant tolerance: *Celtis australis* (isohydric, high transplant tolerance) and *Liquidambar styraciflua* (anisohydric, low transplant tolerance). Three production methods were tested: (i) Balled&Burlapped (B&B) (uprooted and immediately planted), (ii) hardened B&B (uprooted, burlapped, frequently irrigated for few months and then planted) and (iii) Air pot (uprooted, grown in air pot for one year and then planted). The experimental field is in Padova (IT) in a peri-urban field. The experimental design consists of 6 randomized blocks (two species and three treatment) for a total of 144 8cm-diameter trees. In the first year following transplant tree health, growth and physiology have been assessed through: (i)biometric measurement (dbh, shoot length, crown dimension…), (ii)leaf gas exchange (instantaneous measurement and A/Ci curves) and (iii)water potential measurement (pre-dawn, midday and xylem).
In very high soil moisture content periods, B&B showed better photosynthesis and mesophyll conductance compared to the others. During the summer period (high water stress), air-pot shows its weak points, with lower photosynthesis and water potential, while during the recovery after the stress, hardened B&B shows the best results in both water potential and gas exchange. The behavior of trees with different treatment were deeply impacted by the tree species. B&B Celtis showed good results during dry period while hardened B&B *Liquidambar* showed the best results during floated period, especially in plant conductivity.

Keywords

Urban trees, Transplant stress, Water potential, Water stress, Dieback

S6 - 02

The problem of invasive alien plants in European urban settings: testing non-invasive cultivars and species as alternatives to *Ligustrum sinense* Lour

Giulia Daniele[1,2]*, Matteo Caser[1], Elena Barni[3,2], Nicole Sebesta[3], Federica Larcher[1,2]

[1]Department of Agricultural, Forest and Food Sciences, University of Torino, Largo Paolo Braccini 2, 10095 Grugliasco, Torino, Italy.
[2]National Biodiversity Future Center (NBFC), Italy.
[3]Department of Life Sciences and Systems Biology, University of Torino, Viale Mattioli 25, 10125 Torino, Italy.
*E-mail : giulia.daniele@unito.it

Abstract

Cities are hotspots for the importation, establishment, growth, and subsequent spread of invasive alien plant species (IAPs); however, they can also have an important role in biodiversity conservation. The IAPs invasions are a major threat to biodiversity, human well-being, and the economy, and may be further exacerbated under climate change. Some ornamental plants, popular in urban green spaces, have become invasive, such as *Ailanthus altissima* (Mill.) Swingle, *Buddleja davidii* Franch., *Ligustrum sinense* Lour., *Lonicera japonica* Thunb., and *Prunus laurocerasus* L. The floriculture industry's plant trade has been recognized as one of the main pathways for the introduction of IAPs worldwide. The purpose of the research, as part of the Italian National Biodiversity Future Center (NBFC) project, is to provide suitable ornamental alternatives, including non-invasive cultivars, and to promote the use of native plants. The contribution focuses on the evaluation of two possible alternatives to *L. sinense* Lour. (IAP): *L. vulgare* L. (European native), and *L. japonicum* Thunb. 'Texanum' (non-invasive ornamental cultivar). In the experimental trial, the three species were compared in their responses in growth and morpho-physiological traits to salt and water stresses under climate-controlled conditions. A total of 270 plants, approximately 25 cm in height, were cultivated in pots (diameter 9 cm) in March 2024 situated inside the growth chamber. The plants underwent two treatments of NaCl solutions (150 mM and 300 mM) and tap water (control).
Additionally, two irrigation levels were applied, specifically 30% and 60% of field capacity, while the control group received 90% of the field capacity.
Preliminary results will highlight plant growth physiological responses, and overall performance, serving as valuable indicators to assess the potential of these species as alternatives for the development of sustainable urban horticulture.

Keywords

Invasive alien plants, sustainable horticulture, ornamentals, urban biodiversity, Ligustrum sinense Lour

S6 - 03

Exploring the impact of moderate water stress on anthocyanin, flavonol glycosides, and terpene dynamics across fruit development and ripening in *Pistacia lentiscus* L.

Lucrezia Muti[1]* , Diana Vanacore[2] , Francesca Alderotti[1], Cassandra Detti[1], Giulia Goracci[1], Cecilia Brunetti[2,1], Francesco Ferrini[1,2], Anna Rita Bilia[3], Antonella Gori[1,2]

[1]University of Florence, Department of Agriculture, Food, Environment and Forestry (DAGRI), Sesto Fiorentino, Florence 50019, Italy
[2]National Research Council of Italy, Institute for Sustainable Plant Protection (IPSP), Sesto Fiorentino, Florence and Turin 50019 and 10135, Italy
[3]Department of Chemistry, University of Florence, Via U. Schiff 6, 50019 Sesto Fiorentino, Italy
*E-mail: lucrezia.muti@unifi.it

Abstract

Pistacia lentiscus L. (Anacardiaceae) is an evergreen Mediterranean shrub whose fruits can be a source of new nutraceuticals with health-promoting properties. The objective of the experiment was to evaluate the effects of a moderate water stress on the biochemical composition of *P. lentiscus* fruits at two ripening stages (November, T1, and December, T2). The experiment started in October and involved twelve five-year-old potted plants, six of which (WW, well-watered) received adequate daily watering to pot capacity.

The remaining plants underwent moderate water-stress treatment (WS, water-stressed), providing 70% of the Fraction of Transpirable Soil Water.
At T1 and T2, Total Terpenes Content (TTC) was analyzed by GC-MS in the oil extracted from fruits. In the remaining pellet (oil cake), Anthocyanins and Flavonol Contents (TAC and TFC, respectively) were quantified through HPLC-DAD.

Plants physiological status was monitored through measurements of stomatal conductance (g_{sw}), chlorophyll fluorescence, leaf Relative Water Content (RWC) and leaf water potential (Ψ w). In addition, leaf flavonol and chlorophyll indexes were assessed through Dualex®. Results showed that P. lentiscus, characterized by its isohydric behavior, reduced g_{sw} under moderate water stress, maintaining high RWC and Ψ w without significantly affecting leaf photochemistry, chlorophyll and flavonol indexes.

Results of biochemical analyses of the fruits revealed that the best ripening time was T1, with TAC and TFC being 5.6 mg/g DW and 1.2 mg/g DW, respectively. In contrast, T2 was the best ripening stage for TTC (0.25 mg/g DW). Overall, TAC, TFC, and TTC were negatively influenced by the deficit-irrigation treatment at both ripening stages. However, a significant increase of β-myrcene in the oil collected from WS plants was observed at T1, underscoring the potential use of water stress to enhance specific metabolite pathways. These findings not only contribute to our understanding of the optimal harvesting period of *P. lentiscus* fruits but also indicate strategic agricultural practices that can maximize the nutraceutical value of its oil and oil cake especially in the face of increasing water scarcity.

Keywords

fruits,Pistacia lentiscus, ripening stages, secondary metabolites, water stress

S6 - 04

Impact of geopedological events on the soil fertility of drylands from United Arab Emirates

Andrea Salvucci[1]*, Nora Baldoni[2], Valeria Cardelli[1], Dominique Serrani[1], Shyam Kurup[2]; María J. Fernández-Sanjurjo[3]; Xosé Luis Otero Pérez[4]; Stefania Cocco[1]; Giuseppe Corti[1,5]

[1]Department of Agriculture, Food and Environmental Sciences, Polytechnic University of Marche, Ancona (Italy)
[2]Department of Integrative Agriculture, College of Agriculture and Veterinary Medicine, United Arab Emirates University, Al Ain (United Arab Emirates)
[3]Department of Soil Science and Agricultural Chemistry, Engineering Polytechnic School, University of Santiago de Compostela, Lugo (Spain)
[4]CRETUS, Department of Soil Science and Agricultural Chemistry, Faculty of Biology, University of Santiago de Compostela, Santiago de Compostela (Spain)
[5]Research Centre for Agriculture and Environment, CREA—Council for Agricultural Research and Economics, Firenze (Italy)
*W-mail:andrea.salvucci@pm.univpm.it

Abstract

Drylands represent about one-third of the global land and mainly occur in Africa and Asia. Although arid and semi-arid regions have been cultivated for a long time, soils developed from aeolian deposits presents serious limitation for plant growth such as salt accumulation, low organic matter content, coarse texture, and low nutrient and water retention. In this context, the contribution of materials deriving from exogeneous sources may improve soil agronomic properties and soil productivity. This study, conducted in Al Foah (United Arab Emirates), aimed at evaluating the influence of landslides on the morphologic and physicochemical properties of cultivated soils at an increasing distance [close (C), medium (M), and far (F)] from the mountainous source of the colluvium and to compare these properties with morphological and physicochemical characteristics of soil evolved on aeolian deposits (dunes). The colluvial material is present in each cultivated soil profile with an increasing depth of 20 (F), 20 (M), and 44 cm (C). This material was subjected to plowing (Ap horizons) at different depths (ranging from 8 to 20 cm) while, in the subsurface horizons, F and M soils recorded sandy aeolian deposits without cultivation marks. The soil of the dunes consisted of sandy stratifications resulting from subsequent aeolian depositional events. Regarding physicochemical properties, the highest cation exchange capacity and nutrient content were found in horizons evolved on colluvial material because of the finer texture. Contrary, subsurface horizons developed from aeolian deposits in cultivated soils were comparable to dune horizons. Therefore, in the C soil, plant roots may find favourable conditions down to a greater depth, which were otherwise limited to the Ap horizons in the other cultivated soils (M and F). Given this, in susceptible and fragile ecosystems such as drylands, soils derived from ancient landslide events may be useful to enhance agricultural production.

Keywords

dryland; landslide; soil fertility; soil horizon; aeolian deposits

S6 - 05

Hydrophobicity and Epicuticular Waxes are Crucial Leaf Traits for Salmonella enterica Attachment on 30 Baby Leaf Salads

Stefania Truschi[1]*, Lorenzo Marini[1], Ilaria Cacciari[2], Ada Baldi[1], Piero Bruschi[1], Johanna Baales[3], Viktoria Zeisler-Diehl[3], Lukas Schreiber[3], Massimiliano Marvasi[4] and Anna Lenzi[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI) - University of Florence, Piazzale delle Cascine 18, 50144, Florence, Italy
[2]CNR, Institute of Applied Physics 'Nello Carrara', Via Madonna del Piano 10, 50019, Sesto Fiorentino, Florence, Italy
[3]Institute of Cellular and Molecular Botany (IZMB), University of Bonn, Kirschallee 1, 53115, Bonn, Germany
[4]Department of Biology, University of Florence, Via Madonna del Piano 6, 50019, Sesto Fiorentino, Florence, Italy
*E-mail: stefania.truschi@unifi.it

Abstract

Food-borne outbreaks caused by vegetables contamination with human pathogens like *Salmonella enterica* often involve salads, which imply high risk due to raw consumption. Baby leaves, being consumed as ready-to-eat salads, may undergo contamination during processing. The initial stage of the contamination of leafy vegetables by human pathogens involves their adherence to the surface of the leaves. The effectiveness of this attachment process is affected by the physical and chemical traits of the leaf surface.

The aims of this study were to evaluate the susceptibility to *S. enterica* contamination of 30 baby-leaf salads, and to verify whether the possible differences in the susceptibility were related to the following leaf traits: hydrophobicity, roughness, and epicuticular waxes.

Leaf disks were inoculated with *S. enterica* by putting 20 μL of the working bacterial suspension on their adaxial side and the attachment was evaluated after 5 min through the counting of colony-forming units on XLD Agar medium. The hydrophobicity was quantified by measuring the contact angle using a drop shape analyser. A portable 3D digital microscope was used for measuring roughness. Epicuticular waxes were quantified by gas chromatography connected to a flame ionization detector, and identified by mass spectrometry. Besides, images of the epicuticular wax crystals were taken using a Scanning Electron Microscope.

Differences in the susceptibility to contamination by *S. enterica* were found between the 30 baby-leaf salads investigated, with the lowest attachment found in wild lettuce (*Lactuca serriola* L.) and lamb's lettuce (*Valerianella locusta* [L.] Laterr.). Attachment was correlated to hydrophobicity and epicuticular waxes. The most important wax components for attachment were alcohols and, in particular, the 3-D wax crystals of C26 alcohol, which increased hydrophobicity. This study contributes to food safety of the vegetable industry by providing new findings on leaf traits associated with lower proliferation of human pathogens in salads.

Keywords

leafy vegetables, human pathogens, contact angle, epicuticular waxes, 3-D wax crystals

S6 - 06

Old-growth forest dynamics in the Pollino National Park: A multivariate analysis approach

Danilo Travascia[1]*, Nicodemo Passalacqua[2], Liliana Bernardo[2], Domenico Gargano[2], Costanza Fiorentino[1], Vittoria Marchianò[3], Aldo Schettino[3], Marco Borghetti[1], Francesco Ripullone[1]

[1]School of Agricultural, Forest and Food Sciences, University of Basilicata, Via dell'Ateneo Lucano 10, Potenza (Italy)
[2]Department of Biology, Ecology, and Earth Science, University of Calabria, Via Pietro Bucci, Arcavacata (Italy)
[3]Pollino National Park, Complesso monumentale Santa Maria della Consolazione, Rotonda (Italy)
*E-mail: danilo.travascia@unibas.it

Abstract

Old-growth forests (OGF) are renowned for their high biodiversity and complex ecosystems. An OGF can be defined as a forest with a high naturalness, where structural features are influenced by old and large trees. These forests are home to endemic and threatened species, making them a rare example of our natural heritage. They also provide ecosystem services and store significant amounts of carbon. The EU Biodiversity Strategy 2030 estimates that OGFs cover less than 3% of the EU's forest area, far from the target set for 2030 (10%). There is currently no widely accepted OGF definition, and indicators used for assessing them do not take into account environmental variability. OGFs conservation also plays a key role for climate change mitigation policies, particularly within the Mediterranean basin, where warming occurs 20% faster than the global average. In Italy, most of the OGFs remains are located in the Apennines, specifically in the Pollino, Sila, and Aspromonte National Parks. However, knowledge about these precious ecosystems and their key features is limited. Our research focused on nine OGFs within the Pollino National Park, with the aim of assessing structural, floristic, and morphological characteristics. For each OGF, a 1-hectare area was selected and divided into 20x20m square plots where topographic, structural, and vegetation data were collected. Sample data were aligned and organized in a matrix for statistical analysis. The floristic data showed correlations with dominant species and altitude patterns through multivariate analysis. Structural features were related to the presence of small trees and the number of large trees; finally, OGFs were largely overlapping in terms of deadwood patterns, except for one site. A relationship was observed between topographic and structural data, indicating potential differences in rates of anthropogenic impact. This approach emphasizes the similarities and differences among OGFs, providing insights into their ecological dynamics and conservation status.

Keywords

biodiversity, naturalness degree, old-growth forests, structural indicators, multivariate analysis

S6 - 07

Know what you eat: nutritional value of the alien species *Callinectes sapidus*

Lina F. Pulido Rodriguez[1*], Giulia Secci[1], Giuliana Parisi[1]

[1]Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali, Università di Firenze

Abstract

Blue crab (*Callinectes sapidus*), native to the Atlantic coast of the Americas, represents a huge plague for Mediterranean countries, since it is considered a highly invasive alien species. Furthermore, the sustainable management of blue crab populations is crucial for preserving coastal ecosystems, making the valorization of crab meat not just a culinary endeavor but also an ecological imperative. In this context, we here have proposed a characterization of 18 specimens of Blue crabs, caught in the FAO 37.1 area at the end of November 2023, in terms of marketable yields (as body meat yield and claw meat yield), chemical composition, and nutritional value. Data were analyzed with SAS software to assess the effect of the anatomical region (i.e., body and claw) on the total lipids and fatty acid profiles. Body and claws represented approximately 38.5% and 43.05% of the whole animal, respectively; the edible parts, hence meat from body and claws, were 23.70% and 16%, respectively. The anatomic regions significantly affected the total lipid content and a few fatty acids. Specifically, the body meat had a higher lipid content (0.74g/100g) than claw meat; however, both resulted in lean meats. The body had a higher sum of saturated (29.5% of the total fatty acid methyl esters) and polyunsaturated (34.9% of total FAME) fatty acids (FAs) compared to the claw meat. This last was richer in monounsaturated FAs. In conclusion, blue crabs had lean meat irrespective of the anatomic regions considered, and its fatty acid profile resulted beneficial to human health.

Keywords

sustainability, fatty acid profile, Blue crab

S6 - 08 The host, the guest, the holo-biont

Francesco Tiezzi[1]*, Christian Maltecca[2]

[1]University of Florence - DAGRI, Piazzale delle Cascine 18, Firenze, Italy.
[2]Department of Animal Science, North Carolina State University, 120 W Broughton Dr, Raleigh, NC, USA.
*E-mail: francesco.tiezzi2@unifi.it

Abstract

There is an intricate relationship between host physiology and the gut microbiome dynamics in animals. The holo-biont concept tries to provide an interpretation of this relationship. Our goal is to shed light on the impact of the genotype of the host on the presence of its microbial symbionts, oriented towards the maintenance of gut health in farm animals.
We will examine the potential evolution of the host throughout its life, highlighting dynamic changes in gut microbial colonization from birth to adulthood. We will emphasize the symbiotic link between the host and microbiota. This link plays a pivotal role in selection and evolution but also in the physiology of nutrient absorption and in the regulation of animal's behavior. An analytical model for microbiome composition will be introduced, incorporating the influence of host genes, maternal effects, and the environment. The environment impacts the microbiome, mainly through diet and stress, but host genetics seem to moderate and filter this impact. We will provide examples to illustrate the host's influence on microbiome composition, emphasizing bi-directional host-microbiome interactions in the holo-biont. We will present previous and ongoing work from our group, together with results found in literature.

Keywords

genetics, animal breeding, microbiome, stress, holo-biont.

S7 - 01

AGRONOMIC AND QUALITATIVE EVALUATION OF OLD WHEAT VARIETIES FOR INNOVATIVE USE IN FORAGE FARMING

Sofia Del Gaudio[1]*, Annamaria Di Serio[2], Vincenzo Alfano[3], Alessandra Immovilli[4], Fabrizio Ruozzi[4], Roberto Davolio[4], Maria Teresa Pacchioli[4], Isabella Masiello[5], Enrica De Falco[3], Domenico Ronga[3]

[1]PhD School in Agricultural, Forest and Food Sciences, University of Basilicata, via dell'Ateneo Lucano 10, Potenza, Italy, and University of Salerno, Via Giovanni Paolo II, 132, 84084 Fisciano, Italy
[2]Chemestry and Biology Department, University of Salerno, Via Giovanni Paolo II n. 132, 84084, Fisciano, SA, Italy
[3]Department of Farmacy, University of Salerno, Via Giovanni Paolo II n. 132, 84084, Fisciano, SA, Italy
[4]Centro Ricerche Produzioni Animali—CRPA S.c.p.A, Viale Timavo 43/2, 42121 Reggio Emilia, Italy
[5](C.R.A.A.) Centro per la Ricerca Applicata in Agricoltura, Azienda Agricola Sperimentale Regionale Campania Improsta
*E-mail: sodelgaudio@unisa.it; sofia.delgaudio@unibas.it

Abstract
The use of wheat varieties as forage is attracting considerable interest especially in mountainous and hilly livestock contexts thanks to some advantages such as the autumn-spring cycle and the early harvest time, coupled with good forage quality. Whitin wheat varieties old ones still exhibit a low harvest index, with tall plants, which correspond to higher hay production. In addition, old varieties are particularly tolerant to abiotic stress, and they are characterized by lower nitrogen requirements, greater genetic variability, making cultivation more sustainable. However, it is necessary to delve deeper into some aspects with the aim to optimize the use of these varieties. Considering this aspects, the agronomic and qualitative evaluation of 6 different wheat varieties was conducted assessing three modern varieties (Ludwig, Nogal and GS Armando) and three old ones typically cultivated in the Campania region (Risciola, Carosella and Senatore Cappelli). The experimentation was carried out for two years (2021 and 2022) at the Improsta Experimental Farm, Battipaglia (SA). The experimental trial, conducted according to a randomized block design with five biological replicates, included both destructive and non-destructive parameters at the main phenological stages (heading (for hay production) and dough (for silage production)), investigating physiological, agronomic and qualitative traits. Physiological and agronomic measurements were done using digital instruments, while the quality of the harvest product was assessed using Near-Infrared Reflectance Spectroscopy. Old wheat varieties highlighted higher yield in terms of protein per hectare. In addition, among the main parameters for forage evaluation, no qualitative differences emerged between traditional and modern varieties. In particular, Net Energy for Lactation (NEL Kcal/Kg DM) does not show substantial variations between conventional and old varieties. Furthermore, in addition to the agronomic and practical advantages, the reintroduction of old varieties offers the possibility of diversifying the feed ration increasing the biodiversity and the agricultural sustainability.

Keywords

Biodiversity, Sustainability, Livestock, Quality, Climate Change.

S7 - 02

Nitrogen Symbiotic Exchange Dynamics in the Wheat-Vetch Intercropping System: A Study within the AgrEcoMed Project

Michele Denora[1]*, Donato Casiello[1], Andi Mehmeti[1], Pierluigi Casiero[1], Domenico Mario Melone[1], Vincenzo Candido[1], Enrica De Falco[2], Domenico Ronga[2], Gabriele Cioffi[2], Antonio Landi[2], Michele Perniola[1]

[1]Department of European and Mediterranean Cultures, University of Basilicata, Via Lanera, Matera, Italy
[2]Pharmacy Department, University of Salerno, Via Giovanni Paolo II 132, 84084 Fisciano, Italy
*E-mail: michele.denora@unibas.it

Abstract

Intercropping is an agroecological practice where two or more species are cultivated simultaneously in the same field, aiming to enhance both quantitative and qualitative responses and the resilience of the cropping system compared to the same species cultivated in monoculture. The trial was conducted at the La Generale cooperative in the Genzano di Lucania countryside as part of the AgrEcoMed research and innovation project, funded by the PRIMA Foundation, in line with the prevailing agroecological approach in Mediterranean countries. In the 2022-2023 growing season, an experiment was conducted on durum wheat (*Triticum durum* Desf.) var. Tirex intercropped with vetch (*Vicia sativa* L.) var. Ereica. The purpose of this study was to quantify the dynamics of symbiotic nitrogen (N) exchange, fixed by legumes and transferred to cereals. The experimental treatments consisted of comparing wheat intercropped with vetch, wheat in monoculture at the same planting density as the intercropping, and wheat at the regular planting density.
In this study, the compared plots were not fertilized with mineral N, as required by organic farming regulations. The overall effects were quantified using the N balance, measuring the nutrient uptakes of the different cropping systems. The results showed no significant differences in grain yield between wheat cultivated in monoculture (2.8 t/ha) and wheat intercropped with vetch (2.6 t/ha). However, in intercropped wheat, the N content in the grain was significantly higher, at 63.7 g/kg (‰), compared to 57.8 g/kg (‰) in monoculture wheat. This trend was also observed in the straw. Overall, intercropped wheat accumulated more N compared to monoculture wheat, with a total uptake of 91.3 kg/ha of N compared to 76.1 kg/ha of N in monoculture wheat. This Δ of 15.2 kg/ha N indicates an active nitrogen symbiotic exchange dynamics between legumes and cereals. These results underscore the importance of legumes in providing agroecological services.

Keywords

Intercropping ,Durum wheat, Vetch, Nitrogen dynamics, Agroecological services

S7 - 03

Effect of direct sowing of processing tomato on biodegradable mulching film

Annamaria Di Serio[1]*, Domenico Ronga[2], Vincenzo Alfano[2], Mariangela Cucino[3], Anna Ciancolini[4], Dalila Villano[4], Michele Falce[4]

[1]Chemestry and Biology Department, University of Salerno, Via Giovanni Paolo II n. 132, 84084 Fisciano, SA, Italy
[2]Pharmacy Department, University of Salerno, Via Giovanni Paolo II n. 132, 84084 Fisciano, SA, Italy
[3]Azienda Agricola Schettini Giovanna, Via Chiusa del Bosco, Battipaglia, SA, Italy
[4]Novamont S.p.A. Via G. Fauser n. 8, 28100 NO, Italy;
*E-mail: adiserio@unisa.it

Abstract

Processing Tomato (*Solanum lycopersicum* L.) is among the world's most widespread horticultural crops. Recently Cammarano et al. (2022) reported the climate change can affect the processing tomato production sustainability due to an increase of temperature and volume of the irrigation water. Considering these issues, the aim of this work was to evaluate the direct sowing of processing tomatoes on biodegradable mulch film (BMF), as an innovative agronomic adaptative strategy. The study was conducted at Lesina in the province of Foggia (Italy). In particular, mechanical sowing (with a density of 41.666 seads/ha) and transplanting (with a density of 35.714 plants/ha) of cherry tomato, cultivar Cesarino, on BMF was evaluated on a sandy soil. During the entire crop cycle, weather conditions were monitored and agronomic (plant height, soil water content, collar diameter and aboveground and belowground biomasses, fruit water productivity and nitrogen agronomic efficiency), physiological (phenological phase (BBCH), foliar pigments such as chlorophyll, flavonols, anthocyanins, NFI index, leaf temperature,) and qualitative measurements (fruit color, pH and °Brix) were carried out through the use of traditional and digital instruments. A randomized block design was used with three replications for each thesis. All data collected were computerized, subjected to analysis of variance (ANOVA) and the averages were separated by Duncan's $p<0.05$ test. Among the most interesting results direct sowing on BMF highlighted a reduction of irrigation water consumption (-48%) and nitrogen application (-23%), while preserving yield and quality that were comparable to that one's obtained with transplanting. These results open interesting scenarios in the view of climate change issues to increase the processing tomato production sustainability.

Keywords

tomato, sustainability, climate change, irrigation, nutrition

S7 - 04

A mutiplex AS-LAMP (allele specific loop-mediated isothermal amplification) assay to detect two allelic variants endowing acetolactate synthase (ALS) resistance in four weedy amaranth species

Andrea Milani*, Noemi Di Vita, Silvia Panozzo, Laura Scarabel

Institute for Sustainable Plant Protection (IPSP), National Research Council of Italy (CNR), 35020, Legnaro (PD), Italy
*E-mail: andrea.milani@ipsp.cnr.it

Abstract

The evolution of resistant weed biotypes represents a serious threat for crop production sustainability. To maintain production and contain weeds, farmers are forced to resort to multiple herbicide applications and often to change the management strategy by using herbicides with worse ecotoxicological profiles. This can pose a risk for the environment, animal and human health.
Therefore, the on-site early detection of resistance might help stakeholders to optimize the use of agrochemicals. To comply with this need, we developed an allele-specific loop-mediated isothermal amplification (AS-LAMP) assay to rapidly detect the point mutation 574-Leuendowing resistance to ALS inhibitors in *A. retroflexus, A. hybridus* and *A. tuberculatus*. Quite recently, a new allelic variant (574-Met) and a new Amaranthus species (*A. palmeri*) have been recorded in Italy, therefore the assay had to evolve.
The LAMP primer sets were designed on an ALS multiple alignment to choose the most conserved among the four *Amaranthus* species. To allow the detection of two resistance-endowing allelic variants with a single reaction (multiplex AS-LAMP), a new strategy was set up, based on using two loop B primers specific for the two allelic variants (Leu, TTG, and Met, ATG). Being the 574-Leu mutation very common among amaranths, biotypes of all species were available and tested, and the assay correctly identified plants carrying the mutant allele. Instead, the assay to detect the allelic variant 574-Met was only tested in A. *hybridus* biotypes, as no other amaranth species hasthis allelic variant to date. Also in this case the LAMP test was successful. Considering the very clear amplifications, we are currently developing a colorimetric assay.
As far as we know, this is the first example of multiplex AS-LAMP developed in weeds and it could concretely contribute to the confinement of resistant weed populations and to the reduction of the pesticide use.

Keywords

Early detection, target-site resistance, ALS inhibitors, weedy amaranths, herbicide resistance

S7 - 05

HUMAN URINE AS A USEFUL ALTERNATIVE TO SYNTHETIC FERTILIZERS

Rosalinda Nicastro[1]§* , Christophe El-Nakhel[2]§ , Giovanna Marta Fusco[1], Danny Geelen[3], Youssef Rouphael[2], Stefania De Pascale[2], Petronia Carillo[1]

[1]Department of Environmental, Biological and Pharmaceutical Sciences and Technologies, University of Campania "Luigi Vanvitelli", Via Vivaldi 43, 81100 Caserta, Italy
[2]Department of Agricultural Sciences, University of Naples Federico II, 80055 Portici, Italy
[3]Horticell Lab, Department of Plants and Crops, Ghent University, 9000 Ghent, Belgium
§Authors who equally contributed to the work
*E-mail: rosalinda.nicastro@unicampania,it

Abstract

The agricultural sector is facing an enormous pressure due to the unprecedented demand for food deriving from the exponential growth of the global population. One potential solution is intensive farming, which however, requires high use of non-renewable potassium and phosphorus fertilizers and synthetic nitrogen fertilizers. Therefore, there is the need to embrace new, more environmentally friendly fertilization practices able to enhance nitrogen use efficiency (NUE) to sustain agricultural productivity while minimizing both costs and negative impact of N fertilizers on the environment and human health. For this reason, we studied the effects of the use of human urine derivatives (liquids and precipitates) vs commercial fertilizers on the metabolic profile and antioxidant activity of lettuce (*Lactuca sativa* L.) cv. Grand Rapids in soilless cultivation. The Hydrolized urine induced the highest concentrations of total and essential amino acids and proteins. The urine concentrated by electrodialysis (ED concentrate) caused lower accumulation of soluble sugars, starch and MDA, but higher polyphenols and antioxidant capacity (ABTS) and activity (CAT and APX).
The use of the NPK control fertilizer determined higher levels of H_2O_2 and increased the amino acids aspartate, asparagine, isoleucine and MEA.
Arginine and glutamate increased after treatment with K-struvite, the solid urine derivative that, similarly to the NPK control, improved leaf number and area, and fresh and dry weight. The same growth parameters showed the lowest values in plants fertilized with the Hydrolized urine. Our study showed encouraging results for the possible re-use of waste streams for creating a closed nutrient loop, as an easy strategy for sustainable intensification of agricultural systems in a circular economy perspective.
Nevertheless, additional investigation is still required to decrease the concentration of salts in urine derivatives, thereby mitigating their potential adverse effects on plants' growth and yield.

Keywords

Sustainable fertilization, nutrient recovery, circular economy, wastewater

S7 - 06

Short-Term effects of Conservation Agriculture: A Two-Year Trial in Tuscany, Italy

Antonio Pescatore*, Simone Orlandini, Marco Napoli

Department of Agriculture, Food, Environment and Forestry (DAGRI) – University of Florence, Piazzale delle Cascine 18 (50144), Florence (Italy)
*E-mail: antonio.pescatore@unifi.it

Abstract

The costs of conventional agriculture (CN) are driving the adoption of conservation agriculture (CA), while the latter increases also the sustainability of the cropping systems (Guidoboni et al., 2023). This study aimed to evaluate the short-term effects of transitioning from CN to CA, specifically examining the shift from conventional tillage (CT) to reduced tillage (RT) with and without cover crop (CC) management. The experiment, conducted from October 2021 to February 2024 in Tuscany, Italy, encompassed two growing seasons (GSs). Soil characteristics included clay-loam texture, alkaline pH, and low organic matter content. The climate is typical of Mediterranean region. A randomized block design with tillage as the main factor and CC nested within tillage was employed. Winter wheat and spring barley comprised the crop rotation, with tillage radish (TR) chosen as the CC compared to conventional fallow management. Results showed significant increases in soil bulk density (BD) in RT compared to CT after both GSs, adversely affecting crop yield. Winter wheat GY in RT was 21% lower than CT, and spring barley GY in RT suffered a 41% reduction. CC biomass in RT was substantially lower than CT, indicating potential limitations. However, spring barley GY after TR cultivation was higher in both RT and CT compared to fallow. The initial transition toward CA is challenging, with RT exacerbating soil physical properties immediately after TR termination. Despite yield losses, integrating TR seems to mitigate GY losses, echoing findings from previous studies (Bekewe et al., 2022; Landschoot et al., 2019). Nonetheless, limitations in CC biomass accumulation in RT compared to CT suggest the huge potential of TR to mitigate CA drawbacks. In conclusion, transitioning from CN to CA requires careful consideration, with CC integration showing promise in mitigating some issues associated with RT.

Keywords

Reduced tillage, cover crop, crop rotation, soil compaction, crop productivity

S7 - 07

MEDITERRANEAN COASTAL DUNE RESTORATION: MONITORING THE EFFECTS OF SOIL BIOENGINEERING TECHNIQUES

Miriam Chiarulli[1]*, Giovanni Francesco Ricci[1], Giovanni Romano[1], Francesco Gentile[1]

[1]Department of Soil, Plant and Food Sciences (DiSSPA) – University of Bari "A. Moro", Italy
*E-mail: miriam.chiarulli@uniba.it

Abstract

Coastal dunes are vulnerable ecosystems threatened by erosion phenomena caused by anthropogenic and natural dynamics. To counteract erosion processes, a possible low-impact environmental solution is represented by soil bioengineering works, in which the use of native plants is combined with the use of inert materials. A pilot intervention has been implemented to mitigate erosion processes in a coastal area within the municipality of Massafra, Patemisco (TA). Various technical solutions have been adopted, including the use of a biomesh, the construction of a wattle to protect the base of the dune, and the planting of native shrubby species and weeds from the area. Near the intervention area, a weather station has been installed, to simultaneously monitor the climate trend in the area. Following the intervention, vegetation monitoring were carried out both in field and through remote sensing.
The aim of the study is to investigate the evolution of vegetation trends and the consistency of several intervention approaches through monitoring activities, which initiated shortly after the implementation of the works.
The preliminary results have shown that the wattle has protected the base of the dune and has allowed sand accumulation near the structure. The biomesh, along with the other adopted technical solutions, has positively influenced the survival rate of the plants, especially of a couple of shrubby species, which have shown survival rates ranging from 53% to 80%. The herbaceous species have displayed high survival rates, regardless of the technical solution adopted (>90%). The NDVI, used to monitor the plants cover, has increased during the months of intervention. Subsequently, a slight reduction in the index was observed, due to the plants' adaptation to the new soil conditions.

Keywords

Coastal dunes, Soil erosion, Soil bioengineering, NDVI monitoring

S7 - 08 SOIL BIOENGINEERING TECHNIQUES FOR POST-FIRE EROSION CONTROL

Annunziata Fiore[1]*, Giovanni Francesco Ricci[1], Francesco Vito Ronco[2], Francesco Gentile[1]

[1]Department of Soil, Plant and Food Sciences (DiSSPA) – University of Bari "A. Moro", Italy
[2]Apulia Region Civil Protection Department, Via delle Magnolie 6/8, 70026 Modugno (Bari), Italy
*E-mail: annunziata.fiore@uniba.it

Abstract

Forest fires can increase the risk of soil erosion due to the decrease in vegetation cover or the changes in soil properties (i.e. infiltration capacity). This can lead also to economic, cultural, and ecological effects. Mediterranean areas due to multiple factors such as rainfall regime, physical-structural characteristics of the soil, land use, topography and the fire regime itself, are prone to erosive phenomena. Moreover, current climate change will accelerate soil erosion in burned areas. Soil bioengineering works are low impact mitigation measures which can be used to counteract post-fire erosion processes.
This study aims at providing insights on the realization of a Soil Bioengineering pilot work in the forested area of Gravina in Puglia (an area of 1900 hectares, in which a fire of 1170 hectares was recorded on 12/08/2017) and analysing the restoration of the field development capacity of some selected species.
The works were realized in two areas (area 1 and area 2) located along slopes with the same general conditions (slope, type of soil, fire severity) except for exposure. The intervention involved various strategies: the removal of weeds, the implementation of a wattle and a palisade and the planting of native shrubs and tree species. A monitoring plan, characterized by in field and remote activities was structured with the aim of evaluating the effects of the soil bioengineering works.
The first field inspections revealed that the survival rate in both areas was approximately 82%. After the realization of the works, an increase in the average NDVI was detected in area 1. In area 2 instead, a decrease was highlighted due to the operation of the more dense weeds removal.

Keywords

Forest fires, Soil erosion, Post-fire mitigation measures, Soil bioengineering

S7 - 09

Securing hydrocarbon contaminated soils by turfgrass-based assisted phytostabilization technique

Anna Verde*, Donato Visconti, Nunzio Fiorentino, Massimo Fagnano

Department of Agricultural Sciences, University of Naples Federico II, Portici (NA)
* E-mail: anna.verde2@unina.it

Abstract

Soil contamination represents a major threat to human health and natural ecosystems and can be managed using both chemical and biological methods. Chemical methods are often very expensive and severely limit soil ecosystem services, while phytoremediation allows to limit the dispersion of contaminants reducing the sanitary and environmental risks. In this study, the effects of compost and a microbial biostimulant (*Bacillus megaterium* EL5 and *Kosakonia pseudosacchari* TL13) were evaluated on two grass mixes (MA: *F. Arundinacea* Shreb., *P. pratensis* L., *L. perenne* L.; MB: 2 varieties of *F. Arundinacea* L.) as a safety measure to reduce the dispersion and resuspension of hydrocarbon (TH)-contaminated soil particles. A high soil coverage (80 %) was recorded three months after sowing (MAS) for MA mixture and 6 MAS with MB mixture, confirming the slow growth rate of the species included in the MB mixture. Compost amendment promoted plant growth allowing high soil coverage in both grass mixes. The application of the microbial biostimulant significantly reduced the concentration of hydrocarbons in soils. Leaves washing did not modify TH content of plant tissues, besides the same level of contamination was recorded in both contaminated and non-contaminated soils. This suggests their biogenic nature and allows to exclude both the root uptake and the deposition of contaminated soil particles on leaf blades. Results confirmed assisted phytoremediation as an economical, environmentally sustainable and efficient tool by reducing the resuspension of contaminated soil and reducing soil hydrocarbons content.

Keywords

Phytoremediatiom ; Heavy hydrocarbons ;Permanent meadows ; Biostimulants

S7 - 10

Use of proximal, remote sensing and reanalysis data to assess the water needs for an industrial tomato crop

Angeloluigi Aprile[1]*, Oscar Rosario Belfiore[1], Anna Pelosi[2], Guido D'Urso[1], Giovanni Battista Chirico[1]

[1]Department of Agricultural Sciences, University of Naples "Federico II", NA, Portici, 80055 Italy
[2]Department of Civil Engineering, University of Salerno, SA Fisciano, 84084 Italy
*E-mail: angeloluigi.aprile@unina.it

Abstract

Water is a vital component of crop production. However, a major barrier to agricultural growth, especially in arid and semi-arid areas, is the growing problem of water scarcity, which is frequently connected to climate change. Ineffective water management and competition from other productive sectors for water resources access increase the water crisis in agriculture. In this context, it is more important than ever to take use of technical advancements to maximize the efficiency of the water usage in agriculture. This study evaluates an advanced irrigation scheduling method to optimize irrigation water for open-field crops using field data, comparing to a standard approach that solely uses crop growth models. The proposed method integrates data from remote sensing technologies with crop growth models to demonstrate how irrigation planning at the farm and irrigation district levels can be supported successfully by a sequential assimilation of satellite crop imagery. Another aspect that this study aims to explore is how weather data, not obtained by final user from local weather stations, but acquired from alternative sources, impacts the results. This study presents the integration of the following components to process tomato crops in Campania region (Southern Italy):

- canopy cover data derived from multispectral images acquired by Sentinel-2 satellite constellation;

- weather data from proximal stations, reanalysis data (CAMS and ERA5LAND) and satellite imaging for climate monitoring (CMSAF);

- the agro-hydrological model *AquaCrop* simulating both soil water balance and crop growth.

This work demonstrated that integrating the crop satellite images acquired with Sentinel-2 satellite images with a crop growth model as *AquaCrop* could represent an efficient strategy to precisely assess crop water requirements, thus allowing the implementation of more sustainable agricultural practices. This study also aims to show how using alternative sources for the weather data doesn't impacts the result of simulations.

Keywords

Irrigation scheduling, Optimizing water utilization, Processing tomato crops, Remote sensing technology, Water management

S7 - 11

Water quality trend in an irrigation canal affected by wastewater discharge

Pietro Drei[1], Giuseppe Maistrello[1]*, Stevo Lavrnic[1], Francesca Gaggia[2], Elia Pagliarini[2], Diana Di Gioia[2], Attilio Toscano[1]

[1]Department of Agricultural and Food Sciences - Section of Agricultural Engineering, University of Bologna, Viale Fanin 50, 40127 Bologna, Italy
[2]Department of Agricultural and Food Sciences - Section of Agricultural Microbiology, University of Bologna, Viale Fanin 42, 40127 Bologna, Italy
*E-mail: giuseppe.maistrello2@unibo.it

Abstract

Discharging wastewater into irrigation canals is a common practice that actually represents indirect wastewater reuse in agriculture. This can help to address the growing water scarcity problem caused by climate change in the Mediterranean basin. However, mixing surface water with wastewater within irrigation canals can lead to changes in water quality therefore potentially affecting its suitability for agricultural use. Therefore, ensuring safe irrigation practices by assessing water quality trends during the irrigation season remains challenging.

This study aimed to analyze the water quality trends in irrigation canals under irrigation scenarios tied to crop water needs, potentially affected by a wastewater treatment plant's discharge point. We conducted a sampling campaign to monitor some physical, chemical, and microbiological water parameters along an irrigation canal, focusing on the irrigation water reuse parameters outlined in the Regulation EU 2020/741. This study focused on the reach of a main irrigation canal (3500 m), as well as secondary canal (860 m), which carries only treated wastewater from the WWTP discharge point to the main canal. Water samples were collected at nine different points, before and after the junction of the canals, across three distinct periods representing different phases of the irrigation season. This approach allowed us to characterize results concerning the system's real environmental and hydraulic variability. The results of the sampling campaign 2023 have shown an increasing concentration of TN, TP, NO_3-N, and *E. Coli* following the junction, whereas no impact was observed for TSS, COD, *Total Coliform*, and *Streptococcus*. Overall, the irrigation scenarios have been shown to play a significant role in influencing trend concentrations. The sampling campaign will also take place during the 2024 irrigation season. Future results can lead to a tailored methodology for monitoring and characterizing water quality during irrigation season for indirect wastewater reuse.

Keywords

Wastewater Reuse, Indirect Reuse, Water Quality, Irrigation Canal

S7 - 12

Water Footprint Assessment of agrifood products: the experience of wine making at Banfi within the Agritech PNRR Project

Cosimo Montefrancesco[1], Valentina Niccolucci[1]*, Marlyse Meffo Kemda[1], Nadia Marchettini[1]

[1]Ecodynamics Group, Univ. of Siena, Piazzetta E. Tiezzi 1, 53100 Siena (IT)
*E-mail: valentina.niccolucci@unisi.it

Abstract

The main goal of the National Center for Agricultural Studies (Agritech) is to trace origin and measure sustainability, impacts and efficiency to enhance the value and protect the typical traits in agri-food chains. Agriculture is often associated with relevant environmental impacts, including the emission of greenhouse gases, land use change and overexploitation of freshwater resources. For example, the agriculture sector alone accounts for more than 80% of the global water use, mainly for irrigation. This study aims to evaluate the potential impact of the use of water resources associated with the life cycle of wine production, from the agricultural phase to bottling. The Water Footprint (hereafter WF) measures the volume of water both directly and indirectly used for the production of a good or a service and allows to relate water use with water stress or scarcity.
Winemaking is especially relevant, representing an important source of revenue and a flagship product of Italy. The assessment was carried out using Life Cycle approach along the whole supply chain of a wine product. This study utilized primary data from Azienda Banfi, Montalcino (SI), an Italian large-scale wine making operation with an annual production exceeding ten million wine bottles. WF assessment shows that to produce 1 bottle of 0.75 L red wine are necessary around 80 L of water resources mainly due to winery (60%) and agricultural (37%) activities. The comparison between two distinct wine operations inside the farm shows that the WF can be reduced from 80L to 60 L of water, with a net saving of around 20 L per bottle, when proper water management practices are operated.

Acknowledgement

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Keywords

wine, water footprint, environmental assessment, life cycle analysis, sustainability, Agritech

S7 - 13

Water storage capacity temporal evolution in agricultural land: A study of flood-prone areas in the Bisenzio basin (Tuscany)

Sara Pini[1]*, Andrea Signorile[1], Federico Preti[1]

1Department of DAGRI, University of Florence
*E-mail: sara.pini@unifi.it

Abstract

In November 2023, heavy rainfall caused dramatic flooding in the Florence-Prato-Pistoia plain (Tuscany). The hypothesis is that the expansion of areas hit by flooding and resulting damages are caused by modifications in the drainage network due to agricultural-technique changes, land-use alterations, and soil consumption.
Following the work of Preti (2002) and Sofia et al. (2014), this study quantified the changes in the water storage capacity of farmland. Specifically, the research compared the current level of water retention capability of "minor" hydraulic infrastructure with the historical situation. The study areas were located in the Bisenzio basin, upstream of the flooded regions. By analysing available images from 1954 and 2023, it was possible to identify differences in the drainage system. The quantification of the peak discharge was obtained using precipitation records to convert rainfall into runoff.
The photointerpretation of the images shows a decrease in the density of the drainage network, resulting in a loss of water storage capacity. This means that for the same amount of rainfall, the volume of flood water may be higher, with a reduction in return times, and consequently an increase in the associated flood hazard. Considering the land use changes and climate trends, this study suggests that attention should be paid to increasing the functionality and territorial diffusion of the drainage network and compensatory intervention (i.g. equivalent flood retention storage widespread in the watershed), as a measure to mitigate flood risk.

Keywords

Artificial drainage network, Agrarian landscape, Land use change, Urbanization, Flood risk mitigation

S7 - 14

Evaluation of the effect of winter cover crops in paddy fields on SOM and N input and methane emissions

Crosetto L.[1], Moretti B.[1], Seren Rosso A.[1], Beltramo A.[1], Romani M.[2], Cadei E.[2], Celi L.[1], Vidotto F.[1], Said-Pullicino D.[1]

[1]Dept. of Agricultural, Forest and Food Sciences, University of Turin, Grugliasco, Italy
[2]Rice Research Centre, Ente Nazionale Risi, Castello d'Agogna, Italy
*E-mail:lucia.crosetto@unito.it

Abstract

The cultivation of cover crops during winter period in rice fields is becoming increasingly widespread in Italian rice cultivation. This technique increases soil organic matter and consequently improves fertility and is particularly interesting for Italian rice-growing areas where the availability of amendments is limited. The choice of a nitrogen-fixing leguminous species as cover crop also increases the availability of nitrogen for plants, thus reducing the use of mineral fertilizers. In rice-field soils where conditions are reducing, however, increasing carbon inputs can lead to higher CH4 emissions and this can become an environmental concern. It is, therefore, necessary to identify new agronomic management practices that allow cover crops to be cultivated while maximising nitrogen inputs to the soil without increasing CH4 emissions.
To this end, the winter cultivation of Vicia villosa in paddy fields was evaluated with a water management strategy involving dry seeding of rice followed by continuous field submergence. Two treatments were defined with the same water management, one with and one without the cultivation and subsequent burial of Vicia villosa. During 2022/2023 and 2023/2024 cropping seasons, soil characteristics, pore circulating solution, and gas emissions are monitored in two farms in Lomellina (PV) to assess carbon and nitrogen dynamics in rice fields.
Preliminary results indicate that the amount of nitrogen supplied to the soil from vetch cover crop is approximately 150 kg N/ha, a dose comparable to mineral fertilization. As far as CH4 emissions are concerned, on the other hand, although vetch cultivation contributes 2 t/ha of C to the soil, there are no significant differences between the treatment with green manure and the one without. This result could indicate that the choice of sowing rice underground would lead to an aerobic degradation of the crop residues thus mitigating CH4 emissions.

Keywords

cover crop, rice, Vicia villosa, CH4 emission, nitrogen fixation

S7 - 15

UNDERLYING REACTIONS TO REDUCE HEXAVALENT CHROMIUM USING *RHODOCOCCUS QINGSHENGII* BACTERIAL STRAIN

Mondal S.*, Melzi A., Colombo M., Zecchin S., Cavalca L.

Department of Food, Environmental and Nutritional Sciences, University of Milan, Via Celoria 2, Milan-20133, Italy)
*E-mail: Subhoshmita.mondal@unimi.it

Abstract

It is crucial to understand the overall metabolic reactions of bacteria in detoxifying heavy metals to elucidate resistance mechanisms and enhance the efficiency of bioremediation in contaminated wastewater. Extracellular polymeric substances (EPS) possess affinity for binding metals, which consequently affects the bioavailability of heavy metals. The following functional enzymes were studied to lower chromium contamination: chromate reductase, NADP-dependent oxidoreductase, gluathione-S-transferase. The participating enzymes may potentially facilitate the reduction process of Cr(VI) to Cr(III) by transferring electrons. The aim of this study was to clarify these mechanisms in the Cr(VI)-resistant strain SC26 of *Rhodococcus qingshengii*. As per Jacob-Monod's uninhibited model, the specific growth rates (μ, CFU ml^{-1} h^{-1}) were 0.214, 0.177, and 0.155 at Cr(VI) concentrations of 25, 50, and 100 mg L^{-1}, respectively with K_s (substrate saturation constant) 19.90 mg L^{-1} of Cr(VI). Conversely, as per Haldane substrate inhibited model, K_i (substrate inhibition constant) was 191.52 mg/L of Cr(VI). When the strain SC26 was grown in galvanic wastewater at concentrations of 50 and 100 mg L^{-1} Cr(VI), the ability to reduce Cr(VI) to Cr(III) was maintained by 98% and 82% respectively, after 169 h incubation.

Enzymatic activity of chromate reductase (U mg^{-1} of protein) was 288.08 in the presence of 50 mg L^{-1} Cr(VI) and 4.50 in the absence of metal. A NADP-dependent oxidoreductase gene expression (Livak method) was observed 7 times higher in the presence of 50 mg L^{-1} Cr(VI) than in its absence.The experiment for glutathione-S-transferase activity is presently performed.

Thus, over-expression of both chromate reductase and NADP-dependent oxidoreductase seem to be involved in reducing chromium toxicity in *Rhodococcus qingshengii* strain SC26. The primary challenge lies in implementing the use of this strain in large-scale wastewater treatment.

Acknowledgement

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Keywords

Rhodococcus, hexavalent chromium, detoxification, wastewater

S7 - 16

Preliminary results on greenhouse gases and ammonia emissions from dairy cow slurry storage

Elena Scaglia[1]*, Valentina Caprarulo[1], Valeria Sergi[1], Laura Giagnoni[1], Anna Simonetto[1], Gianni Gilioni[1]

[1]Department Civil, Environmental, Architectural Engineering and Mathematics—DICATAM, University of Brescia, 25123 Brescia, Italy.
*E-mail: elena.scaglia@unibs.it

Abstract

Livestock systems produce slurry (feces+urine) usually stored in tanks for a minimum of 120-days before land application. The slurry storage accounted for 24% of on-farm emissions, in which ammonia (NH3), and greenhouse gases (GHGs) including carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4) are the most important. This study aimed at monitor the ammonia and GHGs emissions during slurry storage in ten dairy farms located in Lombardy (Italy).
Farms were monitored four times (September 2022, December 2022, March 2023, June 2023). Slurry samples were analyzed for dry matter (DM;%), nitrogen (N;%f.w.), pH and temperature. GHGs and ammonia emission fluxes were monitored by dynamic-chamber through FTIR portable gas analyser (GasmetGT5000Terra). Data were analyzed by PROC GLIMMIX and PROC CORR (SAS9.4), the model accounted for effects of farm, sampling time, and 2-way interaction. DM, N, temperature, and pH mean values were 7.50(±4.21SD), 0.21(±0.09SD), 16.46(±6.85SD), and, 7.33(±0.46SD). CO_2 was higher in September-2022, June-2023 (P<0.01; 7.59a,7.28a,3.90b,3.88b), farm (P<0.01; 5.89±4.27SD) and time*farm (P<0.01) interactions resulted statistically significant. N_2O was higher in September-2022, June-2023 (P<0.01; 0.00022a, 0.00018a, 0.0001b, 0.0001b), farm (P<0.01; 0.00012±0.0003SD) and time*farm (P<0.01) interactions resulted statistically significant.
NH_3 changed among sampling time (P<0.01), with farm (P<0.01; 0.20±0.17SD) and time*farm (P<0.01) interactions statistically significant.
CH_4 was higher in September-2022, June-2023 (P<0.01; 0.33a, 0.32a, 0.08b, 0.10b), with farm (P<0.01; 0.21±0.30SD) and time*farm (P<0.01) interaction statistically significant.
There was a positive Spearman correlation (P=0.01) of temperature with CO_2, N_2O, NH_3 (r=0.76,0.66,0.67), and of NH_3 with DM, N (r=0.79,0.82).
The preliminary results showed important differences in emission among sampling time and farms. Slurry temperature, pH, DM, and N influence slurry emissions. The FTIR-analysis is a valuable method for monitoring the emissions. For NH_3, detection limits of the method and the volatilization should be considered since the emission depends on the equilibrium between liquid and gas phases of NH_3.

Keywords

Emission, Greenhouse Gases, Ammonia, Dairy cow, Slurry Storage

S8 - 01

Development of an integrated system that combines a cropping system model and a tool for the optimisation of manure redistribution

Gabbrielli Mara[1], Allegrezza Marina[1]* , Botta Marco[1], Hutchings Nicholas John[2], Pullens Johannes Wilhelmus Maria[2], Acutis Marco[1], Perego Alessia[1]

[1]Department of Agricultural and Environmental Sciences, University of Milan, Via Celoria 2, 20133 Milan, Italy
[2]Department of Agroecology, University Aarhus, Blichers Allé 20, Postboks 50 DK-8830 Tjele, Aarhus, Denmark.
*E-mail: marina.allegrezza@unimi.it

Abstract

The increasing intensification of crop and livestock production, and the consequent farming specialisation and high livestock density, raises growing difficulties in the achievement of a balance between economical profitability and environmental sustainability.
An integrated system was developed to support stakeholders in the identification of viable solutions to maintain crop productivity and reduce environmental impact at local or regional scale.
A regional database, containing farms data about livestock load, manure-N, and crop nitrogen requirements, was employed to perform long term simulations of the prevalent cropping systems with the ARMOSA process-based model that simulates crop growth, carbon and nitrogen dynamics under different pedoclimatic conditions and crop management practices.
A software tool was developed to assess the opportunity of moving manure from farms with an excess manure (surplus-farms) to farms where manure is lacking according to the crop N requirement that is fulfilled mainly with mineral fertilizers (deficit-farms). The tool ran at a regional scale and it was applied in two case studies, i.e., Lombardy (Northern Italy) and Denmark. The possibility of manure redistribution was estimated with the integration of optimization algorithms that consider the distance between surplus-farms and deficit-farms, the costs and CO_2 emissions associated with manure transport and the mineral fertilizers purchased in the deficit-farms. The outcome of the tool is the list of deficit-farms that take advantages, in terms of costs and CO_2 emissions, of receiving manure and reducing the purchase and application of mineral fertilizer. In these farms, ARMOSA is applied to evaluate the crop productivity, soil organic carbon stock, crop N recovery, and N losses (NO_3 leaching, N_2O and NH_4 emissions) before and after receiving manure.
This system will enable an advanced assessment, at regional scale across Europe, of how relocating manure affects nitrogen use efficiency and soil carbon stock evolution in diverse pedoclimatic conditions and cropping systems.

Keywords

soil C and N dynamics, GHG emission, manure fluxes optimization, cropping system model

S8 - 02

How a multidisciplinary Living Lab approach can address different stakeholder queries about environmental impacts, production efficiency and milk quality in dairy farm

Francesco Ferrero*, Gabriele Rolando, Ernesto Tabacco, Giorgio Borreani

Department of Agricultural, Forest and Food Sciences (DISAFA), University of Torino, Largo Braccini 2, 10095 Grugliasco, Italy
*E-mail: francesco.ferrero@unito.it

Abstract

Livestock production is a complex system in which several actors, such as farmers, processing industries, retailers, and consumers interact with different questions on environment friendly processes, the healthy rearing of animals, and affordable and quality dairy products. A sustainable intensification process can be obtained through a holistic approach and a common management plan drawn up by agronomists, economists, nutritionists, and farmers, regardless of the specific characteristics and management programs of the involved farms. This study aimed to improve farm efficiency, environmental sustainability, and milk quality by achieving a better overall and synergistic efficiency through an innovative and multidisciplinary approach starting from the cropping system management phase to feeding strategies. A multi-year study was conducted to analyze the shift in cropping system management on an organic and on a conventional dairy farm, considered as a “lighthouses”, and which were part of a Living Lab. The main actions involved changes in the crop valorization to formulate animal diets, in the harvest schedule of the crops and in the process of forage conservation. The results showed that it is possible to intensify milk production and at the same time mitigate the impacts (in terms of carbon footprint, load indexes, nitrogen surplus, land occupation) of dairy productions both under conventional and organic management.
Interestingly, conventional farm used half the animals and half the surface area as the organic farm to reach the same carbon footprint and milk production levels. On the other hand, organic farm obtained a better milk quality and determined a better performance, in terms of inputs use efficiency.

Keywords

Carbon footprint, Living Lab, Milk quality, Nitrogen balance, Land Occupation

S8 - 03

Assessing management practices effect on greenhouse gasses emissions from agricultural soils: a regional scale modelling study

Marco Perfetto[1]*, Mara Gabbrielli[1], Marina Allegrezza[1], Alessia Perego[1], Giorgio Ragaglini[1]

[1]Department of Agricultural and Environmental Sciences Università degli Studi di Milano, Milano, IT
*E-mail: marco.perfetto@studenti.unimi.it

Abstract

Cropland contributes significantly to the emission of two major biogenic greenhouse gasses (GHGs): carbon dioxide (CO_2) and nitrous oxide (N_2O).
Given that the majority of anthropogenic N_2O emissions are associated with agricultural activities, their estimate plays a key role in the evaluation of the mitigation potential of efficient soil and crop management practices.
ARMOSA model was calibrated using CO_2 and N_2O emissions measured in continuous (Ravenna, within AGRESTIC Life+ Project) in a conventional (cCS) and in an efficient (eCS) cropping system (CS). The two compared CS implemented the following crop rotation: maize, durum wheat, processing tomato, durum wheat (cCS); pea, durum wheat + alfalfa, processing tomato, durum wheat + alfalfa (eCS). The objectives of this study were: assessing CS effects on GHGs emissions and exploring the model sensitivity to pedoclimatic variability. A regional (Emilia Romagna) up-scaling was carried out for selected soil textures (7 classes) and Soil Organic Carbon contents (3 levels). The upscaling was performed, over 43 years, for each Agri4Cast meteorological cells of the region, according to a factorial experiment with SOC levels combined with the soil texture classes. The results showed a reduced effect of climate on the emission levels, while a clear effect of soil characteristic was highlighted. The simulations showed lower N_2O emissions in the eCS, with a decreasing trend at decreasing levels of clay and silt content. Moreover, our simulations confirmed a higher relevance of denitrification processes in N_2O formation than nitrification. From the application of a random forest algorithm, it emerged that N2O deriving from denitrification was mainly influenced by soil texture, while the most relevant effect on N_2O deriving from nitrification was induced by soil organic carbon and its mineralization.

Keywords

soil GHG emission, cropping system modelling, soil organic carbon, carbon dioxide, nitrous oxide

S8 - 04

Regulated deficit irrigation tolerance in three *Olea europaea* L. cultivars and study of its impact on olives phenolic profile

Francesca Alderotti[1,2] *, Cecilia Brunetti[2,1], Ermes Lo Piccolo[1], Benedetta Agnoloni[1], Cassandra Detti[1], Diana Vanacore[2], Lorenzo Cecchi[1], Tommaso Ugolini[1], Francesco Ferrini[1,2], Antonella Gori[1,2]

[1]University of Florence, Department of Agriculture, Food, Environment and Forestry (DAGRI), Viale delle idee 30, 50019 Sesto Fiorentino (Florence, Italy)
[2]National Research Council of Italy (CNR), Institute for Sustainable Plant Protection, Via Madonna del Piano 10, 50019 Sesto Fiorentino (Florence, Italy)
*E-mail: francesca.alderotti@unifi.it

Abstract

Regulated deficit irrigation (RDI) is employed in intensive olive orchards to conserve water by meeting only a portion of the full crop evapotranspiration (ET) demand during specific periods, while minimizing the impact on yields. In this pot experiment conducted at the experimental field of DAGRI (Sesto Fiorentino) within the AgriTech-PNRR, we assessed the tolerance of three *Olea europaea* L. cultivars ('Arbequina' (A), 'Leccio del Corno' (LC), and 'Maurino' (M)) to a regime of RDI (50% of ET) compared to fully irrigated plants (100% ET). Plants were sampled after twenty (T1) and forty (T2) days from the start of the treatment, performing gas exchanges, water relations, chlorophyll fluorescence, chlorophyll index (Chli), and plant hydraulic measurements. Additionally, we examined the impact of RDI on the phenolic profile of olives.
Each cultivar demonstrated distinct levels of tolerance to RDI.
Arbequina plants exhibited higher vulnerability to xylem embolism compared to the other cultivars due to their higher minimum epidermal conductance. Despite the less conservative water usage, osmotic adjustments contributed to maintaining proper leaf water status in A-RDI plants.
LC showed the lowest vulnerability to xylem embolism. At T1, stomatal and biochemical limitations impaired photosynthesis in LC-RDI plants, resulting in a reduction in Chli to prevent photo-oxidative damage at T2. M-RDI exhibited the most significant deterioration in gas exchanges and water relations performances, indicating the lowest tolerance to RDI. Interestingly, RDI had varying effects on the olive phenolic profile according to the cultivar. Overall, RDI induced an increase in flavonols and Oleuropein content in A-RDI and LC-RDI, and an increase in demethyloleuropein in M-RDI.
This study is significant for promoting more sustainable water management in intensive Mediterranean olive cultivation based on the cultivar's RDI tolerance. Furthermore, it provides new insights into the quantitative and qualitative alterations in the olive phenolic profile under RDI.

Keywords

Olea europaea L., Regulated deficit irrigation, intensive olive orchards, xylem embolism, olive phenolic profile

S8 - 05

Effects of proline-rich specific yeast derivatives foliar applications on the physiology of grapevines subjected to water deficit

Harsh Tiwari[1]*, Clara Ripa[1], Pier Giorgio Bonicelli[1], Tommaso Frioni[1]

[1]Department of Sustainable Crops Production, Università Cattolica del Sacro Cuore, Piacenza.
*E-mail: harsh.tiwari01@icatt.it

Abstract

Biostimulants produced from yeast derivates have gained traction in recent years thanks to their potential in alleviating plant abiotic stress conditions and improving yield and quality of final products. The objective of this work was to evaluate the effects of a proline-rich specific yeast derivates (SYD) on physiological performances of potted grapevines maintained at different irrigation levels (WW=100%ET, WS1=80%ET, WS2=40%ET).
WS1-SYD vines exhibited leaf water potential (Ψ) levels comparable to those of WW vines, while WS1-Control had significantly lower Ψ than WW vines. Interestingly, WS2-SYD vines had a Ψ comparable to WS1-C. Leaf photosynthesis and stomatal conductance tracked Ψ. WS1-SYD and WS2-SYD vines showed higher pre-stress leaf proline concentration and lower leaf H_2O_2 concentration under water limiting conditions. While a significant decrease of leaf fv/fm was observed in Control vines, no loss of photochemical efficiency was observed in WS1-SYD and WS2-SYD vines. At harvest, WS2-SYD had lower yield than WW-C and WS1-SYD, but not significantly lower than WS1-Control.
Proline based specific yeast derivatives can significantly improve vine water status by interacting with endogenous proline and preventing reactive oxygen species biosynthesis and thus leaf yellowing, so preserving yield levels under stress conditions.

Keywords

Viticulture, biostimulants, proline, hydrogen peroxide, water use efficiency

S8 - 06 Superabsorbent Hydrogels: a new tool for vineyard water management?

Tommaso Frioni[1]*, Clara Ripa[1], Pier Giorgio Bonicelli[1], Harsh Tiwari[1]

[1]Department of Sustainable Crops Production, Università Cattolica del Sacro Cuore, Piacenza.
*E-mail: tommaso.frioni@unicatt.it

Abstract

The term 'hydrogel' identifies three-dimensional cross-linked chains of hydrophilic functional groups, or networks of colloidal particles that can absorb and retain a significant amount of water with respect to their own weight. In this work, three hydrogels - H1 and H2 based on potassium polyacrylate, respectively, and H3 of organic base - were compared in: i) pot experiments with VH1 (30g of H1 applied per substrate), VH3 (100g/pot of H3), VC (control without hydrogel), subjecting them to stress up to a stem water potential (ψ) of -1.4 MPa followed by rehydration, and ii) field trials where VH2 (20g/vine of H2 at planting) was compared with VC.
H2 showed a maximum water absorption (369.6gH_2O/g) higher than H1 (83.6gH_2O/g) and H3 (9.2gH_2O/g). VH1 maintained higher net photosynthesis (A) compared to VC for PAR>400, while VH3 showed higher A compared to VC for PAR>800 (+28% and +18% respectively). Under stress, VH1 exhibited higher soil ψ compared to VC (up to +0.25MPa) and both VH1 and VH3 maintained A > VC (+2.2 and +1.1µmol $m^{-2}s^{-1}$ respectively, on the last day of stress). Upon re-watering, VH1 showed higher A and fv/fm compared to VC (+4.3µmol m^{-2} s^{-1} and +0.16). VH3 and VH1 had, respectively, higher leaf concentrations of N (+28% compared to VC) and K (+38% of VC). In field, VH2 exhibited higher leaf ψ and A compared to VC (+0.1MPa and +5%). By the end of the season, VH2 had longer shoots (+15%) and a larger diameter of the third internode (+7%).
Hydrogels enable water conservation near the root systems and increase soil ψ, making them a highly interesting resource for vineyard growth stages.

Keywords

Viticulture, drought, water potential, water relations, water use efficiency

S8 - 07

Automatic mapping and characterization of forest disturbances in Italy using remote sensing Sentinel-2 data

Livia Passarino[1]*, Saverio Francini[1], Davide Travaglini[1], Gherardo Chirici[1]

[1]Department of Agriculture, Food, Environment and Forestry, Università degli Studi di Firenze, Via San Bonaventura, 13, 50145 Firenze, Italy
* E-mail: livia.passarino@unifi.it

Abstract

Forests play a crucial role in the Earth's ecosystems, by providing a wide range of goods and services. However, global warming is causing an increase in disturbances and forest vulnerability. For these reasons, monitoring and mapping forest disturbances is essential. Remote sensing (RS) data, along with new high-performance computing platforms and sophisticated algorithms, can be utilized to automatically predict forest disturbances.
In this study, we created a reference database of 724 forest disturbances, and we utilized RS Sentinel-2 data, the Google Earth Engine implementation of the 3I3D algorithm, and the Random Forest classifier to automatically predict and characterize Italian forest disturbances in three identified classes: clearcuts, forest fires, and wind damages.
We produced a spatially explicit dataset (20 m of resolution) of Italian forest disturbances from 2017 to 2022, in which we identified 120178 disturbances and predicted approximately 160 thousand hectares (ha) of disturbances. Forest disturbances varied from 17337 ha in 2020 to 45675 ha in 2017. Clearcutting was responsible for the majority of disturbances (103948 ha for 95008 disturbances) followed by fires which caused 42207 ha and 17913 disturbances and wind with 13090 ha and 7257 disturbances. The Tuscany region had the highest value of clearcuts (27766 ha). Wildfires were concentrated in the southern part of Italy, specifically in Calabria, Sicily, and Sardinia, while wind damages were primarily concentrated in the northwest of the Italian peninsula (Trentino Alto Adige and Veneto) and mostly related to the Vaia storm that occurred in 2018. The performance of the classification model revealed an overall accuracy of 91% and a Cohen's kappa coefficient of 86%.
These results provide a useful tool for monitoring forest disturbances over time and space and can serve as a basis for producing updated official statistics, currently not available in Italy.

Keywords

forest disturbance, fire, wind, clearcut, Sentinel-2

S8 - 08

CHITOSAN NANOPARTICLES LOADED WITH ORANGE ESSENTIAL OIL AGAINST *APHIS GOSSYPII* : CHARACTERIZATION, INSECTICIDAL ACTIVITY AND SELECTIVITY

Raffaele Cavaliere[1,2]*, Antonino Modafferi[3], Ilaria Latella[3], Francesca Laudani[3], Vincenzo Palmeri[3], Orlando Campolo[3] and Giulia Giunti[1]

[1]University of Salerno (Department of Pharmacy)
[2]University of Basilicata (Department of Agricultural, Forest and Enviromental Science)
[3]Mediterranean University of Reggio Calabria (Department of Agriculture)
*E-mail : racavaliere@unisa.it

Abstract

Pest control is experiencing many problems related to climate change, resistance to conventional pesticides and pesticide safety. In this scenario, the development of new environmentally friendly control tools is needed. In this study, chitosan nanoparticles loaded with orange essential oil were developed, chemically and physically characterized and their insecticidal activity was evaluated against *Aphis gossypii* Glover (Hemiptera: Aphididae).
The nanoparticles' size was 250.5 nm on average and a PDI of 0.197, indicating a good homogeneity of the formulation. The physical characteristics were optimal, and the formulation was used to assess toxicity towards the target aphid, using topical (spray) and residual (leaf dip) bioassays. To assess the effects of the nanoparticles against non-target organisms, a phytotoxicity test on zucchini plants and a topical toxicity trial against the coccinellid predator *Propylea quatuordecempunctata* L. were carried out.
Toxicity trials against A. gossypii showed the highest mortality *via* direct administration of the formulation in topical contact test, causing over 90% mortality at the highest tested concentration (formulation containing 0.4% of chitosan nanoparticles). The acute toxicity of the nano-formulation (0.4, 0.2 and 0.1%) was statistically comparable with the positive control (lambda cyhalothrin 0.3%). Furthermore, residual bioassays highlighted significant toxicity (around 80% mortality) when the highest concentrated formulation (4% of chitosan nanoparticles) was applied. In contrast, no effects were recorded toward non-target organisms, both zucchini plants and *P. quatuordecempunctata.*
The results of the present study are promising, both for the physio-chemical characteristics of the developed nanoparticles, as well as for the phytotoxicity, selectivity and insecticidal activity against the target species.
Our results suggest that this nano-formulation can be a potential alternative for aphid control in Integrated Pest Management (IPM) programs.

Keywords

aphid; biopesticide; toxicity; pest control; botanicals

S8 - 09

Mitigating dismantling costs by repurposing recovered asphalt in desealed soil

G.Fantoni[1], B.Rompato[1], G.Mastrolonardo[1], R. Paradelo Núñez[2], G. Certini[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence (UniFi), Piazzale delle Cascine, 18, 50144 , Firenze, Italy
[2]Departamento de Edafoloxía e Química Agrícola, Universidade de Santiago de Compostela, Avaliación da Calidade do Solo
*E-mail: gregorio.fantoni@unifi.it

Abstract

The practice of permanently covering soil with impervious material such asphalt and concrete (soil sealing) increased exponentially since the industrial revolution, crippling soil ecosystem services. As a result, soil sealing represents a compelling danger on sustainability, at both local and global scale. At the dawn of the new millennium, efforts to convert this trend are due and are actually being carried out, although on a still too limited surface. Desealing (or depaving) has shown enormous potential for recovering new surfaces to plant growth and other soil ecosystem services. However, soil desealing is not as simple as it may appear. In addition to technical and legal issues, high practice costs and material disposal refrain the attempters, who usually are public administrations. To individuate a cheaper alternative to landfill disposal and favouring the reuse of anthropic wastes, we studied the effects of incorporating the removed asphalt, once suitably crumbled, into the desealed soil to be used as a green area.The experiment is underway, in situ, in a former parking lot in Prato, Italy, which has been dismantled and transformed into a public park. In a fenced part of the meadow, the performances of four different blends of urban soil, compost (5% everywhere) and asphalt in different proportions (up to 50%) to the soil, are going to be monitored for at least one year in terms of physical, chemical and biochemical properties evolution, as well as supported microbial, animal and plant biomass, activity and diversity. Here, we present some preliminary results.

Keywords

Desealing; Depeving; Smart city; Soil Ecosystem Services; Soil Sealing

S8 - 10

Land use legacy drives post-abandonment forest structure and understorey composition: a multidisciplinary approach to manage novel forest landscapes

Giacomo Marengo*[1], Nicolò Anselmetto[1], Davide Barberis[1], Michele Lonati[1], Giampiero Lombardi[1], Matte Garbarino[1]

[1]Department of Agricultural, Forest and Food Sciences (DISAFA), University of Torino, Largo Paolo Braccini 2, 10095 Grugliasco, TO, Italy
*E-mail: giacomo.marengo@unito.it

Abstract

In European mountain regions, centuries of interaction between natural and anthropic dynamics have shaped semi-natural agro-silvo-pastoral ecosystems. Traditional practices, such as silviculture and grazing, favoured the establishment of complex landscape mosaics characterised by an interspersion of forests, wood-pastures, grasslands, and cultivated land.
However, post-World War II socio-economic changes have triggered widespread land abandonment, resulting in a transformation of grassland-dominated areasinto forests. This study aimed to spatially discriminate the management strategies suitable for post-abandonment forests using a multiple scales (from landscape to survey scale) and disciplines (plant, forest and historical landscape ecology) assessment of the land use legacy effects on forest structure and understorey. We identified post-abandonment forests within a western Alps catchment through a land use/land cover change detection from 1954 to 2017. Field surveys were conducted across three different land use legacies (transitions from grasslands, wood-pastures, and sparse forests to dense forests) to collect data on forest structure and understorey composition. Using Redundancy Analysis (RDA), we explored the land use legacy effects on post-abandonment forests, with forest structure and understory descriptors as response variables and environmental factors as predictors. Over the study period, 29 % of the landscape experienced land use changes, with forest expanding at the expense of open areas. RDA analysis revealed ecological and environmental differences among post-abandonment forests, notably depending on the historical presence of biological legacies: forests derived from former wooded areas exhibit conditions far from natural trajectories, while those derived from former grasslands are still related with historical land use conditions. Starting from these findings, we advocate an integrated management approach that considers historical land use legacies and their ecological implications on novel landscapes. This approach aims to optimise the planning of post-abandonment forests and identify areas where pastoral activity restoration is ecologically most suitable.

Keywords

land use change, land use legacies, land abandonment, natural reforestation, landscape planning

S8 - 11

Caviar and sturgeon meat: from luxury to sustainable food production

Riccardo Napolitano[1,2]*, Arianna Martini[1], Marco Martinoli[1], Domitilla Pulcini[1], Nicolò Tonachella[1], Richard Newton[2], Fabrizio Capoccioni[1]

[1] Consiglio per la Ricerca in Agricoltura e l'Analisi dell'Economia Agraria (CREA) Centro di ricerca "Zootecnia e Acquacoltura" Via Salaria 31, 00015 - Monterotondo (Roma) - ITALY
[2] Institute of Aquaculture, University of Stirling, Stirling FK9 4LA, Scotland, United Kingdom
*E-mail: riccardo.napolitano@stir.ac.uk

Abstract

Caviar (sturgeon roe) is a luxury seafood product, currently mainly coming from aquaculture. For its production, female sturgeons are farmed for several years (8-18 years, depending on the species); males are bred until their sex is determined (3-8 years), which results in costs for feed and other inputs that the farmer must bear to produce sturgeon meat, sold at a low price to even partially cover the expenses.The caviar supply chain therefore provides two co-products: caviar and meat from slaughtered specimens. Despite the growing interest in the sustainability of agri-food supply chains, the environmental impact of caviar production has never been assessed. This work aims to evaluate the environmental performance of an Italian caviar production chain obtained from four different sturgeon species. A Life Cycle Assessment (LCA) approach, widely used to measure the environmental impacts of processes and products, including animal production, was applied. Two scenarios were simulated to investigate possible impact mitigation strategies: (1) increasing the supply of renewable energy and (2) reducing the use of feed. LCA results for caviar production showed high variability depending on the species, for example, the carbon footprint ranged from 52 to 81 kg CO_2 eq./kg caviar. Feed and energy were the inputs with the largest contribution, accounting for up to 94% and 47% of the total impacts respectively. Energy scenario analysis highlighted an average impact reduction of 2.2%. A feed reduction during the growth phase resulted in a 17% reduction in impact. This study provides the first assessment of the environmental performance of the caviar production chain and describes potential impact mitigation strategies. Feed reduction, for example, could be achieved through early sex determination using genetic techniques, to select only females and thus significantly reduce the amount of feed required for caviar production.

Keywords

LCA; environmental performances; aquaculture; co-products

SHORT COMMUNICATIONS

S1 - SC01

EXPLORING ECONOMIC VIABILITY : INSECT MEAL INTEGRATION IN PIG, POULTRY AND FISH SUPPLY CHAINS

Lorenzo Baima*, Filippo Brun, Simone Blanc, Valentina Maria Merlino

Department of Agriculture, Forest and Food Sciences, University of Turin,
Largo Paolo Braccini 2, 10095 Grugliasco (TO), Italy
*E-mail: lorenzo.baima@unito.it

Abstract

Protein plays a crucial role in the formulation of feeds for pig, poultry and fish farms, with soybean being the predominant component in conventional feed formulations. However, in recent years, soybean has faced criticism due to its environmental impact from farming practices. Additionally, according to the FAO, soybean (with palm oil) is implicated in causing at least 50% of global deforestation.
Given the importance of pork, poultry, and fish supply chains for the European agricultural context, the need arises to find an alternative protein source to the traditional ones that can be included in animal feed. Consulting the literature, it is interesting to note that flours obtained from insects have excellent growth prospects in the feed industry. In particular, the species *Hermetia illucens*, *Musca domestica* and *Tenebrio molitor* have been the subject of small-scale studies and trials to define their impacts on the final meat product. In Italy, this supply chain has not yet been developed extensively. However, important research projects at the national level are working towards defining and validating innovative production systems with a view to a more sustainable future agriculture, also based on the introduction of insect meal in animal feed.
Given the environmental, ethical, and economic challenges confronting poultry, pork and fish supply chains, this study seeks to establish a feasibility index for evaluating the viability of integrating this protein source into Italian context. This index is unrelated to market demand, which requires products increasingly linked to the territory, where flours can be locally sourced and processed, with efficient plants, cutting down on the long-distance transport currently required for soybeans and thereby reducing production costs. However, achieving a production level that is both economically viable and capable of replacing soybeans entirely remains a work in progress, necessitating further time and researches.

Keywords

alternative proteins, insects meal, soybean, economic sustainability

S1 - SC02

The effects of regional suitability on productions' sustainability: the case of durum wheat

Elisa Biagetti[1]*

[1]Department of Economics, Engineering, Society and Business Organization, University of Tuscia, via del Paradiso 47, 01100 Viterbo, Italy)
*E-mail: elisa.biagetti@unitus.it

Abstract

The development of a crop is inevitably linked to a number of local ecosystem factors such as the soil or pedo-climatic characteristics.
Knowing the reference ecosystem becomes fundamental in order to make productive choices in terms of cultivation and related techniques that are efficient from an economic-environmental point of view. In an era in which we constantly talk about increasing agricultural productivity, together with an environmental protection factor, aiming at the so-called "sustainable intensification", a fundamental role is played by what is defined as regional suitability. But what does it mean? The terms indicates "the predisposition of a specific territory to successfully host a crop" (Graviano and Piras, 2008).
Therefore, the more we are able to respect the intrinsic climatic and soil requirements of cultivation, the less there will be a need to use external inputs, such as fertilizers and pesticides, thus facilitating the possibility of sustainable and at the same time profitable cultivation.
Given these considerations, the work focuses on the cultivation of durum wheat, evaluating how much territorial suitability, at a regional scale, influences the use of inputs, production yields, economic results and environmental sustainability. The empirical analysis focuses on the evaluation of the Ecological Balance of the crop in the approximately 2,000 companies surveyed by the FADN. This result is related to technical aspects such as production yield, input use, crop size and cultivation methods, as well as to the economic result to understand how territorial suitability influences the production-environmental trade-off.
The results obtained will allow us to develop reflections regarding the role of territorial suitability in conditioning the relationships between environmental and economic performances and therefore, ultimately, under which conditions a sustainable intensification strategy can be pursued.

Keywords

Suitability, Ecological Balance, Sustainability, Durum Wheat

S1 - SC03

Transparency and Certifications: Sustainability Communication in Italy's Apple Supply Chain

Antonina Sparacino[1]*, Giulia Mastromonaco[1], Valentina Maria Merlino[1], Stefano Massaglia[1]

[1]Department of Agricultural, Forest and Food Sciences, University of Turin, L.go P. Braccini 2, 10095, Grugliasco, TO, Italy
*E-mail: antonina.sparacino@unito.it

Abstract

One of the objectives of the PNRR ("Piano Nazionale di Ripresa e Resilienza") is to evaluate and investigate fruit and vegetable supply chains to identify factors related to traceability, sustainability, and the use of certifications. Italy is the second largest European producer of apple fruit, and in 2023, compared to the previous year, the production increased by 3%. An important step is to create a long-term environmentally, financially and socially sustainable environment for product innovation and differentiation. Therefore, the aim of this study is to analyze major apple producer and distributor companies and investigate their marketing strategies related to certified products, transparency goals, and the main tools used to demonstrate the company's commitment to sustainability issues. The research method follows the theory of Content Analysis on information scraped from websites of major Italian companies. From our findings, although there is generally slight communication from companies related to sustainability, the aspects concerning sustainable production in terms of land use, irrigation systems, and the use of renewable energy resources are prominent. Sustainable communication primarily focuses on the first stage of the supply chain, particularly production in the field and the methods adopted. The promoted certifications for products are oriented towards origin (e.g., PDO, PGI) and organic production. This study could contribute to improving the sustainability communication strategies of apple fruit producers and distributors and enriching the valorization of Italian apple productions.

Keywords

apple fruit, content analysis, marketing strategies, supply communication, sustainability

S1 - SC04

Unlocking Agricultural Residue Value: A Comprehensive Cost-Benefit Analysis of Biochar Implementation

Perrone M.[1]*, Mazzocchi C.[1], Tosca A.2, Verga E.[2]

[1]Department of Agricultural and Environmental Sciences, University of Milan
[2]Minoprio Foundation, Vertemate con Minoprio, Como
*E-mail: mariavittoria.perrone@unimi.it

Abstract

Biochar is a carbon-rich material derived from pyrolysis. Pyrolysis involves heating organic matter in a low-oxygen environment, resulting in the production of biochar, bio-oil, and syngas. Notably, biochar allows long-term soil carbon storage, with potential benefits for agricultural sustainability (e.g., productivity, reduced environmental impacts, and water retention). Furthermore, biochar technology aligns with the principles of circular economy, where organic waste represents a valuable feedstock for energy generation and carbon sequestration. Despite its potential, the widespread adoption of this technology remains a challenge. This study aims to provide economic insights regarding biochar technology implementation in northern Italy. A cost-benefit analysis was chosen to obtain a comprehensive understanding of the financial aspects behind this technology implementation, estimating the economic viability of biochar adoption into agricultural practices. Data collection regards primary and secondary sources. Costs have been collected based on the production process encompassing agricultural residues procurement (collection and transportation), feedstock pre-processing (drying and shredding), pyrolysis unit construction and operation, warehousing, application of biochar as a soil conditioner, and carbon credits certification costs. Concerning benefits assessment direct and indirect effects have been accounted. Direct economic benefits include all revenues related to products sale, hence, energy, biochar, and carbon credits trade. Indirect benefits regard the agronomical gains related to biochar application on soil, such as increased crop productivity, decrease of nitrous oxide (N2O) emissions from soil, and enhanced water retention. Results show that the type of feedstock treated and transportation distances play an important role in the economic viability of investments. Finally, a sensitivity analysis shows that large-scale production plants are more efficient and economical compared to small-scale pyrolysis units. Overall, the paper provides valuable information on the economics of biochar for the Italian agricultural sector, enabling potential advantages of capitalizing on agricultural residues while providing climate change mitigation thanks to carbon removal and renewable energy production.

Acknowledgment
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Keywords

Biochar, Circular Economy, Cost Benefit Analysis, Pyrolysis

S1 - SC05

"From Peaks to Plains: A Risk Comparison of Dairy Cattle Farms in Northern Italy"

Benedetta Damiani[1], Samantha Testa[2], Biagini Luigi2 Attilio Coletta[2], Corsi Stefano, Severini Simone[2]

[1]Università degli Studi di Milano, Dipartimento DISAA, Milano, Italy
[2]Università degli Studi della Tuscia, Dipartimento DAFNE, Viterbo, Italy
*E-mail: benedetta.damiani@unimi.it

Abstract

The study focuses on assessing the risk associated with dairy farming in mountain regions compared to non-mountain regions in Northern Italy. Northern Italy is a significant producer of cow's milk, but its territory varies greatly, presenting challenges for dairy farming. Mountain farms, characterized by smaller size and fragmented terrain, face different risks compared to those in plain and hill zones. The aim is to evaluate these risks to improve risk management strategies. Using data from the Italian Farm Accountancy Data Network (FADN) from 2014 to 2021, the study analyzes 4048 observations of specialized dairy farms in Piedmont, Lombardy, and Veneto regions, divided into mountain (129 farms) and non-mountain (319 farms) zones. Various risk analysis indicators, including the coefficient of variation (CV), Value at Risk (VaR), and Expected Tail Loss (ETL), are utilized to compare the risk profiles of the two groups. Preliminary findings reveal significant differences in the risk profiles of mountain and non-mountain dairy farms. These disparities emerge from various factors, including income volatility and differences in risk indicators. The study suggests the need for specific risk management strategies tailored to each region due to differences in output value, production costs, and environmental conditions. Under the Common Agricultural Policy (CAP), risk management tools can categorize farmers based on similar characteristics and offer diverse instruments for different risk scenarios within the same territory. The Income Stabilization Tool (IST) emerges as the most suitable tool for managing risks in the dairy sector in Northern Italy, covering fluctuations in production costs and output levels. The study advocates for tailored ISTs for homogeneous groups of participants to prevent segregation based on risk profiles and ensure fair participation in risk management instruments. In conclusion, the study highlights the importance of understanding and addressing the specific risks faced by dairy farms in mountain regions compared to non-mountain regions. Tailored risk management strategies, particularly through ISTs, are crucial for sustaining dairy farming in Northern Italy.

Keywords

Risks, FADN, dairy, IST

S1 - SC06

Nutri-Score: checkmate to Geographical Indications? Evidence from an experimental auction in Italy

Alice Stiletto[1]*, Riccardo Vecchio[2]*, Luigi Cembalo[2], Samuele Trestini[1]

[1]Department of Land, Environment, Agriculture, and Forestry, University of Padova, Viale dell'Università 16, Legnaro (Padova), Italy
[2]Department of Agricultural Sciences, University of Naples Federico II, Via Università 100, Portici (Naples), Italy
*E-mail: samuele.trestini@unipd.it

Abstract

The EU's Farm to Fork strategy (F2F) promotes the mandatory implementation of a Front-Of-Pack nutritional label to enhance citizens' diets by encouraging healthier food choices, with the Nutri-Score (NS) being a favored option. While widely supported within the EU for effectively steering consumers towards healthier products, oppositions arise on the political and producer levels due to potential negative economic impacts, particularly on specific food sectors and Geographical Indications (GIs). Recent literature has stressed the need to investigate this aspect in more detail, highlighted the lack of studies in the literature. This study addresses this gap by examining consumers' willingness to pay for GI products labeled with different Nutri-Score grades. An experimental auction involving 200 Italian consumers was conducted. Various products representing different NS levels, including both conventional and GIs, were utilized. To illustrate, conventional pasta and Pasta di Gragnano PGI (NS=A), conventional piadina and Piadina Romagnola PGI (NS=C), and conventional hard cheese alongside Parmigiano Reggiano PDO were surveyed. Results indicate that the Nutri-Score influences consumers' willingness to pay, with premiums and penalties observed for A and D scores, respectively, aligning with expectations.

Misinterpretation of the labels significantly undermines their effectiveness as a health tool, underscoring the need for robust communication strategies within the EU to achieve F2F objectives. GIs generally face penalties from Nutri-Score adoption, particularly affecting loyal GI consumers. However, well-established GIs like Parmigiano Reggiano PDO do not suffer adverse effects, as the positive value associated with the GI offsets the NS's negative impact.

Keywords

Farm to Fork; traditional foods; PDO; PGI; European Union;

S1 - SC07

Analyzing the Impact of Nutri-Score and Eco-Score Labels on Food Preferences: what is the state of the art?

Giulia Andreani[1]*, Giovanni Sogari[1]*, Rungsaran Wongprawmas[1]*, Davide Menozzi[1]*, Cristina Mora[1]

[1]Department of Food and Drug, University of Parma, Parco Area delle Scienze 47/A, 43124, Parma, Italy
*E-mail: giulia.andreani@unipr.it

Abstract

Given the increasing need to shift toward healthier and more sustainable diets, national and international authorities are seeking strategies that could help consumers in their daily dietary decisions. Among the potential interventions that could support consumers' choices, the use of front-of-pack (FOP) labels is of high interest. For instance, in 2020, the European Commission proposed a harmonized FOP labeling scheme to "empower consumers to make informed, healthy and sustainable food choices". As a consequence, scientific research investigating the effectiveness of nutrition and sustainable FOP has increased rapidly. To provide a comprehensive overview of the current literature on this topic, the present study aims at systematically reviewing studies assessing the effectiveness of two FOP labels:the Nutriscore (NS) and the Ecoscore (ES). These two rating systems provide an overall assessment of the nutrition (NS) and environmental sustainability (ES) impact of a food product by assigning a rating letter from A (best score) to E (worst score), with an associated color
from green to red.
The search was conducted in May 2023 using two electronic databases – Scopus and Web of Science – and a total of 289 articles were retrieved.
After removing duplicates and after the title and abstract screening using Covidence as the main software, 83 relevant studies were considered for full-text screening and data extraction. The data extraction process is currently ongoing, and findings will be synthesized in a narrative form.
Preliminary results on the NS showed that, for consumers' objective understanding, this label usually performs better than other FOP nutrition labels; however, results for subjective understanding are more heterogeneous.
Findings will be of help for policymakers to best identify and develop interventions that consider FOP labels to steer consumers' food choices.

Acknowledgment

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Keywords

Systematic Review, Front-of-pack Labels, Consumers, Health, Sustainability

S1 - SC08 FROM PIXELS TO PATHWAYS: ANALYZING DECISION-MAKING ACROSS VIRTUAL AND REAL NATURE

Tommaso Fantechi[1]*, Antje Risius[2], Caterina Contini[1], Clara M. Mehlhose[2]

[1]Department of Agriculture, Food, Environment and Forestry, University of Florence, Piazzale delle Cascine, 18, 50144, Florence, Italy
[2]Department of Agricultural Economics and Rural Development, Georg-August-Universität Göttingen, Göttingen, Germany
*E-mail: tommaso.fantechi@unifi.it

Abstract

The environmental implications of food consumption highlight the necessity to explore alternatives that can encourage consumers to make sustainable choices. Nudging has emerged as an innovative strategy for influencing consumers and facilitating habit changes without being intrusive. Existing literature suggests that establishing a connection with nature may serve as a nudging technique that promotes more sustainable behaviours.
Our objective is to examine how the presence of the forest influences consumer choices with different levels of exposure: viewing a photograph of a forest, exploring the forest through virtual reality, and physically being present in the forest. A total of 150 participants were evenly distributed among three groups, each exposed to varying levels of forest interaction. The first group served as a control, observing only a photograph of a forest. The second group experienced the forest via a 360° virtual reality video, allowing participants the freedom to explore as they desired. The last group was physically immersed in the Göttingen forest. Following each condition, participants completed an identical questionnaire, which included a choice experiment on a product widely associated with nature and commonly consumed in Germany—specifically, honey. In the choice experiment, each scenario featured two honey variants that differed in both price and organic certification. The analysis encompasses measuring willingness to pay for organic certification across the three different levels of exposure to the forest, alongside an examination of attitudes toward sustainability.
Our hypothesis posits that nudging involving exposure to the forest influences the willingness to pay for sustainable attributes. Additionally, we hypothesize significant distinctions among the three different levels of interaction with the forest.

Keywords

Virtual reality, Nudging, Choice experiment, Honey

S1 - SC09

What the GI logo can add to GI names? Insights from GI cheeses with different market share

Leonardo Cei[1]*, Alice Stiletto[1], Samuele Trestini[1]

[1]Department Territorio e Sistemi Agro-Forestali (TESAF), University of Padova
*E-mail: leonardo.cei@unipd.it

Abstract

Geographical indications (GIs) are quality products to which the EU attributes a relevant importance, in terms of policy effort, protection on the market, and financial support. From an economic perspective, GIs have a collective nature at two levels. At the lower level, every producer in the area of origin can participate to a GI scheme (e.g., Parmigiano Reggiano PDO), provided they comply with the code of practice, thus selling their product under the same GI name. At a higher level, every GI producer has to use a common GI logo on their product. Many studies assessed the capacity of GI names to attract a positive willingness to pay (WTP) from consumers. However, studies usually focused on 'famous' GI products. Furthermore, studies tend to estimate the WTP of GI names, focusing on the valorisation capacity of the 'second level' of the collective mark. However, if GIs are to communicate better quality products, we should expect the GI logo to attract a positive WTP 'per se', irrespective of the specific GI name. If this is the case, the GI would be a useful valorisation tool also for relatively unknown local products, not impeding larger and more structured groups to build an additional price premium. The objective of this work is to explore whether the GI logo is able to capture a WTP by itself, and whether this WTP varies for 'famous' and 'unknown' products. To do so, we build a between-subject choice experiment, splitting respondents in two groups, assigning them a different GI product: Pecorino Romano PDO ('famous' product) and Pecorino di Filiano PDO ('unknown' product). Groups are asked to make their choices between the GI product and a non-GI pecorino cheese. For each group, two further subgroups are created. In one of them, the GI product is presented with the PDO term and the PDO logo. In the other, both the PDO term and logo are omitted. The analysis is performed with a multinomial logit, including respondents' socio-demographic characteristics and attitudes.

Keywords

geographical indications, consumer, choice experiment, reputation

S1 - SC10

Profiling of sheep meat consumers: new perspectives towards opinions on farming system, meat quality and national market

Chiara Costamagna[1]*, Danielle Borra[1], Carmine Giuseppe Gulli'[2], Antonio Mimosi[1], Paolo Cornale[1], Valentina Maria Merlino[1]

[1]Department of Agricultural, Forest, and Food Sciences, University of Turin, Largo Paolo Braccini 2, 10095, Grugliasco, Turin, Italy
[2]Department of Veterinary Sciences University of Turin, Largo Paolo Braccini 2, 10095, Grugliasco, Turin, Italy
*E-mail: c.costamagna@unito.it

Abstract

Sheep meat consumption has also decreased in the last few years in the traditional markets of the Mediterranean area, such as Italy. However, the sheep meat production system has both economic, social and environmental significance in the production areas. For this purpose, it appears important to comprehend consumers' opinions and preferences towards this product to improve market production and communication to meet consumers' needs. A survey on consumer preferences for sheep meat was conducted face-to-face in the metropolitan area of Turin (North-West Italy) on 135 responsible for purchasing using a paper questionnaire structured in two main sections: firstly, respondents were asked to indicate their opinion about the sheep meat production system using a 5-point Likert scale. In particular, 1) the type of sheep farming system and its impact on the environment, animal welfare, and the territory; 2) the nutritional and organoleptic quality of sheep meat; and 3) the characteristics of the product on the market (price, origin, and certification) were investigated. The second part asses the individuals' perception of the sheep production system proposing asking the respondent to select three attributes among a set of words/concepts describing the sheep meat supply chain. The responses were analysed using the Principal Component Analysis (PCA) to identify different consumption patterns. Then, a Cluster Analysis was conducted to determine consumer profiles. Finally, a relationship map was created to highlight the strength of the connection between the identified clusters and the keywords selected by the interviews. Two different groups of individuals were identified. The clusters were distinguished by their purchasing motivations, sheep meat quality preferences and socio-demographic characteristics. In addition, the consumer profiles also expressed different opinions about the proposed keywords, which highlighted heterogeneous attitudes and perceptions about the sheep meat production system. The results of this study may help direct new and targeted marketing strategies to revive this crucial livestock production.

Keywords

consumer behaviour, local resources, quality certification, animal welfare

S1 - SC11

Agile fuelbreak maintenance with multipurpose excavators equipped with mini-winch

Martino Rogai*[1,2], Carla Nati[1], Gianni Picchi[1]

[1]Department of BioEconomy, Consiglio Nazionale delle Ricerche, Via Madonna del Piano,10, 50019 Sesto Fiorentino FI, Italia.
[2]University of Lleida, C. del Bisbe Ruano, 14, 25006 Lleida, Spain.
*E-mail: martino.rogai@ibe.cnr.it

Abstract

Rapidly escalating wildfires pose an increasing danger to Mediterranean forests. To mitigate this risk, a network of firebreaks, fuelbreaks, and shaded fuelbreaks is strategically established as preventive silviculture solutions. However, to uphold their efficacy, these structures require timely and cost-efficient maintenance. Without proper management, they can swiftly succumb to vegetation invasion, compromising accessibility and their ability to mitigate wildfire intensity.

In this context, agile and efficient systems for managing wildfire prevention infrastructure are vital to sustain their functionality. Various solutions are employed, contingent upon local resources and expertise. Public funding availability is also crucial, as these forest works are typically economically unsustainable.

This study explores the feasibility of deploying an agile semi-mechanized work system, based on mini-excavator, to perform the tasks of biomass removal from unattended fuelbreaks containing a mix of trees and invasive shrubs. As an additional challenge, the areas involved featured several environmental restrictions to forest operations, requiring low-impact systems. The mini-excavator, equipped with a mini-winch for tree extraction and attachments such as shears, grapples, and mulchers, transforms into a versatile multi-purpose equipment. This system has been compared with a semi-mechanized approach utilizing manual work supported by farm tractors equipped with winch and/or mulchers.

In both scenarios, the resulting products and by-products had been segregated and piled in order to optimize their value for local energy production and added-value manufacts, thereby enhancing the overall economic balance of the operations.

Keywords

wildfires, preventive silviculture, forest operations, fuelbreaks, excavator

SOIL GEOCHEMICAL FINGERPRINTING FOR AGRI-FOOD AUTHENTICITY AND TRACEABILITY

Raffaela Ofano[1,2]*, Luigi Ruggiero[1], Diana Agrelli[1], Carmine Amalfitano[1], Paola Adamo[1,2]

[1]Department of Agricultural Sciences, University of Naples Federico II, Piazza Carlo di Borbone I – Portici, Naples, Italy
[2]Metrofood-It Research Infrastructure
* Raffaela Ofano (e-mail: raffaela.ofano@unina.it)

Abstract

Nowadays consumers are more aware of the issues surrounding food safety due to numerous food scandals over the last two decades. Soil is for plants the main source of mineral elements which can be transferred to agricultural products according to their bioavailability and pedoclimatic conditions.
Therefore, differences in element distribution between geographic regions are reflected in agriproducts. This is why multielement fingerprinting is one of the most widely used technique to discriminate the geographical origin of food. In this work we tried to find a relation between mineral element content in cultivation soil and in a PDO tomato grown on the slopes of Somma-Vesuvius volcanic complex. The peculiar cultivation environment strongly influences quality and organoleptic properties of this tomato which due to its typicity it is a product susceptible to origin fraud. For this study, cultivation soils and tomato fruits were collected from representative farms inside and outside the PDO cultivation area in 2021-2022-2023 years. Soils were characterized for physical chemical properties and extracted for potentially and readily bioavailable elements. A total of 22 elements were determined in soils and tomatoes. The PCA and LDA were used for geographical classification of soil and tomato samples. The results indicated a tendency to natural grouping of soil and tomato according to provenance farms. The mineral fingerprinting of soils and related tomato fruits from the farms inside the PDO area were correlated and compared to the cultivation areas outside PDO. LDA evidenced not-essential elements as predominant mineral elements of PDO soils discriminating the geographical origin of tomato fruits.
The research activities are supported by METROFOOD-IT Project – Strengthening of the Italian RI for Metrology and Open Access Data in support to the Agrifood, funded under the National Recovery and Resilience Plan – PNRR, Mission 4 “Education and Research”.
Keywords

Mineral elements, Tomato, PDO products, Chemometrics, Bioavailability

S1 - SC13

EXTRACTION AND USE OF FRUIT BY-PRODUCT'S BIOACTIVE COMPOUNDS FOR GLUTEN FREE AND VEGAN COOKIES FORTIFICATION

Carlotta Breschi[1,2],*, Silvia D'Agostino[3], Francesco Meneguzzo[2],†, Lorenzo Cecchi[3], Nadia Mulinacci[1], and Bruno Zanoni[3],†

[1]Department of Neurosciences, Psychology, Drug Research and Child Health (NEUROFARBA), University of Florence, 50121 Florence, Italy ;
[2]Institute of Bioeconomy, National Research Council, 50019 Florence, Italy ;
[3]Department of Agriculture, Food, Environment and Forestry Sciences and Technologies (DAGRI), University of Florence, 50121 Florence, Italy;
*E-mail: carlotta.breschi@unifi.it

Abstract

In the field of food loss/waste resources rich in bioactive compounds, three points are key: (i) which food wastes are richest in powerful compounds; (ii) which extraction techniques are the most promising and have the lowest ecological footprint; (iii) what are the applications (e.g., food industry, cosmetic industry) to boost their value. Certain food by-products, including not-good-for-sale apples and pomegranate peels, are rich in bioactive molecules that can be collected with different extraction technologies.. For this study, three green technologies, both conventional and innovative, were evaluated based on functional metrics such as extraction yield and the recovery and preservation of bioactive compounds available in the raw material: fermentation, good for the selectivity; ultrasound-assisted extraction, good for the extraction yield; and hydrodynamic cavitation, good for the scalability. The hydrodynamic cavitation technique was used to obtain extracts from not-good-for-sale whole apples and pomegranate peel. The extracts were chemically and physically characterized and used in gluten-free and vegan cookie formulations to replace part of the flour and sugar to study whether they can mimic the role of these ingredients. The amount of flour + sugar removed and replaced with extracts was 5% and 10% of the total. Physical (dimensions, color, hardness, moisture content, water activity), chemical (total phenolic content, DPPH radical-scavenging activity), and sensory characteristics of cookie samples were studied. Cookies supplemented with apple extract were endowed with similar or better characteristics compared to control cookies: high spread ratio, similar color, and similar sensory characteristics. In contrast, the pomegranate peel extract enriched the cookies in antioxidant molecules but significantly changed their physical and sensory characteristics: high hardness value, different color, and a bitter and astringent taste. It is suggested that the use of pomegranate peel extracts be rethought, either by reducing the dose or redirecting it towards different products, such as juices.

Keywords

fruit waste; green extraction technologies; antioxidants; fortification; cookies

S1 - SC14

Olive tree (Olea europaea L.) leaves: intra- and interannual variability of the phenolic profile of 4 typical Tuscan cultivars

Tommaso Ugolini[1]*, Irene Digiglio[2], Nadia Mulinacci[2], Graziano Sani[3], Leonardo Ciaccheri[4], Barbara Adinolfi[4], Bruno Zanoni[1], Lorenzo Cecchi[1]

[1]DAGRI – Department of Agricultural, Food, Environmental, and Forestry Sciences and Technologies – University of Florence, via Donizetti, 6 – 50144 Florence, Italy
[2]Department of NEUROFARBA, University of Florence - Via Ugo Schiff 6, 50019 Sesto F.no, Florence, Italy
[3]Consiglio Nazionale delle Ricerche, Institute for BioEconomics - Via Madonna del Piano, 10, 50019 Sesto F.no, Florence, Italy
[4]Consiglio Nazionale delle Ricerche, Istituto di Fisica Applicata Nello Carrara - Via Madonna del Piano, 10, 50019 Sesto F.no, Florence, Italy
*E-mail: tommaso.ugolini@unifi.it

Abstract

Olive tree leaves are a high potential value biomass rich in phenolic derivatives with many biological activities such as anti-hypertensive and anti-diabetic. They are therefore an excellent ingredient for food additives or supplements. Their phenolic content varies according to many different factors such as cultivar, intra- and interannual gathering time, geographical origin and so on.
The aim of this research was to evaluate the variability of the phenolic profile of the 4 main Tuscan cultivars (i.e., Frantoio, Leccio del Corno, Leccino, Moraiolo) over the different phenological phases of the olive plant and during the whole year. With this purpose, a two-years study was carried out, in which olive leaves were analyzed in triplicate from trees grown in an experimental garden in Sesto Fiorentino (FI) and belonging to the four above cultivars, for a total of 108 samples. The phenolic profiles of all the hydroalcoholic extracts obtained from each sample were qualitatively and quantitatively characterized with HPLC-DAD-MS. The four cultivation varieties behaved differently in terms of their secondary metabolites content evolution, with total phenolic contents ranging from 1.7% (w/w DM) for Moraiolo in spring 2022 to 5% for Leccio del Corno in autumn 2023. The data thus obtained can be related to the different cultivars' resistance to stress and can be used to produce extracts with high and constant concentrations of bioactive compounds.

Keywords

Olive leaves, flavonoids, extraction, monocultivar, oleuropein

S1 - SC15

Effects of saturated fatty acid enriched diets on *Tenebrio molitor* larvae

Emma Copelotti[1,2,*], Kristof De Schutter[2], Daylan Amelia Tzompa-Sosa[3], Carl Coudron[4], David Deruytter[4], Simone Mancini[1]

[1]Department of Veterinary Sciences, University of Pisa, Viale delle Piagge 2, 56124 Pisa, Italy
[2]Laboratory of Agrozoology, Department of Plants and Crops, Faculty of Bioscience Engineering, Ghent University, 9000, Ghent, Belgium
[3]Department of Food Technology, Safety and Health, Food Structure and Function Research Group, Faculty of Bioscience Engineering, Ghent University, 9000, Ghent, Belgium
[4]Insect Research Centre, Inagro, Ieperseweg 87, 8800 Rumbeke-Beitem, Belgium
*E-mail: emma.copelotti@phd.unipi.it

Abstract

Tenebrio molitor (mealworm) is one of the four insect species approved by EFSA as novel food and one of the eight species approved as animal feed in the EU. Mealworms can be reared on substrates that include former foodstuffs, such as fried foods or baked goods which typically contain high levels of unsaturated and saturated fatty acids. As the nutritional profile of insects is correlated to the diet, the study aimed to investigate the effect of dietary saturated fatty acids on mealworms. Wheat bran (control, total fat 4%) was enriched with fully hydrogenated rapeseed oil (FHRO) as a source of saturated fat until a total fat content of 5%-7%-10%-12%-15%-20% on a wet basis. The trial lasted two weeks, during which larvae were sampled (T0-T7-T11-T14) along with frass. Substrates, frass, and 24-h starved larvae were analysed for: dry matter (DM), crude proteins (CP), crude fats (CF), ashes, and fatty acid profile. The CP% of mealworms decreased as the amount of FHRO increased in their diets from 15.2 (control larvae) to 14.5 (larvae fed 20% fat diet). Moreover, the CF% increased with the amount of FHRO in the diets. As the FHRO percentage in the diets increased, the levels of PUFA decreased, while the levels of stearic acid (C18.0) and SFA increased. No differences were found in the growth rates of larvae (mg/d). Mortality rates were unaffected in diets containing up to 12% of FHRO, on the other hand, an increased mortality was reported in larvae fed 15% and 20% diets. This study highlights the influence of the diet on the fatty acid profile of mealworms. By harnessing the nutritional plasticity of mealworms, it is possible to unlock the potential of this species and shape the final products to meet the growing demand for sustainable and nutritious feed and food.

Keywords

mealworm, edible insects, fatty acids, sustainability, circular economy

S1 - SC16

DIETS CONTAINING SESAMIN AND ALPHA-LIPOIC ACID AND LIPID QUALITY OF PACU'S FILLETS

Adja Cristina Lira de Medeiros[1], Julio Guerra Segura[2], Katia Rodrigues Batista de Oliveira[3], Fábio Rosa Sussel[4], César Gonçalves de Lima[5], Giuliana Parisi[1], Elisabete Maria Macedo Viegas[5]

[1]Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali, University of Florence, Firenze, Italy.
[2]Department of Animal Science, Federal University of Mato Grosso do Sul, Mato Grosso do Sul, Brazil.
[3]Department of Animal Science, Federal University of Lavras, Lavras, Brazil.
[4]Agency of Agribusiness Technology of São Paulo, Cachoeira das Emas, Brazil.
[5]Department of Animal Science, University of São Paulo, Pirassununga, Brazil.
*E-mail: adjacristina.lirademedeiros@unifi.it

Abstract

In recent years, the pacu (*Piaractus mesopotamicus*) has stood out among the native fish species of great economic interest in Brazil. In addition to its excellent adaptation to climatic conditions, this species prefers an omnivorous diet with a strong tendency towards herbivory, being able to feed on fruits, crustaceans, organic debris, small fishes, and mollusks. Thus, the pacu is a species with low protein requirements and can be fed with a low-cost diet. According to the Organization for Economic Co-operation and Development (OECD), the mean of pacu's production in Brazil was around 12,3091 tonnes, as the average for the period 2012-2021. Concerning diets, it is common practice in aquaculture to supplement fish diets with lipids from plant or animal sources to improve diet formulation. Therefore, this study aimed to evaluate the effects of two metabolic modifiers (sesamin from sesame oil and alpha-lipoic acid) on the fatty acid composition and lipid quality of the pacu fillets. A total of n. 480 pacu juveniles (3.35±0.78 g) was divided into 24 experimental units (with n=20 juveniles for each). Six feeding treatments were randomized in a 3×2 factorial design with three oil sources (soybean, sesame, and linseed oil) and two levels of alpha-lipoic acid (0 and 0.1%) in four replicates. Data were analyzed by one-way analysis of variance and Tukey's test (5%). Sesamin provided by sesame oil did not alter the chemical composition and metabolism of polyunsaturated fatty acids in the fillets of pacu juveniles. However, diets containing linseed oil increased the concentration of n-3 polyunsaturated fatty acids in the fillets, mainly α-linolenic (18:3n-3) and eicosapentaenoic (20:5n-3) acids. Fish that did not receive alpha-lipoic acid supplementation had fillets with higher polyunsaturated fatty acids and lower atherogenicity and thrombogenicity indexes, providing a better lipid quality of the fillets.

Keywords

fillets, linseed oil, polyunsaturated, sesame oil, supplementation

AUTOMATIC GRAPEVINE ANALYSIS FOR ESTIMATING PRUNING WEIGHT THROUGH UAV-DERIVED 3D-MODELS

Riccardo Rossi[1]*, Anna Rita Balingit[1], Camilla Dibari[1], Gloria Padovan[1], Jacopo Primicerio[2], Marco Bindi[1], Michele Moretta[1], Niccolò Bartoloni[1], Nicolina Staglianò[1], Sergi Costafreda-Aumedes[2], Marco Moriondo[1,2]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence (UNIFI), Piazzale delle Cascine 18, 50144 Florence, Italy
[2]Institute of BioEconomy, National Research Council of Italy (CNR-IBE), Via Madonna del Piano 10, 50019 Sesto Fiorentino, Italy
*E-mail: r.rossi@unifi.it)

Abstract

Pruning weight (PW) is a crucial metric for assessing several vineyard parameters, including plant vigour, biomass accumulation and stored carbon [1]. The yield-to-pruning-weight ratio can also serve as a valuable indicator to achieve an optimal balance between vegetative growth and reproduction, thereby maximising both fruit quality and quantity [2]. The accurate estimation of PW is, thus, essential for guiding winegrowers to make informed decisions about vineyard management practices (e.g., fertilisation, defoliation and green pruning) based on the spatial variability of vine vigour.
Recent advancements in remote sensing techniques and spectroscopy analysis have promoted the adoption of Unmanned Aerial Vehicles (UAVs) for non-destructively monitoring the vineyard structural properties from the relevant three-dimensional (3D) models. However, while previous studies have demonstrated the robustness of allometric relationship between vine 3D-architecture and PW [3,4], the reliability of an early prediction model for seasonal vegetative balancing has to be investigated in depth.
To address this issue, the present study aims to present the potential application of grapevine morphometric traits derived from 3D-models at different growth stages as proxies for PW. Firstly, an UAV data-driven approach was developed to automatically identify and locate individual vines, forming the basis for monitoring canopy architecture evolution. Then, allometric equations relating the model-derived information and the manually collected PW were established to evaluate their prediction accuracy at flowering, veraison and harvest time. The results confirmed the viability of the proposed methodology as a non-destructive, automatic tool for the early prediction of PW across a vineyard, despite its susceptibility to seasonal variability in plant development. This valuable information could aid winegrowers in promptly optimising field operations' intensity and frequency to enhance fruit quality and quantity, as well as in planning the management of residual biomass within a Life Cycle Assessment concept.

Keywords

3D-modelling; Photogrammetry; Plant segmentation; Precision viticulture; Residual biomass

Acknowledgements

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S2 - SC02

Enhancing nutritional content of maize and wheat microgreens: varietal screening and sodium selenate nutripriming

Cosimo Matteo Profico[1,2]* , Silvana Nicola[2]

[1]Università degli Studi di Torino, Dipartimento di Scienze Agrarie, Forestali e Alimentari, Largo P. Braccini 2, 10095 Grugliasco (TO), Italia
[2]Università degli Studi del Piemonte Orientale via Duomo 6, 13100 Vercelli (VC), Italia
*E-mail: cosimomatteo.profico@unito.it

Abstract

Selenium (Se) is an essential micronutrient for humans. It is introduced into the animal's diet through plant tissues. However, the availability of Se in the soil can vary greatly depending on geographical region and agricultural practices, resulting in differences in the amount of Se present in plants. Se deficiency in animals can result from a Se-deficient diet or from factors such as climate and antinutritional compounds that interfere with Se. Biofortification is a solution to enhance selenium levels in plants.
Biofortification application on maize (*Zea mais* L.) and wheat (*Triticum aestivum* L.) microgreens could increase their nutritional value. The objective was to cultivate maize and wheat microgreens via sodium selenate (Na_2SeO_4) Nutripriming Technique. A varietal screening of 8 maize and 8 wheat varieties took place in a Micro-indoor (MitTech) Plant Factory with Artificial Light (PFAL) using a jute mate as a substrate for the seedlings. The LED spectrum consisted of 13% blue, 15% green, 61% red, and 11% far-red (1Blue:4Red ratio). The Photosynthetic Photon Flux Density (PPFD) was set at 255 μmol m −2 s −1 with a photoperiod of 14 hours.
The screening phase identified the best candidates based on their antioxidant, sugar, phenolic and chlorophyll profiles. Subsequently, the identified optimal varieties were treated undergoing the Nutripriming Technique. The seeds were infused in sodium selenate solution for 24 hours. Three different doses of selenium (0 mM (control), 10 mM and 100 mM with Na_2SeO_4) were used. To assess the nutritional value of the microgreens, Se accumulation in the plants, total chlorophyll, sugars and phenols, antioxidant capacity, oxidative stress enzyme activity and fresh yield were analyzed. The initial insights hold promise for improving selenium-enriched food production, with potential benefits for human well-being and ecological balance. However, confirming and expanding upon these promising results will require continued rigorous data acquisition and analysis.

Keywords

micronutrient; Selenium accumulation; Dietary intake; Micro - PFAL

S2 - SC03

A multi-sensor remote sensing approach to monitor charcoal production sites in Somalia's forests

Luca de Guttry[1]*, Iqro Abdi Olow[1], Paolo Paron[2,3], Michele Bolognesi[2], Ugo Leonardi[2], Laura Stendardi[4], Giovanni Argenti[1], Camilla Dibari[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Florence, Italy
[2]United Nations Food and Agriculture Organization (FAO - Somalia), Mogadishu, Somalia
[3]IHE Delft, Institute for Water Education, Delft, the Netherlands.
[4]EURAC Research, Institute for Earth Observation, Bolzano, Italy.
*E-mail: luca.deguttry@unifi.it

Abstract

Somalia, with 2/3 of its land devoted to agriculture and livestock rearing, is facing the negative impacts of uncontrolled deforestation activities, particularly due to the extensive and often illicit charcoal production. This leads to forest degradation dynamics and the depletion of the country's woody resources. To monitor these tendencies, remote sensing offers many advantages in terms of temporal and spatial coverage. Our study aimed to develop a workflow that integrates optical, Sentinel-2, and Synthetic-Aperture Radar (SAR), Sentinel-1, imagery to detect charcoal kilns in Somalia. The process was implemented in Google Earth Engine, making it replicable and scalable to other regions. Southern Somalia (Jubbaland State, approx. 110200 km^2) was chosen as the test area since charcoal exploitation represents a critical issue in the region. Furthermore, a detailed dataset was available for the area, developed by the Food and Agriculture Organization (FAO-SWALIM) through photo-interpretation of kilns' presence. Our methodology involved producing a single image containing optical (NDVI) and SAR (VV and VH polarizations) information over the first three months of 2016 and 2017. Subsequently, we calculated the difference between the two images and extracted the pixel values in correspondence with the known charcoal sites. Based on these values, different thresholds (e.g., the mean +/- a set number of standard deviations) were tested for classifying the difference image. The results consisted of binary maps (10 m resolution) showing kilns' presence or absence. Overall accuracy reached almost 70% in some cases, while sensitivity and specificity varied more (0.4 to 0.9), depending on the threshold. Notably, some of the classifications were very balanced, with values around 0.7 for all three accuracy metrics. Our study demonstrates that a multi-sensor remote sensing approach is a valuable and reliable tool to monitor and quantify forest degradation dynamics, particularly considering the difficulties in collecting field data in unstable countries.

Keywords

Remote sensing, Sentinel 1 and Sentinel 2 integration, Charcoal production, Deforestation, Somalia

S2 - SC04

Agroecosystems Characterization for Identification of High Nature Value Farmlands

Anna Lilian Gardossi[1]*, Lucia Piani[1], Maurizia Sigura[1]

[1]Department of Agricultural, Food, Environmental and Animal sciences, University of Udine, Address : via delle Scienze, 206 (UD)
*E-mail : anna.gardossi@uniud.it

Abstract

Agroecosystems are often perceived as incompatible with the conservation and protection of natural resources. However, recognizing the role of low-intensity agricultural systems in biodiversity conservation has led to the formulation of the concept of High Nature Value Farmlands (HNVF).
These areas are politically relevant in the EU, as the HNVF concept is integrated into monitoring and assessment frameworks such as the Rural Development Programmes and the Common Agricultural Policy.
This study is part of the project "SICANSE-Development of an information system on the natural capital and ecosystem services of the agricultural and forestry sector" (Action 2.1.3). Our aim is to estimate the total extent of HNV farmland and monitor trends in its extent and condition at the regional scale.
HNVFs are cultivated landscapes that support high levels of biodiversity or conservation-interest species and habitats. They are classified into three categories based on the presence of semi-natural vegetation in farmland, landscape diversity of low-input agricultural systems, and the presence of conservation-interest species.
The methodology approach developed for HNVF mapping involved several phases:
1. Creation of the reference database by integrating available datasets;
2. Identification of potential HNVF types;
3. Weighted integration of indices;
4. Characterization.

In these steps techniques for generalizing input maps have been applied to achieve detailed representation appropriate to the scale.
To obtain basic information for HNVF identification, territory analysis was conducted to preliminary identify HNVFs using land cover maps integrated with Habitat Map.
The indices used to characterize the three types of HNVF was independent and relative to crop variability (Culture Diversity index), presence of natural elements and extensive practices (Extensive Managed Crops and Pastures, Hedgerows Cover indices) and presence of rare species (Habitat-Directive index).
Early results showed that 84% of the territory considered has more than 20% agricultural land and is therefore a probable HNVF.

Keywords

Agroecosystems, High Nature Value Farmlands, Mapping techniques, Biodiversity conservation

S2 - SC05

Extra Virgin Olive Oil Production: Innovations and Solutions for Quality Enhancement Throughout Processing

Ferdinando Corti[1]*, Giulia Angeloni[1], Agnese Spadi[1], Piernicola Masella[1], Alessandro Parenti[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), Università degli Studi di Firenze, Piazzale delle Cascine 18, 50144, Firenze, Italy
*E-mail: ferdinando.corti@unifi.it

Abstract

During the extraction process, the quality of extra virgin olive oil (EVOO) can be affected by several factors at different stage. Plant and machines evolved over the years to increase the productivity, improve the quality and the hygiene conditions. However, critical issues still remain in many operations related to heat transfer, energy and water consumption, extraction efficiency and oxygen control, which is not always considered a quality hazard. In the present work, some critical issue for EVOO quality are pointed out, presenting some technical solutions for a greater control of the operative parameters. At the post-harvest stage, the use of refrigerated cells for the storage of olives before crushing, prevents the formation of *fusty* defect linked to the warming of the fruit heaps, which can rise within a few hours after the harvesting. In the mill plant, a sintered steel sparger placed at the crusher outlet for the oxygen dosage of the olive paste, is useful to improve the development of organic volatile compounds linked to fruity, bitter and spicy attributes. Moreover, the use of tubular shaped malaxer designed to increase the ratio between heat transfer surface and the olive paste volume ensures high heat transfer transmittance, allowing to bring the product to the optimal processing temperature in a short time. At the centrifugal separation stage, an in-line optical system can be suitable to detect the change between different subsequent olive batches, avoiding the cross-batch contamination due to residual oil in the decanter at the end of the extraction cycle. Finally, the use of a sealed feed duct system at the vertical separator under technical gas, e.g. nitrogen, was found to strongly reduce the dissolved oxygen concentration in the oil due to the centrifugal action, increasing the shelf life of the EVOO.

Keywords

extra virgin olive oil quality, dissolved oxygen, centrifugal extraction, temperature control, volatile organic compounds

S2 - SC06

A novel technique to register multispectral camera images at short distance from the target crop

Sabina Laveglia*[1], Giuseppe Altieri[1], Francesco Genovese[1], Attilio Matera[1], Mahdi Rashvand[1], Giovanni Carlo Di Renzo[1]

[1]University of Basilicata, School SAFE, Viale dell'Ateneo Lucano 10, 85100 Potenza, Italy
*E-mail:sabina.laveglia@unibas.it

Abstract

Multispectral imaging (MSI) holds significant promise in agricultural contexts, particularly for assessing plant stress. However, a common challenge faced in MSI applications is the misalignment of spectral bands captured by these devices. This study proposes a solution by leveraging stereo-camera technology and MSI sensors to automatically compensate for distance discrepancies, thereby enhancing real-time registration in close-range applications. The research investigates distances ranging from 500 mm to 1500 mm with 100 mm increments, applying corrective shifts to ensure precise registration across spectral bands. Two alignment methods, Checkerboard (CB) and Discrete Fourier Transform (FT), are compared to determine their effectiveness in facilitating accurate image registration and enabling reliable spectral analysis. The proposed method involves the analysis of offsets related to alignment among the tested techniques. Additionally, the study focus into the extraction of vegetation spectral indices to analyze the health status of vegetation and distinguish between healthy and diseased plants. It evaluates how alignment quality varies with different target heights. Results indicate consistent trends in offset changes as target distance varies, demonstrating satisfactory alignment accuracy at different distances. Among the vegetation indices explored, the Normalized Difference Vegetation Index (NDVI) emerges as a robust discriminator of plant health. The overall goal of this research is to establish a versatile framework applicable to remote sensing and agricultural monitoring thus providing a reliable tool for monitoring plant health status aiming to improve real-time agricultural management practices and contributing to improved crop yield and sustainability.

Keywords

Precision Agriculture, Automated Spectral Alignment, Plant Health Monitoring, Stereo-camera Technology, Real-Time Image Registration

S2 - SC07

Development of open-source platform for monitoring soil carbon dioxide: proof of concept and prototyping

Niccolò Rimbotti[1], Daniele Sarri[1], Marco Vieri[1], Andrea Pagliai[1], Carolina Perna[1], Giuseppe Rossi[1], Federico Rotini[2]

[1]Department of Agricultural, Alimentary, Environmental and Forestry Sciences - Biosystem Engineering Division -DAGRI, University of Florence, Piazzale delle Cascine 15, 50144 Florence Italy
[2]Department of Industrial Engineering-DIEF, University of Florence, Via di Santa Marta 3, 50139 Florence – Italy
*E-mail: niccolo.rimbotti@unifi.it

Abstract

Carbon dioxide sensors are widely used for environmental monitoring. Their development and diffusion were prompted by its high and potentially hazard in closed, poorly ventilated and crowded environments. From this need have been developed a wide range of low-cost sensors. However, this is not the only application for a carbon dioxide sensor. More advanced types with greater reliability have been used for research purposes. In the present study, an open platform based on open-source hardware was developed using two environmental sensors, the SCD30 and SCD41 from Sensirion, to monitor carbon dioxide emissions from agricultural soils.

A first aim was to assess the quality and health of the soil through an indirect measurement of the degradation activity. The prototype was validated using a research-grade measurement device, the Innova 1412 from LumaSense Technologies. During the test, Figure 1, we made a comparison between the platform and the Innova. This analysis was conducted as follows: 18 chambers were applied to the pots, carrying out an analysis of carbon dioxide at the beginning and after one hour of accumulation. The SCD41 sensor was found to be unsuitable for the study.

However, the SCD30 sensor appears to be functional. The main difference that allows this distinction is that the SCD41 requires a higher volume to achieve the correct response. This would cause a large volume of air to be drawn in from outside the chamber, resulting in excessive dilution of the gas. This result allowed us to calibrate the platform to make it suitable for the study: we used a flexible chamber so that we could analyse constant gas concentrations over a long period of time. The calibration, Figure 2, produced excellent results, confirming the suitability of the SCD30 for the study.

Keywords

Precision agriculture, soil property, prototyping, carbon dioxide, open source

S2 - SC08

SOIL MAPPING WITH A LIMITED NUMBER OF SAMPLES BY COUPLING EMI AND NIR SPECTROSCOPY IN HAZELNUT TREE ORCHARD

Leonardo Pace[1]*, Simone Priori[2], Monica Zanini, Valerio Cristofori

[1]Department of DAFNE, University of Tuscia, Via San Camillo del Lillis snc, Viterbo
[2]Department of DAFNE, University of Tuscia, Via San Camillo del Lillis snc, Viterbo
*E-mail: leonardo.pace@unitus.it

Abstract

Precision agriculture relies on detailed soil mapping to optimize resource utilization. Traditional methods like EMI sensing require extensive soil sampling and lab analyses to predict soil characteristics. VIS-NIR and NIR spectroscopy offer faster, cost-effective alternatives, improving map accuracy with more data points. This study aims to assess a methodology for detailed soil mapping in a 4-hectare hazelnut grove in Corte Migliorina farm, Southern Tuscany, Italy, using EMI proximal sensors and NIR handheld spectrometers. EMI maps reveal soil variability patterns, with only 5 topsoil samples collected for lab analysis based on ECa and elevation variations. Additionally, 40 topsoil samples were collected on a grid for NIR spectroscopy, using the Neospectra Scanner, a low-cost NIR spectrometer based on MEMS technology. Partial Least Square Regression (PLSR) was employed to predict soil properties like clay, sand, organic carbon (SOC), total nitrogen (TN), and cation exchange capacity (CEC) using a national spectral library augmented by local samples. Spatial interpolation of predicted soil variables was performed using ECa maps, elevation, and DEM derivatives as covariates, with Universal Kriging (UK) and Regression Kriging (RK) methods evaluated. Prediction errors were assessed using 5 additional lab-analysed points, showing similar accuracy between RK and UK, with slightly lower errors for SOC and clay mapping (R^2>0.8) and marginally lower for TN (R^2>0.5). Sand and CEC mapping demonstrated lower accuracy.

Keywords

Spectroscopy,Precision Agriculture,Clay, Soil Organic Carbon, Electrical Conductivity

S2 - SC09

Feasibility assessment of a low-cost visible spectroscopy-based prototype for monitoring polyphenol extraction in fermenting musts

Gianmarco Alfieri[1], Margherita Modesti[1], Andrea Bellincontro[1]*, Francesco Renzi[1,3], Jose Luis Aleixandre-Tudo[2]

[1]Department for Innovation of Biological, Agrofood and Forest Systems (DIBAF), University of Tuscia, Viterbo, Italy
[2]Instituto de Ingeniería de Alimentos (Food-UPV), Departamento deTecnología de Alimentos, Universidad Politécnica de Valencia, Valencia, Spain
[3]Nature 4.0 Società Benefit Srl, Via della Chimica, 7, Poggino Production Area, 01100 Viterbo (VT), Italy
*E-mail: bellin@unitus.it

Background: Polyphenols have long been employed to evaluate grape and wine quality, emphasizing the critical need for their measurement throughout various winemaking stages. Currently, polyphenols are predominantly assessed through analytical methods, which are characterized by time-consuming procedures, and environmentally unfriendly practices. Alternatively, non-destructive spectroscopy-based devices offer an option, yet they tend to be costly and not readily accessible for smaller wineries. This study introduces initial steps in employing a portable, user-friendly, and cost-effective visible (VIS) spectrophotometer prototype for direct polyphenol measurement during winemaking.

Results: Grapes (cv Syrah, Bobal, and Cabernet Sauvignon) at different maturation stages were fermented with or without stems. Throughout fermentation, parameters such as color intensity, total polyphenol index, total anthocyanins, and tannins were monitored. Concurrently, VIS spectra were acquired using both the prototype and a commercial instrument. Chemometric approaches were then applied to establish correlation models between spectra and destructive analyses. The prototype models demonstrated an acceptable level of confidence for only a few parameters, indicating its current lack of complete reliability at this stage.

Conclusions: While VIS spectroscopy is already utilized for polyphenol analysis in winemaking, the aspiration to automate the process in wineries, particularly with low-cost devices, remains unrealized. This study proposes the feasibility of a low-cost and user-friendly spectrophotometer. The results indicate that, in the early stages of prototype utilization, the goal is attainable but requires further development and in-depth assessments.

Keywords

Polyphenols; Visible (VIS) spectrophotometer; tannins; anthocyanins; non-destructive analysis

S2 - SC10

UNCOVERING ARBUSCULAR MYCORRHIZAL FUNGI DIVERSITY WITH PROTEOMICS

Simone Marcolini[1]*, Elisa Pellegrino[1], Riccardo Zecchi[2], Riccardo Romoli[2], Giuseppe Pieraccini[2], Laura Ercoli[1]

[1]Crop Science Research Centre, Sant'Anna School of Advanced Studies, Via Luigi Alamanni, 22, 56017 - San Giuliano Terme (PI), Italy;
[2]Mass Spectrometry Center (CISM), Department of Health Sciences, University of Florence, Viale G. Pieraccini 6, 50139 - Florence, Italy
*E-mail: simone.marcolini@santannapisa.it

Abstract

Arbuscular mycorrhizal fungi (AMF) are ubiquitous plant symbionts in various (agro)ecosystems. Since AMF provide many benefits to the plant, such as increasing yield, and nutrient uptake (Lekberg and Koide, 2005; Pellegrino et al., 2015; Zhang et al., 2018), they have been applied as biostimulants in agriculture. Nowadays, commercial inocula are based on generalist single AM fungal taxa, defined by low genetic variability and more susceptible to environmental changes. Hence, it is essential to enhance the isolation and cultivation of unexplored arbuscular mycorrhizal (AM) fungal taxa, derived from both agricultural and natural soils. Functional variability of the symbiosis between AMF and crops correlates with AM fungal systematics at higher (families, genera) and lower (species, isolates/strains) hierarchies (Arcidiacono et al., 2023; Avio et al., 2006; Koch et al., 2006, 2017; Munkvold et al., 2004; Marro et al., 2022). Morphological and molecular data are widely used to describe novel AM fungal species, but often they lead to misidentifications and expensive and time-consuming analyses. In this study, a Matrix-Assisted Laser Desorption Ionisation Time of Flight Mass Spectrometry (MALDI-TOF-MS) proteomic-based biotyping have been used successfully in solving the AMF taxonomy at low systematic levels. Several isolates belonging to the families Archaosporaceae and Glomeraceae have been identified by MALDI-TOF-MS biotyping. The proteomic spectra were then used to assess AMF diversity at genera, species and intra-species level. Evidences of a large proteomic AMF intra-species diversity have been observed in Archaosporaceae rather than Glomeraceae. Looking to the future, proteomic-based techniques, such as MALDI-TOF-MS, holds great potential to resolve the systematic of many unknown taxa of AMF.

Keywords

AMF, Archaeosporaceae, intra-species diversity, proteomic, MALDI-TOF-MS

S2 - SC11

Quality and safety of baby leaf lettuce grown in floating system with different nitrogen and salt conditions can be assessed by hyperspectral data

Lorenzo Pippi[1,2], Athos Pedrelli[1], Fatjon Cela[1], Luca Incrocci[1], Marco Landi[1], Cristina Nali[1], Lorenzo Cotrozzi[1]

[1]Department of Agriculture, Food and Environment, University of Pisa, Pisa, Italy
[2]University School for Advanced Studies IUSS Pavia, Pavia, Italy
*E-mail: lorenzo.pippi@phd.unipi.it

Abstract

This study examined the capability of full-range (350-2500 nm) reflectance spectroscopy to evaluate the quality and safety of baby leaf lettuce subjected to different nutrient and salt conditions. *Lactuca sativa* L. plants were grown in a floating system under three nitrogen concentrations (1, 7 and 14 mM). Seven days before harvesting, plants were exposed to salinity, by applying Na_2SO_4 or NaCl added in the nutrient solution (EC > 3.00 dS/m). Leaf spectral measurements were paired with standard measurements of photosynthetic pigments, phenolic compounds and ions, fora total120 samples (480 spectra) distributed across treatments. Analyzing leaf spectral signatures (400-2400 nm) by partial least squares discriminant analysis, we accurately discriminated plants exposed to the different combinations of nitrogen concentrations and salt treatments, reporting a 97% of overall accuracy for validation. Furthermore, using a partial least squares regression (PLSR) approach, we developed predictive spectral models to estimate from spectra the content of an array of leaf traits commonly investigated to elucidate crop quality and safety, i.e., chlorophylls (Chl) and carotenoids (Car), total phenols, anions and cations. Most of these traits (Chl *b*, Na^+ , Cl^- , NO_3^- , SO_4^{2-} , PO_4^{3-}) were accurately predicted by spectral models (model goodness-of-fit for validation, R^2 : 0.65-0.86), and good predictions were also reported for Chl *a*, Chl *a* + Chl *b*, Car, Mg^{2+} , F^- (R^2 : 0.46-0.58). Finally, variations of vegetation spectral indices and leaf traits derived from spectra by developed PLSR-models confirmed the capability of hyperspectral data to monitor the responses of lettuce to nutrient and salt stress. Overall, the present study highlights the utility of scaled-down vegetation spectroscopy as a management and monitoring tool in a protected agrosystem, and suggests that integration of this approach into intelligent and automated protected systems could greatly enhance the efficiency in input management and increase crop quality and safety.

This study was carried out within the Agritech National Research Center and received funding from the European Union Next-GenerationEU (PIANO NAZIONALE DI RIPRESA E RESILIENZA (PNRR) – MISSIONE 4 COMPONENTE 2, INVESTIMENTO 1.4 – D.D. 1032 17/06/2022, CN00000022). This manuscript reflects only the authors' views and opinions, neither the European Union nor the European Commission can be considered responsible for them.

Keywords

crop management, hyperspectral signatures, intelligent and automated greenhouses, Lactuca sativa, trait prediction

S2 - SC12

USING HYPERSPECTRAL DATA TO PREDICT LEAF PHYSIOLOGICAL TRAITS AND DISCRIMINATE OZONE EFFECTS ON GRAPEVINE (*Vitis vinifera* L.)

Giuseppe Quaratiello[1]*, Jacopo Manzini[2], Lorenzo Cotrozzi[1], Yasutomo Hoshika[2], Elisa Pellegrini[1], Cristina Nali[1], Elena Paoletti[2]

[1]Department of Agriculture, Food and Environment, University of Pisa, Via del Borghetto 80, 56124 Pisa, Italy
[2]Institute of Research on Terrestrial Ecosystems, National Research Council of Italy, Via Madonna del Piano 10, 50019 Sesto Fiorentino, Florence, Italy
*E-mail: giuseppe.quaratiello@phd.unipi.it

Abstract

The photosynthetic process and the water relationships can be harnessed to monitor plant's health under unfavourable environmental conditions. Vegetation spectroscopy is a promising tool allowing the rapid and non-destructive monitoring of a wide number of individual plants. Here, we tested the capability of reflectance spectroscopy to predict several grapevine (*Vitis vinifera* L., cv *Cabernet sauvignon*) leaf traits related to photosynthetic and hydric status, under increasing ozone (O_3) concentrations. Full-range hyperspectral profiles (i.e., 400-2400 nm) acquired from leaves exposed to three O_3 concentrations (ambient air, AA; 1.5 × AA O_3, indicated as moderate O_3, MO; 2.0 × AA O_3, indicated as elevated O_3, EO) were coupled with measurements of photosynthetic capacity and water use efficiency (inferred by means of the parametrization Bernacchi's and Variable J models). Predictive spectral models were developed using partial least squares regression. Most of the parameters were well estimated by predictive models (average model goodness-of-fit for validation, R^2: 0.40-0.65). Additionally, the analysis of spectral signatures allowed to discriminate plants exposed to elevated O_3 with high accuracy, both at the first (65%, BBCH 77 = bunch closure) and the second phenological stage (72%, BBCH 83 = berry ripening), even before the onset of O_3-induced visible foliar injuries. The results of the current study could be applied in several scientific fields, such as precision agriculture and plant phenotyping.

Keywords

Vegetation spectroscopy; partial least squares regression; spectral signature; digital agriculture; air pollution

S3 - SC01

Vitro-derived hop plantlets, var. Magnum, are a rich source of bioactive compounds

Leandra Leto[1]*, Anna Agosti[1], Samreen Nazeer[1], Lorenzo Del Vecchio[1], Andrea Di Fazio[1], Valeria Guarrasi[2], Martina Cirlini[1], Benedetta Chiancone[1,2]

[1]Department of Food and Drug, University of Parma, Viale Parco Area delle Scienze 27/A, 43124 Parma, Italy
[2]Institute of Biophysics, National Research Council (CNR), Via Ugo La Malfa 153, 90146 Palermo, Italy
* E-mail: leandra.leto@unipr.it

Abstract

In recent years, the increasing demand for bioactive compounds extracted from plant matrices for use in the pharmaceutical, cosmetic or agri-food industries has stimulated research into the search for green sources from which these molecules can be extracted.
Hops (*Humulus lupulus* L.) are the subject of numerous studies due to their richness in bioactive metabolites, such as terpenoids, phenolic compounds (e.g. xanthohumol), alkaloids and bitter acids (humulone and lupulone), with antioxidant, antimicrobial and antiviral properties, in all parts of the plant.
In addition to the biomass of hop plants grown in open field, stakeholders can also make use of micropropagated plants, whose production is independent of the season.
In this study, *vitro*-derived hop plantlets, var. Magnum, were evaluated as a potential source of bioactive compounds, testing two matrices (whole plant or leaves only), two extraction techniques (shaker or sonicator) and two solvents (ethanol/water or water only). Total phenolic content (TPC) and antioxidant activity (AO) (DPPH, ABTS and FRAP) were measured for each extract.
All tests showed a higher concentration of biomolecules in the leaves, both in terms of TPC and AO, when shaker and alcoholic solvent were used. However, even though the TPC of the green extracts was lower, leaf extracts with water showed comparable values to those extracted with ethanol/water (respectively, 10.02 ± 0.63 mg GAE/g vs. 13.39 ± 0.47 mg GAE/g).
Results obtained, although preliminary, have confirmed the richness in terms of polyphenols of *vitro*-derived hop plantlets, var. Magnum, and the potential of green extraction techniques. Further studies are needed to increase the extraction yield, finding alternative solvents suitable for green extraction.

Keywords

Antioxidant activity, Bioactive compounds, Green extraction, Humulus lupulus L., Micropropagation

S3 - SC02

From Orchard to Table: enhancing *Castanea sativa* traceability using DNA molecular markers along the supply chain

Lorenzo Antonio Marino[1] *, Vera Pavese[1], Paola Ruffa[1], Martina Ferrero[1], Alberto Acquadro[1], Lorenzo Barchi[1], Roberto Botta[1], Daniela Torello Marinoni[1]

[1]Dipartimento di Scienze Agrarie, Forestali e Alimentari-DISAFA, Università degli Studi di Torino, Largo Paolo Braccini 2, 10095 Grugliasco, Torino, Italy
*E-mail: lorenzoantonio.marino@unito.it

Abstract

Castanea sativa Mill. represents one of the most renowned species in Italy for its exceptional organoleptic quality and high nutritional value of its nuts, which are usually destined for fresh consumption, but also for the production of commercial foods. Nowadays, the presence of Chinese chestnut (*C. mollissima*) and Euro-Japanese hybrids (*C. sativa* × *C. crenata*) in the Italian market requires an efficient genetic traceability system to protect the consumers and producers from fraud and to ensure the connection with the territory. Here, we reported a genetic traceability protocol to identify *Castanea* species along the supply chain, from the chestnut orchards to the processed products, based on DNA markers (SSRs and SNPs) analyses.

SSR markers were employed for cultivar identification starting from plant material (leaves, episperm, and seed) and processed food (creams, beverages, flour, and cookies). Even if the SSR analyses allowed to discriminate cultivars starting from somatic tissue (e.g. leaves), the SSR nuclear markers were not able to trace chestnut cultivars from seed and processed food due to the presence of the paternal DNA, derived from pollinizer plants, which interfered with the identification of the maternal cultivar.

Consequently, six *C. sativa* cultivars were Illumina sequenced to circumvent this issue, highlighting maternally inherited markers. A panel of SNP/INDEL markers in the chloroplastic region was identified and validated. This set of plastid SNP/INDEL markers could distinguish *C. sativa* from *C. mollissima* and *C. crenata* species starting both from somatic tissue and processed food. Moreover, High-resolution Melting (HRM) analysis was employed as a functional and efficient approach for SNP/INDEL validation, developing a rapid, reliable, reproducible protocol for chestnut traceability in food products.

Keywords

SSR, SNP, High-Resolution Melting (HRM), maternal inheritance

S3 - SC03

Development of new biotechnological strategies for improving breeding in woody species

Vera Pavese[1]*, Andrea Moglia[1], Lorenzo Antonio Marino[1], Elena Corredoira[2], Ma Teresa Martínez[2], Daniela Torello Marinoni[1], Roberto Botta[1]

[1]Dipartimento di Scienze Agrarie, Forestali e Alimentari—DISAFA, Università degli Studi di Torino, Largo Paolo Braccini 2, Grugliasco, 10095 Torino, Italia
[2]Misión Biológica de Galicia, Sede en Santiago, Consejo Superior de Investigaciones Científicas, Avd. Vigo, s/n, 15705 Santiago de Compostela, Spain
*E-mail: vera.pavese@unito.it

Abstract

Traditional breeding in woody plant species is still challenging, due to long biological and reproductive cycles; the advent of *New Plant Breeding Technologies (NPBTs)*, with the CRISPR/Cas9 system, represents a viable solution for speeding up the breeding process, allowing precise mutation of target genes. In Italy, chestnut and hazelnut are highly appreciated for their nuts, employed in the regional and national confectionery industry.

Due to the lack of extensive genetic information on these species, our research was focused on improving the genetic resources, and accelerating the breeding process by employing *NPBTs*. In chestnut, the CRISPR/Cas9 was applied on somatic embryos, targeting the *phytoene desaturase (pds)* gene, whose knock-out may lead to an albino phenotype; regenerated shoots present the white phenotype with an average editing efficiency of 60%. Additionally, we investigated the application of CRISPR/Cas9 as a ribonucleoprotein complex (RNPs), to produce editing events without transgene integration. This method was applied in both chestnut and hazelnut protoplasts.
In chestnuts, 4,500,000 protoplasts/mL (with 91% viability) were isolated from *C. sativa* embryogenic calli, using 1% Cellulase R-10 and 0.5% Macerozyme R-10 enzymatic solution. In hazelnuts, protoplasts (1,100,000 protoplasts/mL with 99% viability) were derived from somatic calli of 'Tonda Gentile Trilobata' cultivar leaves using 2% Cellulase R-10, 0.5% Macerozyme, and 1% Pectinase from *Aspergillus aculeatus* enzyme solution. In chestnut, the editing efficiency at pds locus upon RNPs transfection ranged between 15% to 20%. In hazelnut experimentation with RNPs is currently underway, acting on the *Terminal flower 1 (tfl1)* gene, whose mutation causes early flowering in vitro, a promising trait for the advancement of new breeding strategies.

Keywords

CRISPR/Cas9; phytoene desaturase; protoplast; resilience; gene editing

S3 - SC04

Unveiling hidden potential : wild tomatoes for enhancing agrobiodiversity and face salinity stress in the Anthropocene

Susanna Cialli[1]*, Alice Trivellini[2], Giulia Carmassi[2], Luca Incrocci[2], Anna Mensuali[1]

[1]Crop Science Research Center, School of Advanced Studies Sant'Anna, Pisa, Italy
[2]Department of Agricultural, Food and Agro-environmental Sciences, University of Pisa, Pisa, Italy
*E-mail: susanna.cialli@santannapisa.it

Abstract

The Anthropocene epoch, marked by significant human influence on Earth's ecosystems, poses various challenges, including agrobiodiversity loss. Biodiversity is crucial for mitigating abiotic stresses, with salinity posing a major concern in agriculture. Climate change worsens this scenario, with soil salinization emerging as a global threat. In thiscontext, seawater offers promise due to its global abundance across the globe. While using only seawater is not feasible, combining it with freshwater holds promise in addressing issues. Tomatoes, which have a moderate tolerance to salt, belong to the *Solanaceae* family and are closely related to 13 species in the *Lycopersicon* section. This section hosts wild relatives and traditional landraces, serving as repositories of valuable traits. Eleven species prosper in arid habitats from the Andes to the Pacific coast (Ecuador to Chile), with two natives to the Galapagos Islands. *Solanum pimpinellifolium*, within this section, is the closest relative to cultivated tomatoes. These wild varieties, which have evolved in challenging natural conditions, represent valuable reservoirs of genetic diversity that could improve the performance of modern crops, particularly in the face of current climate changes. This study aimed to investigate the different tolerance to salinity present in wild tomato varieties (*Solanum pimpinellifolium* L.) to enrich agrobiodiversity. The goal was to enhance the gene pool of modern cultivars and address climate challenges in the Mediterranean region utilizing their adaptability to salt stress. An in vitro screening was set up to evaluate biometric and biochemical parameters, analyzing numerous accessions in confined growth chambers. Autotrophic conditions were recreated using sucrose-free culture medium, mimicking in vivo responses. Sea salt simulated seawater stress. The results distinguished key parameters related to salt stress. S. *pimpinellifolium* L. accessions studied so far have demonstrated greater resistance to salinity compared to conventional cultivars in growing media supplemented with 60% seawater.

Keywords

S. lycopersicum, S. pimpinellifolium, seasalt, abiotic, stress

S3 - SC05

Morphological and qualitative characterization of four tomatoes (*Solanum lycopersicum* L.) landraces from Piedmont

Fabiana Marino*, Silvana Nicola

Dept. of Agricultural, Forest and Food Sciences (DISAFA), University of Turin.
*E-mail: fabiana.marino@unito.it

Abstract

The valorization of local varieties or landraces of agricultural plant species is fundamental for the preservation of agrobiodiversity. Landraces represent an important source of genetic diversity as they are ancient populations developed in specific regions, demonstrating significant adaptation to marginal environments. The purpose of this study, conducted within the framework of the project *"Conservation, sustainable use, and development of plant genetic resources in agriculture. Frumatica: durum wheat and tomato*" (RDP 2014-2020 Piedmont), was the evaluation of morphological and qualitative characteristics of four tomato landraces from the Piedmont Region (Bela Rosina, Costoluto di Cambiano, Piatta di Bernezzo and Velluto Canavesano). The tomato landraces were cultivated during the summer season in 2023 following organic farming practices, and two trial fields were set up (one in protected cultivation and one in open field). Characterization was performed using the morphological descriptors listed in the morphological description sheet No. 29 for tomatoes proposed by the Working Group for Biodiversity in Agriculture (*Gruppo di lavoro per la Biodiversità in Agricoltura, GIBA*). The analyses allowed for the evaluation of tomato plant responses to the two cultivation techniques (in tunnel and open field), highlighting differences and similarities at morpho-physiological and qualitative levels among the four local tomato varieties. In particular, Bela Rosina stood out from other landraces for its rosy color and, qualitatively, for the higher °Brix level. In Velluto Canavesano the distinctive feature observed was the larger fruit size compared to other landraces. Costoluto di Cambiano and Piatta di Bernezzo were found to be very
similar for all observed traits. These similarities might suggest that the two landraces are closely related genetically and may not be considered distinct genotypes. It would be advisable to conduct a genetic analysis to assess the genealogy between these two varieties before requesting their registration in the National Register of Conservation Varieties.

Acknowledgments

ASCI (Associazione Solidarietà Campagna Italiana) for the recovery and provision of tomato seeds and place.

Keywords

agrobiodiversity; local varieties; morphological descriptors; qualitative traits

S4 - SC01

Biostimulants as effectors of Metabolic Profiling and Phenotypic Plasticity under changing environment.

Giovanna Marta Fusco[1]*, Rosalinda Nicastro[1], Letizia Pagliaro[1] and Petronia Carillo[1]

[1]Department of Environmental, Biological and Pharmaceutical Sciences and Technologies, University of Campania "Luigi Vanvitelli", 81100, Caserta. Italy
*E-mail: giovannamarta.fusco@unicampania.it

Abstract

As the agricultural sector should face the new challenges posed by climate change through low impact production practices, there is a growing interest in biostimulants as new paradigm for the sustainable intensification of crops. These products, regardless of type, have the potential to improve resource use efficiency and strengthen plant resilience to abiotic stresses.
Although recent research has focused primarily on quantifiable parameters, the complex biochemical, cellular, and metabolic interactions between plants and biostimulants remain largely unexplored. This lack of understanding extends to the mechanisms underlying the effects of biostimulants on plants, particularly regarding the new biostimulant formulations, which contain various bioactive molecules. Although the studies on the management of biostimulants, have mainly focused on the timing and method of application in order to assess the true potential of these products, we have examined the effects of different formulations of biostimulants, on the primary and/or secondary metabolism of plants in dependence on the synergistic action of their bioactive components. In particular we have examined the effects of protein hydrolysates (PH) on juta, spinach and basil, and also microrganisms on different tomato varieties. Understanding how biostimulants, or their components, work is pivotal for improving the knowledge behind their development for producing better products able to boost the rpoduction of high-quality food while protecting the enviroment in the long run.

Keywords

Biostimulants, metabolic profile, bioactive compounds,crops, climate change

S4 - SC02

Cerato and Curniciello dry beans: molecular characterization of two different ecotypes from Caserta's rural areas

Laura Alberico[1]* and Pasqualina Woodrow[1]

[1]Department of Environmental, Biological and Pharmaceutical Sciences and Technologies (DiSTABiF), University of Campania 'Luigi Vanvitelli', Via Vivaldi 43, 81100-Caserta, Italy
* e-mail: laura.alberico@unicampania.it

Abstract

Campania's agricultural products represent an important patrimony, both economically and culturally, to promote and safeguard. The research sector has implemented numerous programs for recovering, characterizing, and valorizing local varieties and ecotypes. Common bean (*Phaseolus vulgaris* L.; family Fabaceae) is an annual herbaceous plant that produces pods and edible seeds. Cerato and Curniciello dry beans are two different ecotypes cultivated in the rural areas of Caserta (Southern Italy).
The nutritional value shows that dry beans are a good source of crude proteins, starch, fibers, vitamins, and minerals. Consumers, seeking a healthy lifestyle, are reconsidering the consumption of crude proteins from plant-based foods. In this work, we have analysed the nutritional composition and results showed that Cerato has a lower content of crude proteins (21.18 vs 23.41 g/100 g), lipids (1.27 vs 2.08 g/100 g) and total amino acids (16.01 vs. 17.89 g/100 g) compared to Curniciello dry beans.
Finally, a molecular characterization using the AFLP molecular marker was performed. The results of the AFLP assay showed a total of 253 bands, ranging in size from 250 bp to 2500 bp, of which 89 (35%) were monomorphic bands. A similarity matrix, based on Jaccard's coefficient, was constructed including AFLP profiles. The two landraces have reproducible polymorphic bands demonstrating that there is a certain degree of variability between the two different ecotypes but low variability within the same landrace and a different genetic pool despite the proximity of the two cultivation areas (20 km). Molecular characterization is also essential for traceability purposes aiding in the prevention of food fraud and product adulteration throughout the food chain.

Keywords

Phaseolus vulgaris L., AFLP, genetic characterization, nutritional profile, valorizing local cultivars

Sustainable strategies to improve plant growth and protection: biostimulant action of *Brassicaceae* hydrolysates and new solarization system for pest control

Annamaria Massafra[1,2]*, Laura Righetti[2], Irma Terracciano[2], Luisa Ugolini[2], Laura Bassolino[2], Valerio Battaglia[3], Ernesto Lahoz[3], Pasquale Mormile[4], Nicola Pecchioni[1,2]

[1]University of Modena-Reggio Emilia (Department of Life Sciences, University of Modena-Reggio Emilia, Via Amendola 2, 42122 Reggio Emilia, Italy)
[2]Council for Agricultural Research and Economics (CREA), Research Centre for Cereal and Industrial Crops, via di Corticella n. 133, 40128, Bologna, Italy
[3]Council for Agricultural Research and Economics (CREA), Research Centre for Cereal and Industrial Crops, via Torrino 2, 81100 Caserta, Italy
[4]Green App Srls, Contrada Olivola 129/a, Benevento, Italy
*E-mail: annamaria.massafra@crea.gov.it, annamaria.massafra@unimore.it

Abstract

Climate change and intensive pollution negatively affect crop and food production worldwide. Developing new and effective sustainable strategies to enhance plant growth and protection represents a significant challenge for an eco-efficient agriculture. We aim to evaluate the effects of alternative methods to the use of synthetic products for plant growth and defence.
Defatted seed meal from the Brassicaceae *Eruca sativa* and *Crambe abyssinica* are used as a substrate to produce protein hydrolysates as plant biostimulants. The protein hydrolysates are prepared using a two-step enzymatic hydrolysis and characterized for chemical parameters, including nitrogen, carbon, free amino acids, and other bioactive molecule content.
Modifications to pH, incubation time, and proteolytic enzymes will be performed to make the hydrolysis protocol easier to scale-up. Preliminary investigations are currently conducted utilizing established *in vitro* bioassays on model plants to evaluate hormone-like activity, with a particular focus on root development. Similar bioassays are adapted to commercial tomato cultivars. Furthermore, the expression of a set of tomato genes associated with nutrient transport, growth-promoting factors, and plant response to stress is used to screen for biostimulant activity and understand mode of action. In addition, we will assess the impact of an innovative soil solarization system (Solin®, Polyeur), compared to traditional solarization methods, on soil-borne pest management and fruit quality traits of a commercial tomato variety cultivated in high tunnel condition in Campania region. Initially, the effect of time-temperature ranges on selected soil-borne pathogens' activity will be determined in pots using the Micro-Tom cultivar, a model system for tomato genetics.
Molecular analysis to assess the genes involved in plant-pathogen interaction and fruit quality will also be conducted.

Keywords

Brassicaceae, plant biostimulants, protein hydrolysates, solarization, gene expression

S4 - SC04

Biological activity of plant defence inducers: deeds not words

Cosimo Beltrami[1]*, Chiara Pastacaldi[1], Dario Gaudioso[1], Stefania Tegli[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Molecular Plant Pathology Lab, Via della Lastruccia, 10, 50019 Sesto Fiorentino, Firenze, Italy
*E-mail: cosimo.beltrami@unifi.it

Abstract

Pesticides and fertilisers are widely used to protect the plant health and to support their growth and development. In recent years, biostimulants and corroborants have been increasingly adopted for their potential replacement. Within a system of sustainable agriculture and circular economy, obtaining similar functional products from waste and by-products is a challenge to be accepted. However, plant defence inducers still play an unclear role within this classification: they can be classified within corroborants, they induce defences to abiotic stresses as done by biostimulants, and antimicrobial activity cannot be direct, but mediated by activation of plant mechanisms.
In what appears to be a complex and unclear context, the aim of this work is to set scientific standards, which may be repeatable and reliable, to study the impact of these bioproducts on plant systems, starting from simple to more structured assays. Several commercial products, mainly distributed as defence inducers, were selected and compared to other extracts from agro-forestry wastes.
To this aim, several assays were set up with various in vitro plant models.
Regarding defence induction mechanisms, an assay on the analysis of released electrolytes was set up, as these are released more in the early stages of defence. In addition, gene expression analyses were carried out on in vitro plants (*Nicotiana tabacum* and *Solanum lycopersicum*) treated with potential and commercially available defence inducers to assess pathways involved in both developmental and defence mechanisms.
Finally, some *in vitro* plant-pathogen assays were also set up to evaluate the direct effect of these substances within the interaction.

Keywords

Plant defence, biostimulants, standard assays, in vitro test, circular economy

S4 - SC05

ANTIFUNGAL ACTIVITY OF FIVE BIOLOGICAL EXTRACTS AGAINST THE CAUSAL AGENT OF GREY MOLD

Giulia Scimone[1]*, Cathryn Todd[2], Tarita Furlan[2], Mark Sosnowski[2], Cristina Nali[1], Elisa Pellegrini[1]

[1]Department of Agriculture, Food and Environment, University of Pisa, Via del Borghetto 80, Pisa, Italy
[2]South Australia Research and Development Institute, Gate 2b Hartley Grove, Adelaide, Australia
*E-mail: giulia.scimone@phd.unipi.it

Abstract

Due to its short life cycle and high reproductive rate, the causal agent of grey mold, *Botrytis cinerea*, is considered a 'high-risk' pathogen in terms of fungicide resistance development, representing a serious threat in crop protection. The overuse of agrochemicals and the presence of resistant strains lead research towards the study of new 'green' and affordable tools to use in matter of grey mold management. This work aims to investigate the inhibitory effect of four essential oils (EOs; cinnamon, clove, basil and orange) and of a garlic extract (GE) against *B. cinerea* through *in vitro* screening tests. Potato dextrose agar (PDA) was amended with three rates of each extract (0.025, 0.05 and 0.1% v/v for the EOs, while 1, 5 and 10% v/v for GE) and inoculated with *B. cinerea* mycelial plugs (5 mm Ø). Fungal growth was measured every 24 h until the control colony (grown on PDA amended with water) reached the Petri dishes edges. At the end of the experiment, results showed 0.05 and 0.1% cinnamon EO completely inhibited *B. cinerea* mycelium growth, while 0.1% of clove and basil EOs reduced mycelial growth by 79 and 29%, respectively. The 10% GE reduced *B. cinerea* growth by 46%. No rate of orange EO tested inhibited *B. cinerea,* as well as 1 and 5% GE, by the end of experiment. In contrast, they stimulated fungal growth at 48 h (+26% as average). Based on these results some EOs and GE show potential in controlling *B. cinerea*, but the rate influences efficacy in vitro. Further trials are needed to determine their field application potential through in *vivo* evaluations.

Keywords

Integrated Pest management, Botrytis cinerea, fungistatic activity

S4 - SC06 BIOFERTILIZERS IN ALMOND CROP

Laura Mandrelli[1]*, Adriano Sofo[1]*, Antonio Monteforte[2]*, Silvia Pascazio[2]*, Rosa Rubino[2]*, Carlo Pazzani[3]*, Maria Scrascia[3]*, Angelo Marzella[3]*, Angelantonio Calabrese[4]*

[1]Università degli Studi della Basilicata (Dipartimento delle Culture Europee e del Mediterraneo, Via Lanera, 20, 75100Matera MT)
[2]Tersan Puglia (S.P. 231 Km. 1,600, 70026 Modugno BA)
[3]Università degli Studi di Bari Aldo Moro (Dipartimento di Bioscienze, Biotecnologie e Ambiente -DBBA, Campus Universitario Ernesto Quagliariello Via E. Orabona, 4 70125 - BARI)
[4]CNR-IRSA sez. Bari (V.le Francesco de Blasio, 5, 70132 Bari BA)
*E-mail: laura.mandrelli@unibas.it
*E-mail: adriano.sofo@unibas.it
*E-mail: a.monteforte@biovegetal.it
*E-mail: s.pascazio@tersan.it
*E-mail: r.rubino@tersan.it
*E-mail: carlo.pazzani@uniba.it
*E-mail: maria.scrascia@uniba.it
*E-mail: angelo.marzella@uniba.it
*E-mail: angelantonio.calabrese@ba.irsa.cnr.it

Abstract

A high level of dependence on chemical fertilizers as a means of increasing food production has damaged the ecological balance of agricultural soils. Long-term application of mineral nitrogen fertilizers reduces soil microbial activity resulting in a loss of biodiversity and fertility.
From this perspective, biofertilizers represent an important resource which, combined with sustainable agronomic practices, could help to face the current agricultural problems and improve soil fertility over the long term.
The exploitation of beneficial soil microorganisms in the formulation of biofertilizers, such as plant growth-promoting bacteria and fungi, is one potential solution to this problem, providing plants with nutrients required to enhance their growth, increase yield, and prevent abiotic and biotic stress and phytopathogens attack.
In this scenario, the objective of the current work was to evaluate the agronomic efficiency and the effect of different biofertilizers on the biological soil fertility in en experimental almond field located in Modugno (Bari), in southern Italy.
The experimental field was randomised by splitting up the area into four sub-sections for a total of twenty-four plants per treatment over the whole experimental site. Six treatments were performed, among which the organic biofertilizer Biovegetal® , two products enriched with microbial consortia, another organic biofertilizer, a stable manure and an organo-mineral fertilizer.
The activity was focused on monitoring the effects of the application of the different biofertilisers on plant physiological parameters (biometric parameters, foliar diagnostics, water use efficiency, NDVI index detection), chemico-physical properties, soil enzymatic activities (FDA, phosphatase) and soil microbiological properties (DNA extraction and quantification, PCR, bacterial and fungal counts, DNA sequencing).
The effect of biofertilisers on the release and spread of antibiotic resistance genes in agricultural soils is also being studied.
The results of the first year of monitoring showed the first positive responses on theplants treated with the biofertilizers. Particularly, the products enriched with fungal consortium seem to improve the agronomic performance of the plants.

Keywords

Biofertilizers; Sustainable agriculture; Beneficial microorganisms; Almond production ; Antibiotic resistance

S4 - SC07

Two novel biostimulants alleviate drought stress and shape root architecture in durum wheat

Matteo Spada[1]*, Eleonora Coppa[1], Giulia Quagliata[1], Valentina Bigini[1], Daniel Savatin[1], Roberto Ruggeri[1], Francesco Rossini[1], Stefania Astolfi[1]

[1]Department of Agricoltural and Forest Science, University of Tuscia, Address Via San Camillo De Lellis snc
*E-mail: matteo.spada1@unitus.it

Abstract

In the Mediterranean basin, crop productivity and food security are closely linked to the ability of the cropping systems to cope with the challenges imposed by abiotic stresses, such as drought. Limited water availability limits crop productivity by hindering photosynthetic activity and nutrient uptake.
Durum wheat (DW) is crucial for food security of Mediterranean countries, thus novel alternative and targeted strategies are required to improve its resilience to adverse environmental conditions.
In this perspective, biostimulants could be a strategic tool, being able to improve nutrient use efficiency, crop quality, and tolerance to environmental stresses.
This study attempted to minimize the effects of drought in DW genotypes with varying degrees of drought tolerance through the application of two biostimulants, B1 and B2. Both biostimulants were applied via foliar spraying four days after drought stress onset and contained glycine-betaine and vaterite. B1 was also added with a mixture of extracts from the seaweed Codium fragile (Suringar) Hariot and the plant Opuntia ficus-barbarica A. Berger, while B2 also contained Pseudomonas protegens.
Drought significantly reduced the growth of sensitive DW cultivar Iride by increasing oxidative stress and reducing stomata density, most likely affecting gas exchange. However, the application of biostimulants enabled plants to withstand the period of water shortage, by increasing stomata density and by shaping plant root systems. On the other hand, the two biostimulants tested had limited effectiveness when applied to DW genotype Svems16, most likely due to its higher drought tolerance degree (Quagliata et al., 2023).
In conclusion, we have demonstrated that the treatment with biostimulants significantly enhanced the plant ability to face water-limited environments and was especially relevant for drought-sensitive plants.
These findings highlight the potential of biostimulants as a tool to enhance crop resilience and contribute to sustainable agricultural practices.

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Keywords

Biostimulant, Drought stress, Durum wheat, MDA, Stomata

S4 - SC08

Investigate the use of cellulose fibers as a carrier for the development of a Gram-negative bacterial inoculant

Beatrice Farda[1]*, Rihab Djebaili[1], Enrico Sabbi[1], Luz de-Bashan[2], Iris Beatriz Vega Erramuspe[3], Fabrizia Pasquarelli[4], Marika Pellegrini[1]

[1]Department of Life, Health and Environmental Sciences, University of L'Aquila, Via Vetoio 40, L'Aquila, 67100 AQ, Italy
[2]The Bashan Institute of Science, 1730 Post Oak Court, Auburn, 36830 AL, USA
[3]Forest Products Development Center, College of Forestry, Wildlife & Environment, Auburn University, 520 Devall Drive, Auburn, 36849 AL, USA
[4]SPAA s.r.l., Via delle Industrie 11-13, Città Sant'Angelo, 65013 PE, Italy
*E-mail: beatrice.farda@graduate.univaq.it

Abstract

The development of efficient and long-term storage formulations is a major challenge in the production of microbial inoculants for sustainable agriculture. Today, bacterial immobilization on solid supports is a well-established technology and the use of sustainable carriers is attracting new areas of research. In this study, cellulose functional fibers (FF) derived from the pulp industry were tested as a microbial carrier for the Gram-negative bacterial consortium formed by *Azospirillum brasilense*, *Burkholderia ambifaria, Gluconacetobacter diazotrophicus* and *Herbaspirillum seropedicae*. Using a co-culture bioreaction, the consortium was immobilized on FF mixing it with the fibers (1% w/v) to allow the microbial self-adhesion on the surface. The FF were inoculated at three different times during the bioreaction and in different cultural media (T4 and SPAA). Freeze-drying and heat-drying were used as drying methods. The cell viability was detected in wet FF, and dried fibers (1, 15 and 30 days after drying) and the results were expressed in log CFU g^{-1}. Immobilized bacteria were also determined for plant growth-promoting (PGP) traits, such as phytohormons, ammonia production, and phosphate solubilization. The results showed bacterial colonization and exopolysaccharide sheets on FF surfaces, as revealed by scanning electron microscopy visualization. Wet FF showed a good microbial charge (7.5-8.1 Log CFU g^{-1}) and the cell viability after drying was 2 Log CFU g^{-1} lower compared to the wet FF. Significant results were obtained comparing the two different growth conditions and FF inoculation timing ($p<0.05$). Differences between the control (unmodified cellulose fibers) and FF were observed after the drying step, underling the potential role of chemical modification to enhance cell protection. PGP tests showed good results compared to not immobilized consortium. These preliminary findings provide the basis for future studies, focusing on shelf-life tests and optimal application through *in planta* and greenhouse experiments.

Keywords

microbial inoculants, carrier, functional cellulose fibers, cell viability, sustainable agriculture

S4 - SC09

Yield and Nutraceutical Value of Lettuce and Basil Improved by a Microbial Inoculum in Greenhouse Experiments

Elia Pagliarini*, Francesca Gaggìa, Maurizio Quartieri, Moreno Toselli, Diana Di Gioia

Department of Agricultural and Food Science, University of Bologna, V. le Fanin 44, 40127 Bologna, Italy
*E-mail: elia.pagliarini2@unibo.it

Abstract

Agricultural production is increasingly threatened by poorly available nutrients in the soil, scarcity of water for irrigation, reduced soil microbial biodiversity and chemical inputs. A possible solution of these problems comes from the selection of high-performance microorganisms called "Plant Growth Promoting Rhizobacteria" (PGPR), which become active ingredients of biostimulant products for cereal and horticultural crops. In this study, 14 microbial strains, belonging to the genera *Bacillus, Pseudomonas* and *Stenotrophomonas*, were tested on lettuce greenhouse experiment to assess the potential PGP effects. Inocula of 109 CFU·ml-1 of each bacterial strain (a total of 20 ml/pot) were performed three times before harvesting. Analysis on fresh and dry foliar biomass allowed identifying a new isolate, namely *Bacillus haynesii* VWC18, which gave the best results in plant development. A new test with lettuce was then carried out to assess different inoculum concentrations and application times. Analysis of leaf yield and nutrients adsorption showed a significant response of the lowest (10^3 CFU·ml^{-1}) and the highest dose (10^9 CFU·ml^{-1}), applied every ten days until harvest. A new randomized block design with three replicates was performed in lettuce and basil, with the two selected doses, applied every ten days. Root weight, chlorophyll and carotenoids were also examined. Inoculation of *Bacillus haynesii* VWC18 promoted plant growth, chlorophyll and mineral absorption in both crop species. In basil, a dose-dependent increase was observed. The root biomass development resulted an important issue, since a greater root expansion improves the capability of plants to respond to water shortage and to optimize the use of available water. From these results, it has been possible to identify a new isolate, which can be considered in the development of a biostimulant formulation in order to promote the yield and quality of vegetable crops by reducing the intake of chemical fertilizers and synthetic agrochemicals.

Keywords

PGPR, Bacillus spp, Lactuca sativa L, Ocinum basilicum L, mineral uptake, biostimulant

S5 - SC01

From endophytic to plant-pathogenic bacteria and return: unraveling evolution of pathogenicity and virulence

Dario Gaudioso[1]*, Chiara Pastacaldi[1], Cosimo Beltrami[1], Stefania Tegli[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Molecular Plant Pathology Lab, Via della Lastruccia, 10, 50019 Sesto Fiorentino, Firenze, Italy
*E-mail: dario.gaudioso@unifi.it

Abstract

Endophytes are increasingly studied for their potential to protect plants from pathogenic diseases, particularly in agriculture. Their unique feature is their ability to colonize the internal tissues of plants without causing any symptoms. While *Curtobacterium flaccumfaciens (Cf)* has been identified as an endophyte, and has been found effective as a biocontrol agent against phytopathogenic bacteria like *Xylella fastidiosa, Curtobacterium flaccumfaciens pv. flaccumfaciens (Cff)* is recognized as a plant pathogen, causing bean bacterial wilt.
Phytopathogenic bacteria possess sophisticated mechanisms enabling the successful colonization of host plants and initiating infection. Recent studies have highlighted the involvement of pathogenicity islands (PAI) and specific genes like cellulases, proteases, and pectinases in the pathogenicity processes. This suggests that horizontal gene transfer among phylogenetically related microorganisms may have led to the acquisition by *Cf* of genetic traits conferring pathogenicity towards *Cff* evolution.
Here for the first time, a mutagenesis protocol has been developed for the EU quarantine bacterium *Cff*. Knock-out mutants for a protease, a cellulase, a pectinase, and a PAI, as well as for their combinations, were obtained through marker exchange mutagenesis. The mutants exhibited variable roles in *Cff* virulence when artificially inoculated on bean plants. In vitro tests revealed a significant reduction (50-70%) in proteolytic and cellulolytic activity for some mutants. However, reduced pectinase activity was shown using *Citrus pectin,* which needs to be further investigated. In addition, a more reduced degradative capacity was observed in double and triple mutants compared with singles, particularly in the protease activity assay.
Hence, it appears that PAI and the identified genes may play a significant role in virulence mechanisms, which may have conferred at least some disease-causing capacity from *Cf* to *Cff.*
In conclusion, this study raises new answers about virulence, serving as a valuable case study for understanding the acquisition of pathogenicity traits in bacteria.

Keywords

Endophytes, phytopathogens, virulence, mutagenesis, gene transfer

S5 - SC02

Occurrence of tomato mosaic virus (ToMV) in three tomato cultivars under salt conditions: molecular characterization of ToMV isolates and elucidation of their physiochemical effects

Athos Pedrelli[1,2]*, Giovanni Orlandini[1], Lorenzo Pippi[1,3], Alessandra Panattoni[1], Fatjon Cela[1], Cristina Nali[1], Luca Incrocci[1], Marco Landi[1], Lorenzo Cotrozzi[1]

[1]Department of Agriculture, Food and Environment, University of Pisa, Pisa, Italy
[2]Department of Biological and Environmental Sciences and Technologies, University of Salento, Lecce, Italy
[3]University School for Advanced Studies IUSS Pavia, Pavia, Italy
*E-mail: athos.pedrelli@phd.unipi.it; athos.pedrelli@unisalento.it

Abstract

The present work describes research on three tomato (Solanum lycopersicum) cultivars (phenotypically closely related: 'Pisanello', typical of Tuscany, Central Italy, 'Goldmar' and 'Isbylia', commercial F1 hybrids), grown under normal and high salinity (electrical conductivity = 3 or 6 mS cm-1, respectively), and showing virus-like symptoms on leaves. The occurrence of the most destructive (tomato brown rugose fruit virus, ToBRFV; tomato spotted wilt virus, TSWV; tomato mosaic virus, ToMV; pepino mosaic virus, PepMV) and other minor viruses (tobacco mosaic virus TMV; cucumber mosaic virus, CMV) was assayed. The polymerase chain reaction analysis revealed only ToMV (87% of tested leaves), with cycle thresholds values ranging from 21 to 30. Pisanello, Goldmar, and Isbylia plants subjected to normal salinity showed 100, 80, and 50% of ToMV positivity, respectively. Under high salinity, Pisanello and Goldmar showed a 100% positivity, while a 90% rate was reported for Isbylia. Overall, only 13% of plants tested negative.
Molecular typing of ToMV isolates showed three new nucleotide variants (IT-Agritech-1, IT-Agritech-2, and IT-Agritech-3), but found only in Goldmar and Pisanello. The IT-Agritech-1 was found in 82% of tested samples, while the other two in 9% each. The phylogenetic analysis showed these variants clustering together near the isolate Ker.Pep.38 (JX121573) found in *Capsicum annuum*. The physiochemical effects induced by ToMV, assessed by hyperspectral measurements and standard wet chemistry, resulted both cultivar and salt stress specific. In particular, photochemical reflectance index was mostly reduced in high salt subjected Pisanello, whereas no variations in hydrogen peroxide content were reported, phenolic content did not change in Goldmar and Isbylia, while significantly increased in Pisanello, and a rise of proline content was observed in all the cultivars, but only under high salt stress. Overall, the present study represents a pioneering step in highlighting the interactions of viral infection and salt stress in tomato cultivars.

This study was carried out within the Agritech National Research Center and received funding from the European Union Next-GenerationEU (PIANO NAZIONALE DI RIPRESA E RESILIENZA (PNRR) – MISSIONE 4 COMPONENTE 2, INVESTIMENTO 1.4 – D.D. 1032 17/06/2022, CN00000022). This manuscript reflects only the authors' views and opinions, neither the European Union nor the European Commission can be considered responsible for them.

Keywords

Goldmar, Isbylia, Pisanello, phylogenetic analysis, photochemical reflectance index

S5 - SC03

Plant-derived antimicrobial compounds: chemical characterisation and *in vitro* activity against food-borne pathogens

Federica Barbieri[1]*, Chiara Montanari[1], Daniela Bassi[2], Sara Morandi[2], Vida Šimat[3], Martina Čagalj[3], Fausto Gardini[1], Giulia Tabanelli[1]

[1]Department of Agricultural and Food Sciences, University of Bologna, Cesena, Italy
[2]Department for Sustainable Food Process, University Cattolica del Sacro Cuore, Cremona, Italy
[3]Department of Marine Studies, University of Split, Split, Croatia
*E-mail: federica.barbieri16@unibo.it

Abstract

In recent years, the consumer demand for safe and minimally processed foods, without chemical additives, is increasing. In this perspective, the possible application of natural bioactive compounds or essential oils (EOs) with antimicrobial potential could provide an innovative biotechnological tool to assure safety and quality of fresh products. In this research work, different bioactive compounds (phenolic extracts) and EOs, obtained from agro-food sector by-products or medicinal plants were investigated. In particular, they were characterised for their chemical composition through chromatographic techniques and tested *in vitro* to assess their antioxidant activity and Minimum Inhibitory Concentration (MIC) against some spoilage microorganisms (i.*e. Enterococcus faecalis* EF37) and food-borne pathogens (*i.e. Listeria monocytogenes* Scott A). The data showed a complex and interesting chemical profile, with the presence of molecules that have been reported to exert antimicrobial activity. Their effect resulted promising, especially against Gram-positive microorganisms. Moreover, to better study the potential of these natural compounds on microbial cells, a sub-lethal concentration of the most promising samples was added to a culture medium inoculated with *L. monocytogenes* Scott A. The microbial growth dynamics were modelled to highlight differences in the microbial population behaviours and a flow cytometric analysis was used to evidence the effects of these plant derivatives on viability and physiological state of target microorganism. This research has the purpose to increase the knowledge of these plant matrices and to exploit their potential in improving food quality, safety, and nutritional value. This approach can offer a sustainable alternative, widely accepted by consumers, for traditional and fresh food production.

Keywords

natural bioactive compounds, essential oils, antimicrobial activity, flow cytometer, Listeria monocytogenes

S5 - SC04

INFLUENCE OF MULCH FILMS CONTAINING PHTHALATES ON THE SOIL MICROBIAL COMMUNITY : EVIDENCE FROM A SMALL-SCALE STRAWBERRY CULTIVATION EXPERIMENT

Agnese Bellabarba*[1,2], Costanza Scopetani[3], Giulia Selvolini3, Tania Martellini[3,4], Alessandra Cincinelli[3,4], Giovanna Marrazza[2], Alessandra Adessi[2], Carlo Viti[1,2]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, I-50144, Florence, Italy
[2]Genexpress Laboratory, Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Via della Lastruccia 14, I-50019, Sesto Fiorentino, Italy
[3]Department of Chemistry "Ugo Schiff", University of Florence, Via della Lastruccia 3, I-50019 Sesto Fiorentino, Italy
[4]CSGI, University of Florence, Sesto Fiorentino, 50019, Florence, Italy
*E-mail: agnese.bellabarba@unifi.it

Abstract

Soils play a vital role in agri-food production systems, but they can face pressure from plastic pollution, particularly during mulching practices. Mulching materials commonly used often contain contaminants like phthalates, known as endocrine disruptors for humans. These plastic additives may leach into agricultural soils, causing significant changes in microbial community composition. Besides affecting the close interaction between microbiomes and plants, these shifts may ultimately enter the food webs, then posing risks to both soil health and food safety. To investigate the potential impact of phthalates on soil microbial communities, a small-scale in-field experiment was conducted mimicking strawberry cultivation using four different types of mulching films. High-throughput sequencing of the 16S rRNA gene was employed to analyze soil bacterial microbial communities. Moreover, preliminary assessments of phthalates present in mulching films were performed to quantify their presence in soil samples.
According to our findings, there was no variation in species richness of bacterial communities across different mulching films used. However, we observed a more even and diverse distribution of bacterial species in soil communities covered with polyethylene-based films. Notably, significant differences in soil bacterial community structures were recorded among the various mulching films employed, leading to differences in beta diversity. Our correlation analysis revealed that different amounts of different classes of phthalates originated from the diverse mulching films, were associated with distinct bacterial community structure. In conclusion, our preliminary results highlighted how different mulch films can impact soil bacterial communities differently, and suggest that the release of different phthalates into soils may drive changes in these communities.

Keywords

mulching, soil microbial communities, phthalates

S5 - SC05

HARNESSING PHOTOSYNTHETIC MICROORGANISMS IN PHOTOBIOREFINERIES: RESOURCE RECOVERY AND VALUE-ADDED BYPRODUCTS FOR SUSTAINABLE SOLUTIONS

M. Ciani[1]*, L. Bernabò[1], G. Daly[1], C. Capelli[1], K. Guehaz[2], M. Daghio[1], C. Viti[1], A. Adessi[1]

[1]Department of Agriculture, Food, Environment and Forestry, University of Florence, Italy.
[2]Laboratory for the Protection of Ecosystems in Arid and Semi-Arid Zones, FNSV, Kasdi Merbah University, Ouargla, Algeria.
*E-mail: matilde.ciani@unifi.it

Abstract

Novel photobiorefineries, based on the combined action of solar radiation and photosynthetic microorganisms, can support the conversion of carbon and nutrients from waste streams into value-added byproducts addressing sustainability challenges. Anthropic activities have inflicted huge impacts on the environment, including pollution, resource depletion, and climate change. Photobiorefineries offer a sustainable solution to mitigate these impacts by utilizing photosynthetic microorganisms for nutrients and carbon upgrading coupled with the production of green chemicals and fuels by biochemical transformations.
As an example, organic waste streams, a consequence of industrial and agricultural activities, can serve as substrates for purple non-sulfur bacteria (PNSB) cultivation, which can produce biohydrogen gas (H_2) as a byproduct of anoxygenic photosynthesis. This process not only addresses waste management challenges but also provides a clean energy source, contributing to the transition towards a carbon-neutral economy.
Cyanobacteria (prokaryotic) and microalgae (eukaryotic) are other phototrophic microorganisms that exhibit remarkable potential in wastewater treatment and biogas upgrading for biomass production, reducing eutrophication risk. Due to the high binding capacity of exocellular polymeric substances to metallic ions, produced biomass can be adopted for heavy metals biosorption, metallic nanoparticle synthesis, and the production of metallic-organic catalysts.
In conclusion, photobiorefineries offer a sustainable pathway toward resource recovery and value-added byproduct synthesis to mitigate the adverse impacts of human activity on the environment. Future endeavors should focus on optimizing photobiorefinery processes to maximize resource utilization and minimize ecological footprints.

Keywords

Photobiorefinery; PNSB; Cyanobacteria; circular economy

S5 - SC06

Innovative Approaches to Bacterial Identification: Oxford Nanopore Sequencing in Complex Matrices

Ida Romano[1]*, Natacha Bodenhausen[2], Valeria Ventorino[1,3], Michael Schneider[2], Sonja Reinhard[2], Giuseppina Magaraci[1], Ralf Müller[2], Jean-Claude Walser[4], Olimpia Pepe[1,3]

[1]Department of Agricultural Sciences, Division of Microbiology, University of Naples Federico II, Naples, Piazza Carlo di Borbone 1, Portici (NA), Italy
[2]Department of Soil Sciences, Research Institute of Organic Agriculture (FiBL), Ackerstrasse 113, Frick, Switzerland
[3]Task Force on Microbiome Studies, University of Naples Federico II, Naples, Italy
[4]ETH Zurich Genetic Diversity Center, Universitätstrasse 16, Zurich, Switzerland.
*E-mail: ida.romano@unina.it

Abstract

Accurate species-level identification of bacteria and fungi by high-throughput sequencing in complex matrices is important in many fields, including biotechnological processes, environmental monitoring, and clinical diagnostics. Current methods for identifying species in complex environments are often labor- and time-intensive. Amplicon sequencing with Illumina allows for the description of microbial communities, with the drawback that the short fragment length prevents species identification. More precise but quick approaches are needed to allow species-level identification. In this context, the application of Oxford Nanopore sequencing technology (ONT), also referred to as third-generation sequencing, to sequence complex samples is extremely relevant, because the large sequence length enables species-level identification.

This study utilized lignocellulosic biomass samples mixed with soil, alongside bacterial bulk samples obtained by plating the biomass onto a selective CMC substrate for cellulolytic bacteria isolation. The latest generation Flow Cells (R10.4.1) were used and two different protocols were applied: i) the PacBio M13 barcodes two step PCR protocol combined with Ligation Sequencing Kit V14 (SQK-LSK114) and ii) the Native Barcoding Kit 24 V14. This strategy targeted the 16S rRNA gene to characterize the bacterial community, and sequenced genes encoding the endo-1,4-beta-glucanase enzyme. In order to validate the new technology, samples underwent Illumina (V3-V4) and Shotgun sequencing for comparison.

Sequencing of 16S rRNA with ONT resulted in 3’908’291 sequences of ~1500 bp, while the endo-1,4-beta-glucanase genes sequencing yielded 931’689 sequences of ~450 bp. Bioinformatics analysis where performed using USEARCH. Comparable outcomes were observed between Illumina and ONT sequencing methods for bulk samples, which exhibit lower microbial diversity. However, the standard bioinformatic pipeline underperformed when analyzing data from lignocellulosic biomass mixed with soil.

These results demonstrate the potential of ONT as a promising tool to study bacterial community in complex matrices. Further optimization of protocols and bioinformatics pipelines could enhance its applicability. Long-read sequencing technologies offer unprecedented opportunities for comprehensive genomic analysis and warrant continued exploration in microbial ecology and biotechnology applications.

Keywords

Soil microbiology, Metagenomics, Microbiology, Next generation sequencing, Oxford Nanopore technology

Acknowledgements

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S5 - SC07

BREWERS' SPENT GRAINS AS RESERVOIR OF YEASTS AND LACTIC ACID BACTERIA FOR BIOTECHNOLOGICAL APPLICATIONS IN BREWERY

Viola Galli[1]*, Damiano Barbato[2], Alessio Ceccatelli[1], Simona Guerrini[1,2] Lisa Granchi[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Via San Bonaventura 13, 50145 Florence, Italy.
[2]FoodMicroTeam s.r.l., Via di Santo Spirito, 14, 50125 Florence, Italy
*E-mail: viola.galli@unifi.it

Abstract

Brewers' spent grains (BSG) are the solid fraction of barley malt remaining after the production of wort, and the major by-product of the brewing industry, representing around 85% of the total by-products generated. Due to their high moisture and fermentable sugar contents, BSG are very unstable material and a suitable substrate for microbial development. However, few studies have investigated the BSG occurring microbiota, hence this work was aimed to quantify and identify the microbial communities of yeasts, acetic (AAB) and lactic acid bacteria (LAB) present on the BSG of 8 breweries located in Tuscany. The BSG after mashing and filtration, were kept in plastic buckets, left open for 48 h in the brewery environment. BSG were collected and analysed to determine their chemical (fermentable sugars, microbial metabolites, total free nitrogen, and pH) and microbiological features. The 3 microbial groups were found in each brewery in different concentrations, LAB and AAB ranged from 3 log CFU/g to 9 log CFU/g, while yeasts populations ranged from 2 log CFU/g to 5 log CFU/g. LAB isolates (ca. 93), identification by molecular techniques indicated the presence of several species of lattobacilli (e.g *Lactiplantibacillus plantarum*) and *Weissella* spp. A total of 98 yeast isolates were identified; in 4 out of 8 breweries *Saccharomyces cerevisiae* was detected, however the majority of the occurring species belonged to non-*Saccharomyces* genera such as P*ichia, Candida, Hanseniaspora/Kloeckera* and *Kluvveromyces*, with differences based on the brewery. The typing of the *S. cerevisiae* isolates was carried out to compare the profiles with those of the commercial *S. cerevisiae* strains used in the breweries. The non-*Saccharomyce* isolates were preliminary tested as potential co-starter of S. *cerevisiae* for beer production. The findings highlighted BSG as a valuable and rich source of yeasts and LAB which can be exploited for biotechnological applications.

Keywords

brewers' spent grain; non- Saccharomyces yeasts; lactic acid bacteria

S5 - SC08

PLANT BENEFICIAL ACTIVITIES OF THE MICROBIOTA STRICTLY ASSOCIATED WITH ARBUSCULAR MYCORRHIZAL FUNGI ISOLATED FROM THE RHIZOSPHERE OF *AMMOPHILA ARENARIA*

Arianna Grassi[1]*, Irene Pagliarani[1], Caterina Cristani[1], Federico Rossi[1], Alessandra Turrini[1], Monica Agnolucci[1]

[1]Department of Agriculture, Food and Environment, University of Pisa, Via del Borghetto 80, 56124 Pisa, Italy
*E-mail: arianna.grassi@phd.unipi.it

Abstract

The rhizosphere is a dynamic environment colonized by a wide variety of microorganisms, including arbuscular mycorrhizal fungi (AMF) and bacteria that are strictly associated with their spores and mycelium. They promote plant growth and nutrition and increase plant tolerance to abiotic stresses by improving plant water and nutrient-use efficiency and plant antioxidant defence systems. Here we investigated the plant beneficial activities of the microbiota strictly associated with AMF spores occurring in the rhizosphere of *Ammophila arenaria* growing in a maritime sand dune system, a drought-stressed and low-fertility environment. In particular, key bacterial traits fundamental for the improvement of plant resilience toward abiotic stresses, such as drought and salinity were investigated on the strains isolated in pure culture from *R. persica* and *R. fulgida* spores, respectively. Functional analyses were performed to reveal the ability of the bacterial isolates to produce exopolysaccharides (EPS), key compounds favouring water retention and protecting roots against desiccation. The 90 strains producing the highest EPS levels were further analysed for selecting those able to tolerate high salinity concentrations. The 13 selected ones were successively tested for their ability to produce the enzyme 1-aminocyclopropane-1- carboxylate (ACC) deaminase, able to lower the level of ethylene in stressed plants, alleviating its adverse effects, and promoting plant growth. The best performing bacterial isolates will be used for the formulation of effective synthetic microbial consortia as innovative inocula promoting plant growth and resilience under climate change.

Keywords

Arbuscular mycorrhizal symbionts; microbiota; drought stress; exopolysaccharides; ACC-deaminase

S5 - SC09

Exploitation of sprouted barley grains and flour through sourdough fermentation

Giuseppe Perri*[1], Andrea Minisci[2], Marco Montemurro[4], Erica Pontonio[1], Michela Verni[3], Carlo G. Rizzello[3]

[1]Department of Soil, Plant and Food Science, University of Bari Aldo Moro, Via Amendola 165/a, 70126, Bari, Italy;
E-mail:giuseppe.perri@uniba.it;
E-mail:ericapontonio@uniba.it
[2]Vallefiorita s.r.l., Viale delle Comunicazioni 24, 72017- Ostuni (BR)- Italy;
E-mail:a.minisci@vallefiorita.it
[3]Department of Environmental Biology, "Sapienza" University of Rome, Piazzale Aldo Moro 5, 00185 Roma. Rome, Italy.
E-mail: carlogiuseppe.rizzello@uniroma1.it*
E-mail:michela.verni@uniroma1.it
[4]Italian National Research Council, CNR, Institutes of Sciences of Food Prduction, ISPA, Via Giovanni Amendola,122, 70125 Bari, Italy,
E-mail: marco.montemurro@ispa.cnr.it
*E-mail : giuseppe.perri@uniba.it

Abstract

Nowadays, population growth and lifestyle modifications drives the demand for agricultural and food products, steering food manufacturers towards a deep innovation in the food design. Hence, the use of ingredients alternative to wheat flour, capable to fortify final products in proteins, fibers, bioactive compounds and to diversify the organoleptic profile of conventional staple foods, is strongly increasing. Among these ingredients, the demand for germinated seeds has risen due to the awareness of their connection with health and nutrition. In this scenario, in order to valorize highly environmentally sustainable crops, a local barley cultivar "*Nure*" was subjected to a partial and assisted sprouting process, obtaining flour and grains later fermented to produce type II sourdoughs. The germination process led to the reduction of starch and total dietary fibers (−58 and −48% compared to whole barley flour) and to the increase of phenolic compounds and protein bio-accessibility. Fermentation of sprouted barley (SB) with selected lactic acid bacteria determined a further enhancement of its nutritional features, by means of the increased free amino acids (up to 35%) and γ-aminobutyric acid concentrations (up to 57%), and decreased phytic acid content. Exploring the potential of SB sourdough as a bread-making ingredient revealed that the fermentation process effectively mitigated the negative effects on dough rheology and baking performance associated with the intense enzymatic activities in sprouted barley flour. Hence, beyond elevating bread's nutritional and technological attributes, the use of SB sourdoughs, providing native enzymes in a less invasive form, emerges as a promising tool to reduce or substitute commercial enzymes and flour improvers prevalent in the baking industry.

Keywords

Barley, Germination, Sourdough fermentation, Sprouted barley grain

S6 - SC01

Sucrose content in the European hazel pollen: a defence strategy against changing climatic conditions

Claudio Brandoli[1]*, Elisabetta Sgarbi[2]

[1]BIOGEST-SITEIA, University of Modena and Reggio Emilia, via Amendola 2, 42124, Reggio Emilia, Italy
[2]Department of Life Sciences, University of Modena and Reggio Emilia, via Amendola 2, 42124, Reggio Emilia, Italy, "National Biodiversity Future Center - NBFC"
*E-mail: claudio.brandoli@unimore.it

Abstract

The result of a pollination event and therefore the formation of a mature gametofite is linked by the availability of viable and germinable pollen. The viability of pollen depends on several factors including climatic events, the dispersal time and cultivar-dependent characteristics. The physiological bases that regulate these processes are currently little understood although it know that carbohydrates play a key role in regulating osmotic balance. Pollen grains from four wild type (WT) hazel accessions were analyzed to verify whether viability and germinability could be related to the carbohydrate concentration (glucose, fructose, sucrose and starch) during dispersal. Samples were collected from four different hazel collection fields among north and central Italy. Carbohydrates analysis revealed that glucose and fructose were almost absent in WT hazel pollen while starch was not detectable. All samples reported high levels of viability, between 80 and 96%, which was positively correlated with sucrose content, the only carbohydrate detected, regardless of the accession or field considered. Germinability and viability of pollen was also positively correlated to the content of sucrose in all the fields tested. Dehydrated pollen showed a drastic drop in the viability percentages, while once rehydrated it recovered the initial levels. All these data together with the acquired ability to recover the viability could allow to bypass extreme climatic conditions, suggesting a direct intervention of sucrose in the protection of plasma membranes. Here we propose the use of sucrose as a good parameter for a predictive evaluation of the suitability of viable pollen in different stages of the fertilization.

Keywords

cytoplasmic disaccharides, pollen water content, desiccation

S6 - SC02

Understanding future climate change impacts on grapevine productivity through an in-depth characterisation of the past

Francesco Mirone[1]*, Riccardo Manzato[1], Giacomo Santoiemma[1], Giovanni Pascarella[2], Paolo Belvini[3], Andrea Pitacco[1,3], Franco Meggio[1,3]

[1]DAFNAE- Dipartimento di Agronomia, Animali, Alimenti, Risorse naturali e Ambiente, Università degli studi di Padova, Viale dell'Università 16 – 35020 Legnaro (PD)
[2]ExtendaVitis, Via San Gaetano,35/3 - 31044 Montebelluna (TV)
[3]CIRVE - Centro Interdipartimentale per la Ricerca in Viticoltura ed Enologia, Università degli studi di Padova, Via XXVIII Aprile, 14 – 31015 Conegliano (TV).
*E-mail: francesco.mirone@unipd.it

Abstract

Under the current scenario of continuous technological advancement and increasing extreme weather events frequency and unpredictability, viticulture will face the critical challenge of landscape preservation and high quanti-qualitative levels maintenance. In this context, the present study focuses on deepening the understanding of the environmental factors that for most impact grapevine buds' fruitfulness and lastly vine productivity. A long-term time series (2006 to 2022) of buds' fruitfulness data monitored in 10 vineyards in the Conegliano-Valdobbiadene area, a UNESCO World Heritage site renowned for its Prosecco Superiore production, was used. The dataset comprises buds' fruitfulness data of the first 10 buds of the fruiting cane expressed as potential and real fertility, number of blind and sterile buds. These data were compared with 61 indices of climate extremes proposed by the World Meteorological Organization, computed from nearby ARPAV meteorological stations. Understanding the frequency and intensity of extreme weather events and their long-term effects on bud's fruitfulness in this wine region is crucial for wine growers to properly manage vine pruning thus better estimating expected yield results at harvest. Based on the results obtained, it was possible to deepen the intricate relationship that occurs between buds' fruitfulness and climate anomalies in one season and the previous one as the flower induction process lasts 1 year but straddles two consecutive seasons. The application of Multiple Linear Regression (MLR) analysis allowed the development of predictive models to better understand the future climate change impacts on buds' fruitfulness through an in-depth characterisation of the past. This study underscores the role of modern viticulture in harmonizing productivity goals with the preservation of environmental heritage, offering innovative strategies for sustainable management in the face of climate change.

Keywords

bud fruitfulness, yield, climate extremes, modelling

S6 - SC03

HOST AND ENVIRONMENTAL FACTORS SHAPE THE ENDOPHYTIC DIVERSITY AND COMPOSITION OF SICILIAN PHYLLOSPHERE OLIVE TREES

Dalila Crucitti[1,2]*, Stefano Barone[2], Francesco Carimi[1], Tiziano Caruso[2], Davide Pacifico[1]

[1]Institute of Biosciences and Bioresources (IBBR), CNR, Via Ugo La Malfa 153, 90146 Palermo, Italy
[2]Department of Agricultural, Food and Forest Sciences (SAAF), University of Palermo, Viale delle Scienze, 90128 Palermo, Italy
*E-mail: dalila.crucitti@ibbr.cnr.it

Abstract

Plant tissue microbiota comprises endophytes, symptomless bacterial and fungal microorganisms that contribute to plant growth promotion and to stress resistance. Diversity and composition of endophytic communities can be influenced by different host and environmental factors. Mediterranean ecosystems are threatened by climate changes and recently must face several challenges. The mediterranean crop *Olea europea* L. developed multiple adaptive strategies which make it a resilient woody plant. Olive tree microbial communities has been barely studied and a better understanding of microbiota structure evolution and interactions would be useful to predict the host response to climate change. In this context, the culturable endophytes residing leaves and twigs of three Sicilian olive cultivars and wild olive trees were studied and the tissue types, cultivars/wild accessions, phenological phases and farming systems were investigated to understand which among them are involved in microbiota structure. Overall, culturable endophytes belonged to Actinobacteria, Firmicutes, Proteobacteria, Ascomycota and Basidiomycota phyla. Endophyte occurrence in leaf and twig samples ranged in average from zero to 2.62 log CFUs/g with a significative variation among hosts during the winter dormancy and fruit set phases in twigs. Also, alpha diversity of olive microbiota was influenced by twigs and winter dormancy time and the latter had a structuring effect on microbial composition showing a prevalence of bacterial *Methylorubrum* genus and fungal *Aspergillus, Diaporthe, Pyronema* and *Tricharina* genera. Olive hosts affected taxa richness, assessing a wide degree of diversity in *Olea sylvestris* that had an own distinct composition of hosted endophytes. The effect of agriculture management on endophytic communities was less evident, although the interaction “cultivar x organ x season x farming type” could not be excluded. Therefore, the potential role of Sicilian olive Phyllosphere endophytes should be further investigated, with the aim of using native microbial consortia in sustainable cultivation practices capable of facing the Anthropocene.

Keywords

endophyte communities; cvs. Nocellara; Olea sylvestris; tissue specificity; season influence

S6 - SC04

The Val d'Orcia Living Lab of the AG-WaMED project: insights from modelling and participatory activities

Lorenzo Villani[1,2]*, Eleonora Forzini[1], Giulio Castelli[1,3,4], Athanasios Ragkos[5], Chloé Nicolas Artero[6], Davide Danilo Chiarelli[6], Mohamed Bahnassy[7], Gabriele Bertoli[8], Tommaso Pacetti[8], Enrica Caporali[8], Elena Bresci[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Italy
[2]Department of Water and Climate (HYDR), Vrije Universiteit Brussels, Belgium
[3]UNESCO Chair in Hydropolitics, University of Geneva, Switzerland
[4]Environmental Governance and Territorial Development Hub (GEDT), University of Geneva, Switzerland
[5]Agricultural Economics Research Institute, Hellenic Agricultural Organization—DIMITRA, Terma Alkmanos, 11528 Athens, Greece
[6]Department of Civil and Environmental Engineering, Politecnico di Milano, 20133, Milano, Italy
[7]Soil and Water Sciences Department, Faculty of Agriculture, Alexandria University, Alexandria, Egypt
[8]Department of Civil and Environmental Engineering (DICEA), University of Florence, Italy
*E-mail: lorenzo.villani@unifi.it

Abstract
Unlike many other Italian rural areas, the agricultural economy in the Orcia valley is still highly competitive mainly due to the production of high-quality wines and to the touristic vocation of this UNESCO World Heritage cultural landscape. Nevertheless, agriculture is threatened by a variety of challenges including the changing climate with increased temperatures and altered rainfall patterns. For example, more crops which were typically rainfed such as vineyards now often require supplemental irrigation to obtain satisfactory productions both in quality and quantity.
The Orcia valley was selected as the Italian Living Lab (LL) within the framework of the PRIMA-funded AG-WaMED project. AG-WaMED aims at providing innovative, evidence-based participatory management solutions to water scarcity governance starting from the LL and that can be scaled at the Mediterranean level. In particular, the project tackles the problem of water scarcity by including non-conventional waters, that in the Orcia valley are represented by the net of small agricultural reservoirs.
Multi-disciplinary analyses are currently being carried out, such as agro-hydrological modelling with the Soil and Water Assessment Tool Plus (SWAT+) model and economic modelling through linear and parametric programming, nested in current multi-level governance analyses. Project's activities revolve around in-presence meetings with key stakeholders that we actively involve in the modelling by providing data, validating the model's outputs, and suggesting scenarios to be simulated. By the end of the project (August 2025), we envision to propose an integrated watershed management plan including the reflections and the outputs of the participatory modelling activities.
Disclaimer: This research was carried out within the AG-WaMED project, funded by the Partnership for Research and Innovation in the Mediterranean Area Programme (PRIMA), an Art.185 initiative supported and funded under Horizon 2020, the European Union's Framework Programme for Research and Innovation, Grant Agreement Number No. [Italy: 391 del 20/10/2022, Egypt: STDF 45878, Tunisia: 0005874-004-18-2022-3, Greece: ΓΓΡ21-0474657, Spain: PCI2022-132929, Algeria: N° 04/PRIMA_section 2/2021]

Keywords
Non-conventional water, water harvesting, agro-hydrological modelling, participation, co-modelling

S6 - SC05

A framework for organizational life cycle assessment (O-LCA): the experience of Agritech project within the sustainability assessment of the agricultural system.

Renzi, N.[1]*, Castelli, G.[1], Niccolucci, V.[2], Montefrancesco, C.[2], De Micco, P.[3], Cupertino, S.[3], Bresci, E.[1], Penna, D.[1], Bastianoni, S.[2], Riccaboni, A.[3]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), Università degli Studi di Firenze, Italy
[2]Ecodynamics Group, Dept. of Physical, Earth and Environmental Sciences, University of Florence, Italy
[3]Department of Business and Law, Italy, University of Siena, Italy
*E-mail: niccolo.renzi@unifi.it

Abstract

Most international and national policies, such as the Agenda 2030, the European Green Deal, and the Italian Recovery and Resilience Plan (PNRR) are focused on making agricultural systems more sustainable. The environmental sustainability assessment is a key aspect of any organization's strategic decisions. To this purpose, Life Cycle Assessment (LCA) has been recognized as a robust and standardized tool for measuring, monitoring, and tracking both product and organizational performance.
This study reports the experience gained within the AGRITECH National Center of the Italian PNRR fund, aimed to define a shared protocol for O-LCA specific for agricultural companies and compliant with ISO/TS 14072.
An agricultural organization is known as a multifunctional system where different types of agricultural products are cultivated and/or transformed with characteristic supply chains. Furthermore, inside the organization system boundaries can be found potential carbon sinks that can be strategic for a proper sustainability diagnosis.
This protocol comes from the need to light on this topic and to capture the great complexity of these systems by i) defining the scope and the entire system boundaries, ii) structuring the inventory of all input and output flows, iii) assessing the whole impact in terms of carbon footprint and water use, iv) integrating allocation procedures for evaluating the relative impact of a single product inside the organization.
Finally, due to the increasing importance of sustainability strategy and reporting of agricultural organizations, the issue of environmental offsetting is also discussed integrating the role of ecosystem services.

This study was carried out within the Agritech National Research Center and received funding from the European Union Next-Generation EU (PIANO NAZIONALE DI RIPRESA E RESILIENZA (PNRR) – MISSIONE 4 COMPONENTE 2, INVESTIMENTO 1.4 – D.D. 1032 17/06/2022, CN00000022). This manuscript reflects only the authors' views and opinions, neither the European Union nor the European Commission can be considered responsible for them.

Keywords

O-LCA, agricultural system, Water Footprint, Carbon Footprint

S6 - SC06

Long-term compost restoration of potentially toxic elements (PTEs) contaminated soils: evaluation of organic matter physical fractions for the environmental risk assessment

Matteo Garau[1]*, Tom Sizmur[2], Paola Castaldi[1], Giovanni Garau[1]

[1]Department of Agriculture, University of Sassari, viale Italia 39/a
[2]Department of Geography and Environmental Science, University of Reading, Reading RG6 6DW, UK
*E-mail: mgarau@uniss.it

Abstract

Potentially toxic elements (PTEs; e.g. Cd, Cu, Pb, Zn, As, Sb) can negatively affect soil biochemical and microbial activity, as well as plant growth. Their entry into the food chain also poses serious risks to human health. The recovery of abandoned mining sites and surrounding areas, commonly affected by significant PTEs contamination phenomena, is therefore a global priority. In this context, the application of organic amendments such as compost may be used to restore PTEs contaminated soils. In this study, a new approach to assess the influence of compost on the distribution of PTEs among the different physical fractions of soil organic matter (SOM) has been developed. Since particulate organic matter, especially not included in soil macro/microaggregates, feeds soil macrofauna, the study of the PTEs content and mobility in the different physical fractions of SOM may reveal the effectiveness of the organic amendment on the reduction of PTEs ecological risks. To better understand the implications of SOM physical fractions in the PTEs ecological risks this study, using earthworm *Eisenia fetitda* as bioindicators, correlates the PTEs toxicity and bioavailability with their distribution in the different SOM physical fractions of soil treated and untreated with compost. The selected soils were collected from a PTEs (Cd, Pb and Zn)-contaminated soil treated in 2015 with compost at 0, 1.5, 3 and 4% rate. The results obtained will increase the knowledge on compost effectiveness in the long-term immobilization of PTEs, and on the reduction of the associated environmental risks.

Keywords

Soil restoration; heavy metal; earthworms; bioavailability; toxicity

S7 - SC01

A NOVEL INDICATOR-BASED APPROACH TO ASSESS THE IMPACT OF AGRICULTURAL PRACTICES ON SOIL HEALTH

Andrea Alpigiano[1,2]*, Marco Pittarello[1], Barbara Moretti[2], Laura Zavattaro[1]

[1]Department of Veterinary Sciences (DSV), University of Turin, Largo Paolo Braccini 2, 10095 Grugliasco (Torino), Italia
[2]Department of Agricultural, Forest and Food Sciences (DISAFA), University of Turin, Largo Paolo Braccini 2, 10095 Grugliasco (Torino), Italy
*E-mail: andrea.alpigiano@unito.it

Abstract

Soil health is a fundamental component of the agro-ecosystem sustainability, as it regards the soil not only as a growing medium for crops, but as a complex, dynamic and living system. Thus, the multifunctionality of soil can provide essential ecosystem services (ES) such as food provision, water and air purification, climate regulation, carbon sequestration, nutrient cycling and biodiversity provision. Agricultural management practices strongly influence soil health, which can be evaluated using indicators. Indicators allow monitoring soil functions over time and comparing the effects of different agricultural practices on a specific ES. The study assesses the linkages between agricultural practices aimed at improving soil health, and different indicators of soil health and agri-environmental performance of agricultural systems. A set of practices that potentially influence soil health, and a list of soil health indicators were established. Each indicator was also associated to a specific ES. The strength of these links was evaluated by 27 experts from 9 countries that condensed knowledge from 47 Long-term experiments located in Europe and China. The survey revealed a classification of four groups of good agricultural practices (soil-, cropping system-, fertilisation- and landscape-oriented) which strongly affected the indicators. The most relevant indicators to describe soil health were SOM content, aggregate stability and soil structure. While soil-oriented and cropping system-oriented practices had a strong effect on improving SOM stock, soil structure, aggregate stability, fertilisation-oriented practices influenced yield and environmental pressure indicators. Finally, practices were evaluated regarding their effects on ESs. All practices had a positive impact on food provision and water and air quality, while fertilisation-oriented and some landscape-oriented practices negatively affected biodiversity and climate regulation services, respectively. This framework can be applied to a variety of situations to better assess positive or negative effects of individual agricultural practices on soil ESs based on documented effects.

Keywords

Soil health, good agricultural practices, agri-environmental indicator, soil degradation, ecosystem service

S7 - SC02

SENSOR-BASED MONITORING OF NITROGEN STATUS IN PROCESSING TOMATO

Beatrice Falcinelli[1]*, Michela Farneselli[1], Francesca Todisco[1], Jennifer Bertuzzi[1], Grazia Tosi[1], Lorenzo Vergni[1], Alessandra Vinci[1], Giovanna Scardapane[2], Francesco Filipponi[2], Francesco Tei[1]

[1]University of Perugia, Department of Agricultural, Food and Environmental Sciences (Borgo XX Giugno, 74- 06121 Perugia, Italy)
[2]Telespazio SpA, Roma
*E-mail: beatrice.falcinelli@unipg.it

Abstract

Proximal and remote sensors are innovative tools for monitoring the nutritional N status of several crops aimed at sustainable N crop management. Thus, on-plant sensors, proximal and remote canopy reflectance were used in field processing tomato within the Agritech project - Task 3.1.1.
Processing tomato was transplanted on 25 May 2023 at density of 3.3 plants m^{-2} under a factorial combination of 2 irrigation (I) (100 % and 60 % of recovery of ETc: I100 and I60, respectively) and 3 N-fertilizer level (N) (0,100 and 200 kg N ha^{-1} : N0, N100 and N200, respectively) applied by fertigation. Growth analysis was performed by sampling plants every 10-14 days from 28 days after transplanting (DAT) until the final harvest. N crop status was monitored at each sampling by a chlorophyll meter (SPAD-502, Minolta), sap nitrate meter (LAQUAtwin, Horiba), a portable multispectral radiometer (Rapidscan CS-45) and a UAV multispectral camera.
Regression relationships between growth and yield parameters and sensor-based measurements were used to determine threshold sensor-based values/indices.
N and I affected crop above-ground dry weight, LAI and N content with a clear interaction. Generally, I100-N200 showed the optimal growth, higher than other treatments. SPAD was significantly correlated (r = 0.73 to 0.92, depending on sampling dates) with leaf sap N-NO3 - concentrations. NDVI was highly correlated with crop above-ground dry weight (r = 0.86 to 0.97) LAI (r = 0.96 to 0.99), except at the beginning of crop cycle when crop canopy was still low and a large proportion of the soil was not covered, and leaf sap N-NO 3 - concentrations (r = 0.80 to 0.97), before fruit growth. A threshold value of SPAD ≥ 62 and of NDVI ≥ 0.75 were found for an optimal crop N status during the crop vegetative growth (i.e., up to about 70 DAT).

Keywords

Processing tomato, on-plant sensors, remote sensors, N-Fertilization, Irrigation

S7 - SC03

Impacts of soil management and sustainable plant protection strategies on soil biodiversity in a Sangiovese vineyard

Sara Del Duca[1]*, Stefano Mocali[1], Francesco Vitali[1], Arturo Fabiani[1], Maria Alexandra Cucu[1], Giuseppe Valboa[1], Giada d'Errico[2], Francesco Binazzi[2], Paolo Storchi[3], Rita Perria[3],Silvia Landi[2]

[1]Research Centre for Agriculture and Environment, Council for Agricultural Research and Economics (CREA-AA), 50125 Florence, Italy
[2]Research Centre for Plant Protection and Certification, Council for Agricultural Research and Economics (CREA-DC), 50125 Florence, Italy
[3]Research Centre for Viticulture and Enology, Council for Agricultural Research and Economics (CREA-VE), 52100 Arezzo, Italy
*E-mail: sara.delduca@crea.gov.it

Abstract

Vine growing is one of the most economically important sectors of Mediterranean agriculture, but its cultivation practices (e.g., excessive tillage, use of chemicals) are highly detrimental to the soil and the associated biota. The application of both natural products inducing endogenous plant defense mechanisms and natural soil management systems represents a potential solution for the preservation and improvement of soil health and biodiversity.
The Life Green Grapes project aimed at evaluating the effects of different natural and sustainable vine control strategies (organic management, use of elicitors) and soil managements (permanent grassing and green manure) on vineyard edaphic communities, compared to the ordinary vineyard management based on inter-row tillage and integrated pest management.
The study vineyard was located in the Chianti Classico area (San Casciano in Val di Pesa, Florence, Italy). Soil TOC, TN, C:N ratio, CaCO3 content, and pH were measured. Edaphic biodiversity was evaluated at multiple levels: microbial communities (bacteria and fungi) were characterized through NGS, while nematodes and microarthropods were isolated and identified.
Then, biodiversity indices, communities structure, and their possible ecological associations were evaluated.
Obtained results highlighted a relation of bacteria, fungi and nematodes with soil chemistry, and an effect of the different soil managements on the structure of the edaphic communities. Network analysis evidenced a positive effect of the application of sustainable soil managements on the relationships among the different soil trophic levels; this aspect suggested that more natural soil managements allow a better interaction between soil organisms and, consequently, the establishment of complex species associations.
In conclusion, this work confirms the importance of the application of sustainable and natural soil management practices in agricultural ecosystems, with the aim of conserving and improving soil biodiversity.

Keywords

edaphic communities; network analysis; multi-trophic diversity

S7 - SC04

EVALUATION OF TOMATO (*SOLANUM LYCOPERSICUM* L.) YIELD AND QUALITY USING DIFFERENT BIODEGRADABLE MULCHING FILMS

Davide Farruggia*, Nicolò Iacuzzi, Federica Alaimo, Noemi Tortorici, Teresa Tuttolomondo

Department of Agricultural, Food and Forest Sciences, Università degli Studi di Palermo, Viale delle Scienze 13, Building 4, Palermo (Italy)
* E-mail: davide.farruggia@unipa.it

Abstract

Mulching is a common practice used in agriculture to ensure several benefits, including soil moisture conservation, soil temperature regulation, weed control, protection of crops from pests and reduction in the use of pesticides and herbicides. Depending on their colour (black, light, white or green) the mulching films absorb and/or reflect the solar radiation, causing soil temperature changes that affect the growth and the productivity of crops.
Although polyethylene is perfectly recyclable, it is not always possible to collect, process and regenerate it. Therefore, polyethylene can be subject to fragmentation and portions of plastic can reach different habitats, causing damage to ecosystems. During last years, the research has focused on the use of biodegradable mulching obtained from vegetable, that do not contain toxic substances. The use of these materials allows to avoid the disposal of conventional polyethylene films. This research was conducted to evaluate the effects of biodegradable films for mulching on the morphological, productive and qualitative parameters of tomato cv. "Rio Grande", grown in open fields in southern Italy. Four mulching treatments (black biodegradable film 12 μm thickness (B12), black biodegradable film 15 μm thickness (B15), black and white biodegradable film 15 μm thickness (BW15), unmulched control (C), were compared using a randomized complete block design with three replicates. Soil temperature was monitored at 5 cm with respect to the ground level. The average temperature in unmulched soil was lower (about 1-2°C) than that under biodegradable films. The biodegradable mulching films generated an improvement in the morphological and physiological characteristics of tomato plants, compared to unmulched plants. Biodegradable mulching films produced higher plant height and chlorophyll content. The commercial yield was higher in the BW15 films, while lower yields were found in unmulched plants. The preliminary results of this study allow to affirm that biodegradable white/black mulching can improve the productive and qualitative performance of tomato grown in environments characterized by high temperatures during the crop cycle.

Keywords

biodegradable films, tomato, yield, quality

S7 - SC05

Effect of the sustainable fertilization strategies on tomato yield and quality

Maria Eleonora Pelosi[1], Ida Di Mola[1], Lucia Ottaiano[1], Eugenio Cozzolino[2], Mauro Mori[1]

[1]Department of Agronomy, University of Naples Federico II, Piazza Carlo di Borbone, 1, Portici, 80055 Naples, Italy)
[2]CREA, Research Center for Cereal and Industrial Crops, Via Torrino, 2, Caserta, IT)
*E-mail: mariaeleonora.pelosi@unina.it

Abstract

Soil is degraded by the over-exploitation of resources and unsustainable agricultural practices affecting approximately 95% of global food production. The intensive use of chemical fertilizers is probably the most impacting practice and a possible mitigation strategy is the use of biostimulants in order to reduce the amounts of chemicals. Our experiment was aimed to verify if the application of two different biostimulants can mitigate the effects of a reduction of the optimal nitrogen (N) dose. Specifically, we compared the following three N levels fertilization: optimal dose -N100%, a dose reduced by 10% -N90% and a dose reduced by 20% -N80%. Two algal-based biostimulants (Bio1 and Bio2) were compared to a not treated control (Control). Biostimulants were applied by foliar spray, on bi-weekly basis, starting from June 14 at the dose 3 ml l-1.
The experimental design was a split-plot and each treatment was replicated three times. The test was carried out during the spring-summer 2023, in open field, in Acerra (Naples). The transplant of the medium-early cycle Orion tomato variety was made on May 5 and the harvest on August 1. N100 and both biostimulants treatments statistically increased marketable yield: 18,7% over N80 and N90, and 20,6% over Control, respectively; interestingly, no differences were found between N80 and N90. N100 also showed the highest values of the number and average weight of fruits; notably, N80 had the lowest number of fruits but a higher average weight compared to N90, and thus reached the same yield level of N90. Biostimulants positively affected only the number of fruits. The not marketable yield declined when the N dose reduced. Texture and total soluble solids significantly increased with both biostimulants: 19.0%, and 12.8% over Control, respectively. Biostimulants improve tomato yield and quality, and seem also to compensate yield decrease due to reduced N doses.

Keywords

Solanum lycopersicum L., sustainable agriculture, nitrogen fertilization, biostimulants.

S7 - SC06

DIFFERENT APPROACHES TO SOIL FAUNA ECOLOGICAL INDICES TO ASSESS SOIL HEALTH

Elena Tondini[1]*, Guenola Peres[2], Lou Lerner[2], Maria Viketoft[3], Cristina Aponte[4], Carlo Jacomini[5], Anita Maienza[6], Rajasekaran Murugan[7], Florent Gaillard[2], Johann Zaller[8], Raphael Wittwer[9], Marcel van der Heijden[9], Marjetka Suhadolc[10], Anton Govednik[10], Rok Mihelič[10], Tess F.J. van de Voorde[11], Maria-Franca Dekkers[11], Derk van Balen[11], Gerard Korthals[11], Gaia Bigiotti[1], Francesco Vitali[1], Giovanni L'Abate[1], Jack Faber[12], Stefano Mocali[1], Lorenzo D'Avino[1]

[1]Council for Agricultural Research and Economics, Florence, Italy
[2]UMR SAS, Institut Agro, INRAE, Rennes, France
[3]Swedish University of Agricultural Sciences, Uppsala, Sweden
[4]Spanish National Research Council, Forestry institute, Madrid, Spain
[5]Italian Environmental Protection and Research Institute, Rome, Italy
[6]National Research Council, Institute of Bioeconomy, Sesto Fiorentino, Italy
[7]University of Natural Resources and Life Sciences, Institute of Soil Research, Vienna, Austria
[8]University of Natural Resources and Life Sciences, Institute of Zoology, Vienna, Austria
[9]Agroscope, Zürich, Switzerland
[10]University of Ljubljana, Biotechnical Faculty, Ljubljana, Slovenija
[11]Wageningen University & Research, Wageningen Plant Research, Wageningen, the Netherlands
[12]Wageningen University & Research, Wageningen Environmental Research, Wageningen, the Netherlands
*E-mail: elena.tondini@crea.gov.it

Abstract

Soil health can be influenced by the application different farming practices and several soil fauna taxa may serve as effective indicators of these impacts. Different taxa experience varying degrees of effects depending on the specific nature of the impact. A comprehensive assessment should therefore consider several organism groups. The evaluation of farming practices' effects on soil fauna commonly involves several types of indices: (i) abundance indices, indicating the quantity of animals; (ii) taxonomical indices, evaluating taxa diversity; and (iii) functional indices, measuring the roles of taxa in ecosystems. However, there is no clear evidence on which of these indices is more suitable for detecting changes in soil status.
The impacts of farming practices on soil fauna abundance and diversity were evaluated in nine European Long-Term Agricultural Experiments (LTEs) across a gradient of pedoclimatic conditions, employing various tillage systems and fertilization practices. In autumn 2022, these LTEs were sampled to assess soil health, including fauna diversity indices, focusing mainly on microarthropods, and earthworms to represent meso-, and macrofauna biodiversity, respectively. This study will compare the three categories of indices mentioned. The aim is to determine which type of indices are most sensitive in detecting differences in soil fauna communities when organic or mineral fertilization practices and standard, reduced, or no tillage management are applied. The development and application of appropriate ecological indices will not only facilitate a more accurate and comprehensive evaluation of soil fauna communities but will also contribute to the formulation of targeted conservation and management strategies aimed at promoting long-term soil sustainability.

Keywords

QBS-ar; Soil biodiversity ; Tillage ; Fertilisation ; Annelida

S7 - SC07

The importance of nursery techniques to support the recovery of degraded areas: the case of *Quercus suber* in Tuscany

Alessandro Bizzarri*, Lucia Mondanelli, Pietro Castellucci, Barbara Mariotti, Alberto Maltoni, Claudia Cocozza

Department of Agriculture, Food, Environment and Forestry, Via San Bonaventura 13, Florence, Italy
*E-mail: alessandro.bizzarri@unifi.it

Abstract

Forests provide a plethora of ecosystem services that are key for human well-being. Due to global warming, sustainable management of forest ecosystems is becoming increasingly important. As a result, research on tree planting is attracting attention as a crucial nature-based solution to mitigate the negative effects of climate change. In addition, degraded areas, as well as post-fire areas, are in urgent need of restoration and reforestation. Therefore, delving into best techniques and nursery stock to use for obtaining high quality seedlings, in terms of morphological (e.g. height, diameter, root structure) and physiological (e.g. nutrient storage, drought hardening, frost hardening) traits, assumes an important role to address reforestation and forest restoration program. We performed an experiment to study the field performance of *Quercus suber* (cork oak) seedlings obtained with local seeds in a nursery by using 4 different pots. In details, the used pots were: AirPots - innovative containers designed to prevent roots defects and favor root-system articulation-of two different volumes, and two classical forest nursery containers, a single-cavity container and a multipot tray. One-year-old seedling were planted in November 2022 in Vicopisano (Pisa, Central Italy), in a Mediterranean degraded area after the 2017 wildfire. Survival, morphological traits, such as root collar diameter and height, and physiological traits, as estimation of chlorophyll content and fluorescence, were measured in 68 plants distributed evenly across 16 plots at the end of the first growing season in field. Our hypothesis suggests that the choice of nursery stock significantly influences the

initial field performance of seedlings. Variations in survival and growth attributable to different nursery stock types are foreseeable. The outcomes of this study have the potential to support reforestation and forest restoration projects towards a sustainable approach with nature-based solutions.

Keywords

Reforestation, Forest restoration, Field performance, Nursery stock, Quercus suber

S7 - SC08

Do forest streams deliver suspended sediment? A Evidence from a forested nested catchment in the Apennine Mountains

Diletta Chirici[1]*, Murgia I.[1], Innocenti L.[2], Verdone M.[1], Manca di Villa Hermosa F.[1], Dani A.1, Preti F.[1], Mao L.[5], Solari L.[2] & Penna D.[1]

[1]Department of Agriculture, Food, Environment and Forestry, University of Florence, via San Bonaventura, 13 - 50145 Florence, ITALY
[2]Department of Civil and Environmental Engineering, University of Florence, via Santa Marta, 3 - 50139 Florence, ITALY
[3]Department of Earth Sciences, University of Firenze, via G. La Pira, 4 - 50121, Florence, Italy
[4]Department of Mathematics and Informatics, University of Florence, via Santa Marta, 3 - 50139 Florence, ITALY
[5]Department of Geography, College of Health and Science, University of Lincoln, Brayford Pool, Lincoln LN6 7TS - UK
*E-mail: diletta.chirici @unifi.it

Abstract

Suspended sediment transport in mountain catchments considerably influences the morphology and ecology of streams, and it is studied in catchments worldwide. However, the mechanisms determining sediment transport variability across different spatial scales in mountain forested catchments are still poorly understood. In this work, we aim to understand drivers and sources of sediment transport at different scales using an integrated monitoring approach. The experimental activities were conducted in a nested mountain catchment in the Apennine Mountains, central Italy. The study area spans from the Rincine catchment (33 km^2) upstream to its headwater portion, the Re della Pietra sub-catchment (2 km^2). The outlet of the Rincine catchment is an artificial lake which is subject to progressive sedimentation. Suspended sediment monitoring was carried out through high-resolution turbidimeters installed at the outlet of the two catchments. Raw turbidity values were converted in concentration through samples automatically collected during large storm events. Manual samplers were also placed at the outlet of three adjacent sub-catchments in order to quantify the contribution of each nested sub-catchment to the total amount of sediment transported to the lake.
Preliminary results show a clear influence of precipitation on turbidity, but only associated with moderate to large floods, whereas intense storms during low flow conditions rarely had determined mobilization of suspended sediment.

Keywords

Nested catchment, Sediment transport, Suspended sediment, Turbidity, Storms

S7 - SC09

Promoting SWBE as NBS: Biodiversity monitoring on a restored landslide, in Tuscany (Italy)

Emanuele Giachi[1]*, Marco Cabrucci[1], Francesca Decorosi[1], Carlo Viti[1], Agnese Bellabarba[1], Giacomo Certini[1], Federico Preti[1]

[1]Department of Agricultural, Food, Environmental and Forestry Science and Technology-DAGRI; Via San Bonaventura, 13 - Firenze
*E-mail: emanuele.giachi@unifi.it

Abstract

Monitoring, restoring, and enhancing biodiversity is one of the most relevant issues in the transition towards more sustainable environmental solutions, while also mitigating the effects of anthropogenic impacts and climate change. The advocacy for Nature-Based Solutions (NBS) has sparked a heightened interest in utilizing vegetation as construction materials, as exemplified by Soil and Water Bioengineering (SWBE) techniques. These techniques combine technical functionality for natural hazard mitigation with environmental benefits for restoring ecological processes.
Through an interdisciplinary approach, we aim to evaluate the impact of the use of SWBE techniques on biodiversity and ecological processes from different perspectives and bio-parameters: soil microorganisms, macro-invertebrates and plants.
Surveys will be conducted in two study areas, both in the municipality of Stazzema, where there was a landslide caused by the same weather event (Versilia flood June 19, 1996): an area settled with the SWBE project, and a naturally evolving landslide site. At each study site, transects were made across the slope gradient, near which the various parameters considered will be sampled. The sampling design involved the combination of surveys of various parameters and different methodologies; for soil characteristics and the study of microorganisms, soil samples will be taken in the first layers and then analyzed in the laboratory, especially the study of metabolic profile for microorganisms using Ecoplate (Biolog) and description of taxonomic diversity of microbial communities.
For vegetation, surveys will be conducted according to the Braun Blanquet methodology and forestry analysis of species composition; for the last macroinvertebrates, traps will be installed in-site, environmentally-designed. We describe the methodologies applied, the inter-disciplinary sampling design and initial observations on the research, which will be further explored with further analysis.

Keywords

Soil and Water Bioengineering, Biodiversity monitoring, Nature-based Solutions, Ecological evolution

S7 - SC10

IMPACT OF NATURE-BASED SOLUTIONS ON SOIL EROSION AND WATER RESOURCES MANAGEMENT: PERSPECTIVES FROM FARMERS

Addolorata Maria Netti[1]*, Ossama M. M. Abdelwahab[1], Giovanni Francesco Ricci[1], Francesco Gentile[1]

[1]Department of Soil, Plant and Food Sciences (DiSSPA) – University of Bari "A. Moro", Italy
*E-mail: addolorata.netti@uniba.it

Abstract

In agricultural lands, soil erosion can undermine soil fertility, leading to a decline in yield. Sustainable water resource management emerges as a crucial element to prevent erosion issues and nutrient transport in agricultural soils. Nature Based Solutions (NBSs) play a fundamental role in optimizing water resource utilization and contributing to soil quality conservation.

In semiarid climates, such as Southern Italy, agriculture stands as a major consumer of global water resources. Projections indicate a surge in agricultural water usage by 2050, potentially aggravating water scarcity in diverse regions. Integrating NBSs into agricultural practices offers a promising strategy to alleviate environmental pressures and sustain production amid changing climatic conditions. Addressing these challenges necessitates a comprehensive and integrated approach, tailored to the unique characteristics of the territory and the engagement needs of local communities and stakeholders.

To fulfill this objective, a thorough assessment identified 13 suitable NBSs for the context. Subsequently, a questionnaire was disseminated across various farms, resulting in 53 collected responses.

The analyzed responses showed that 17% of respondents highlighted soil erosion while 12% pointed to drought-related water management problems, indeed NBSs generating the most interest focused on increasing water resources and combating erosive processes and pollutant transport.

Stakeholders pointed out the importance of the application of most of the 13 proposed NBSs focusing on a few of them (retention ponds, cover crops, creop residue management and vegetated buffer strips). Their choices were mainly based on the dual challenge of ensuring tangible economic gains while effectively managing cost amortization. Thus, integrating NBSs into agricultural practices requires not only environmental consideration but also a keen understanding of the economic dynamics and challenges faced by the farming community.

Keywords

Nature-Based-Solutions, Water resource management, Soil Erosion, stakeholder engagement

S7 - SC11

Spatial assessment of heavy metal contamination areas: a GIS-based analysis for planning and implementing phytoremediation strategies

Stefania Sole[1]*, Gianluca Carboni[2], Maria Caria[1], Giuseppe Todde[1]

[1]Department of Agricultural Sciences, University of Sassari, Viale Italia 39a, 07100, Sassari, Italy
[2]Agris Sardegna, Viale Trieste 111, 09123 Cagliari, Italy
*E-mail: s.sole@phd.uniss.it

Abstract

Human activities, especially in industry and mining, have caused widespread contamination by heavy metals all over the world, leading to severe environmental and human health hazards. The concern about heavy metal contamination is global. These metals, which are non-biodegradable and persistent, can contaminate soils and water, increasing the risk of exposure and health damage. This study aims to identify, among the heavy metals contaminated areas in Sardinia, those susceptible to phytoremediation.
Phytoremediation is an *in situ* biological remediation technique that relies on the ability of plants to absorb and fix soil contaminants to the aerial parts of the plants. Datasets released by the local environmental departments were used to identify and classify the contaminated areas of the region. In addition, QGIS software was used to analyze and evaluate the areas contaminated by heavy metals suitable for phytoremediation activities. The analysis excludes the areas occupied by buildings, facilities and areas presenting preforest Mediterranean scrub.
The results showed that approximately 21,000 hectares, constituting around 1% of the total regional area, are contaminated, with 18,500 hectares affected by heavy metal pollution. The analyses showed that most of the contaminated territories (approximately 96%) are concentrated in the southwestern region of Sardinia. A map of areas contaminated by heavy metals in the Region was thus obtained, identifying areas suitable for the phytoremediation process. In conclusion, the information outlined, and the spatial assessment obtained from this study provide a valuable tool for local authorities. This, data might allow the implementation and planning of effective environmental management strategies, including the phytoremediation of heavy metal-contaminated areas through the valorization of the residual biomass as energy resource.

Keywords

Contaminated areas; Soil pollution; Heavy metal; Phytoremediation; GIS analysis

S7 - SC12

Production of volatile fatty acids from brewing by-products

C. Capelli[1]*, M. Daghio[1], A. Adessi[1], M. Emanueli Francioli[1], C. Viti[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Piazzale delle Cascine, 18, Florence, IT
*E-mail: chiara.capelli@unifi.it

Abstract

Brewery wastewater can pose several environmental and operational challenges, making it a problem that breweries need to address. One solution to this problem could be the utilization of these by-products for the production of high-value molecules. This can be done through dark fermentation, in which hydrogen-producing bacteria hydrolyze complex macromolecules (carbohydrates) into simpler organic compounds (e.g. volatile fatty acids, VFAs). In the process, H_2 and CO_2 can also be produced. VFAs can then be used in other processes, e.g., for the production of bio-electricity in the anode compartment of a bio-electrochemical reactor. Electrons derived from the oxidation of VFAs in anaerobic conditions can be transferred to the anode and flow through a circuit to reach the cathode where purple non-sulfur bacteria will use them to produce H_2.Thus, the project aims to promote the production of VFAs, which can then be used in the second part of the experiment.
To test different conditions for dark fermentation, four dilutions (100% BW, 1:2, and 1:4) were tested. The fermentation was performed in 120 mL serum bottles incubated at 35°C with orbital shaking (35 rpm) for two weeks. Three different types of BW were used: grain wash water (BW1), the must at the end of fermentation of a Triple-A beer (BW2), and the must of a Pale Ale beer (BW3). The best results were obtained with the last, so data refer to BW3 (100%BW).
In BW3, starting from an initial carbohydrate concentration of 40 g/L, it decreased by 32% at the end of fermentation. Regarding VFAs production, 2.14 g/L acetic acid, 7.54 g/L propionic acid, and 0.89 g/L lactic acid were obtained. Future work will focus on finding optimal conditions for the conversion of additional carbohydrates to VFAs.

Keywords

brewery wastewater, VFAs, bio-hydrogen, dark fermentation, bio-electrochemical reactor

S8 - SC01

AGRONOMIC RESPONSE OF PROCESSED TOMATO TO WATER DEFICIT IN HOT-ARID ENVIRONMENT

Nicolò Iacuzzi[1]*, Davide Farruggia[1], Federica Alaimo[1], Teresa Tuttolomondo[1]

[1]Department of Agricultural, Food and Forest Sciences, University of Palermo, Viale delle Scienze 13, Building 4, 90128 Palermo, Italy.
*E-mail: nicolo.iacuzzi@unipa.it

Abstract

A strategy to improve the efficiency of irrigation water is deficit irrigation, which consists in reducing water supplies in relation to crop requirements.
An experiment was conducted on processed tomatoes (cv: Tayson F1) to evaluate the effect of the practice of deficit irrigation on the quantity and quality of tomato production in order to reduce the volumes of irrigation water to this crop. The test was carried out in 2022 in the region of Sicily (Italy) in open field conditions. Four plots (40 m x 40 m) were realized to compare two irrigation systems: complete restoration of the crop water requirements (100% CWR) and deficit irrigation (70% CWR during the entire irrigation season). In the comparison theses, the same cultivation practices were carried out and the same micro-irrigation system was used, managed through the continuous monitoring of the water balance of the soil by means of capacitive probes and tensiometers. The volume of cumulative water (irrigation + rain) administered to the tomato was 4552.87 m^3 (70% CWR) and 4807.47 m^3 (100% CWR).
The two different irrigation regimes significantly affected both yield (98.83 t ha^{-1} for 70% CWR and 126.65 t ha^{-1} for 100% CWR) and quality parameters. The brightness of the fruits (L*), the firmness (N), the °Brix and the dry matter content (%) were significantly higher in CWR treatment at 70% compared to 100% CWR treatment.
Despite the deeper research that is necessary, the results suggest that for the processed tomato the practice of irrigation in deficit is able to save water without adversely affecting the yield and quality, while preserving farmers' incomes and increasing the sustainability of production.

Keywords

tomato, irrigation, regulated deficit irrigation, water productivity, commercial yield

S8 - SC02

Mediterranean Climate Change: Is Organic Agriculture an Option to Face a Perfect Storm?

Margherita Santoni*

Department of Agriculture, Food, Environment and Forestry (DAGRI),
University of Florence, Address : Piazzale delle Cascine 18, 50144 Firenze)
* E-mail: margherita.santoni@unifi.it

Abstract

The current climate, energy and food crises require a reflection on the suitability of agricultural production systems. We analysed the data collected in the Montepaldi Long Term Experiment (MoLTE) field trial, where organic and conventional arable farming systems are running since 1992.
Yields significantly decreased with time in both systems (about -79% and -37% since the beginning of the experiment for spring and winter crops, respectively), which is most probably due to the reduced cumulative rainfall from seeding to harvesting (-40%). Organic winter crops constantly yielded about 21% less than the conventional ones while spring crops did not show significant differences.
Regarding soil parameters, available P_2O_5 decreased over the years both in organic and conventional systems. On the contrary, soil organic matter and total N remained constant. Differences between the two systems were noted only for organic matter, which showed significantly higher values in the organic system compared to the conventional one.
The Energy Use Efficiency (*EUE*) in organic system was higher than in conventional one. Organic winter crops showed a 33% higher *EUE* compared to the conventional counterparts. Even greater efficiency was observed for spring crops, with a 44% higher *EUE* in the organic system.
In conclusion, the farming sector in the Mediterranean area is facing climatic, energy, and food crises. In the face of increasing climate change impacts and amid the ongoing long-forecasted energy crisis, organic system showed a higher *EUE*. Therefore, organic management could serve as a viable alternative to mitigate the impact of the global food system on present challenges while enhancing the overall sustainability of global food systems.

Keywords

organic and conventional agriculture, Mediterranean area, energy balance, climate change

S8 - SC03

Evaluation of Innovative Cropping System for marginal land: the MIDAS project

Alexandro Ferreira[1]*, Federica Zanetti[1], Andrea Parenti[1], Andrea Monti[1]

[1]Department of Agricultural and Food Sciences, Alma Mater Studiorum, University of Bologna, 40127 Bologna, Italy
*E-mail : alexandro.ferreira2@unibo.it

Abstract

In Europe, a significant portion of land is already classified as marginal, and it is likely to increase due to climate change (Von Cossel M., et al.). The HE-MIDAS project aims to evaluate the suitability of a number of resilient industrial crops on marginal land. Among these, safflower, hemp, crambe and miscanthus have been evaluated in North Italy at the experimental farm of the University of Bologna (Ozzano dell'Emilia). The site is characterized by poor chemical composition (sand >65%), and a medium slope (10-15% varying across the site).
In order to achieve a differentiate feedstock production and to promote biodiversity, a strip intercropping system had been set up, including alternate wide strips (4-12 m) alternating annual and perennial crops. The project is currently in its second year of trial. In the first growing season (2023), the three annual crops achieved satisfactory production levels, reporting for safflower and crambe a seed yield of 1.7 and 2 Mg DM/ha, respectively, while for industrial hemp the total harvested biomass was 12 Mg DM/ha.
In summary, the production levels of individual annual crops were on average with previous results under non-limiting conditions.
The perennial grass, miscanthus, has not been harvested yet, since it is still at the establishment phase, which a problematic part of its management and the past year precipitation occurred in May had a negative effect on its vigor. Growing industrial crops on marginal land could be an opportunity for farmers, as it can contribute to soil and biodiversity rehabilitation, climate change mitigation and the creation of economic opportunities.

Funding
This research has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement no. 608622.

Keywords

strip intercropping; marginal land; industrial crops; bio-based prodocts

S8 - SC04

Communication as a social parameter to investigate wildfires

Silvia Calvani[1]*, Cristiano Foderi[1], Riccardo Paoloni[1], Niccolò Frassinelli[1], Francesco Neri[1], Enrico Marchi[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Via San Bonaventura 13, Florence, 50145, Italy)
*E-mail: : silvia.calvani@unifi.it

Abstract

Wildfires, primarily human-induced phenomena, given the causal relation with the land use and climate conditions, have seen an increase in intensity and frequency since the beginning of the last century, driven precisely by climatic and socio-economic changes. Social and environmental factor analysis is useful for weighing the impacts of the factors that influence fire prevention. In this study, we assess communication impacts by analyzing media news and posts sharing about wildfires in Italy, especially in the Tuscany region. Additionally, direct wildfire impacts are evaluated through the examination of two quantitative parameters i.e. their occurrence and extent. The study employs quantitative, qualitative, and statistical methods to analyze the media habits, and investigates the relationship wit. The results of the communication analysis reveal that the year 2017 marked the highest peak of fire news in Italy on Twitter (450), after the events that occurred on a national scale.
Tuscany is the region that presents the highest number of reports in the studied period (10 years) (233). Wildfire-related news is focused on the dry season (June to September). Statistical analyses indicate the strongest correlations are the following: 1) chronicle articles from local newspapers and the number of wildfire events; 2) the number of tweets and the burnt extent. Limits of considered media types are also highlighted. Our results point out media habit as a social parameter to gauge regional fire awareness levels. The wildfire vs. communication index facilitates the comparison of ecological and social parameters, determining critical areas in Tuscany. These findings lay the foundation for a risk perception study through community involvement: indeed, communication is only one component of the social-economical system of a landscape: to explore the influence of human behavior on wildfire risk governance and management, other social dimensions need to be deepened.

Keywords

wildfire risk perception; wildfire prevention; risk communication; socio-ecological study; social media analysis

S8 - SC05

Drought response in wheat involves a changed plant ionomic network

Giulia Quagliata[1]*, Francesco Sestili[1], Gianpiero Vigani[2], Stefania Astolfi[1]

[1]Department of Agriculture and Forest Science, University of Tuscia, Via San Camillo De Lellis snc 01100, Viterbo, Italy
[2]Department of Life Sciences and Systems Biology, University of Torino, Via Verdi 8 10124, Torino, Italy
*E-mail: giulia.quagliata@unitus.it

Abstract

Low-resource environments (e.g., dry or infertile soils) result in limited plant growth and development, which in turn constrain crop productivity. Water shortage is a significant threat to agricultural productivity all over the world. Drought may also affect plant nutrient uptake and assimilation capability causing nutrient deficiencies even in fertilized fields. Durum wheat is an important staple food crop for ensuring food security in the Mediterranean area, which is increasingly subjected to periods of severe drought due to global changes. Thus, identifying wheat cultivars/genotypes able to cope with suboptimal water, and with unbalanced nutrient availability deriving from drought is crucial to mitigate climate change's adverse effects on agriculture.
In this study, the ionome profile of shoot and root tissues of a panel of 15 genotypes, differing for drought tolerance, was examined and related with physiological traits associated to drought tolerance with the aim of identifying those characterised by a positive correlation between ion homeostasis and drought response.
The ionome profile of most genotypes was significantly affected after drought exposure for 7 days in both shoot and root tissues, but at different extent. The Lcye A-B- genotype showed the highest accumulation efficiency for most nutrients in shoots, while Bulel tritordeum and Karim in roots. It is also important to understand how micronutrients interact with each other and with macronutrients. Thus, we performed a nutrient correlation network analysis, which showed that the interactions that occur among nutrients were modified by drought in most tested genotypes. These findings suggest that we need a deeper knowledge of the mechanisms that regulate the homeostasis of micronutrients, that due to their involvement in redox reactions, could contribute to mitigate or aggravate drought impact.

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Keywords

Drought, Food security, Ionome, Wheat

S8 - SC06

Hydrochar from *Myriophyllum aquaticum:* win-win circular strategy to contain an invasive species and produce a new soil amendment

Lorenzo D'Asaro[1],*, Giulia Lauria[1], Federica Barontini[2], Monica Puccini[2], Nicola Silvestri[1], Marco Landi[1,3]

[1]Department of Agriculture, Food and Environment, University of Pisa, Via del Borghetto 80, 56124, Pisa, Italy
[2]Department of Civil and Industrial Engineering, University of Pisa, Largo Lucio Lazzarino 2, 56122, Pisa, Italy
[3]Centre for Climatic Change Impact, CIRSEC, University of Pisa, Via del Borghetto 80, 56124, Pisa, Italy
*E-mail: lorenzo.dasaro@phd.unipi.it

Abstract

Myriophyllum aquaticum (Vell.) Verdc., is an invasive hydrophytic plant native to South America, able to colonize stationary or slow-moving aquatic habitats such as ponds, lakes, and canals with muddy bottoms. The rapid growth and high biomass production capacity (up to 1500 shoots m^{-2}) have significant impacts on the local biodiversity and the working of surface water network.

Consequently, active monitoring, containment, and eradication of this invasive species are necessary for the preservation of aquatic ecosystems and hydraulic safety. Therefore, is essential to explore the potential reuse of M. aquaticum biomass.

This study aims to evaluate the potential use of two types of hydrochar (HC) from M. aquaticum biomass as soil amendments in agriculture. The two HCs were obtained at different temperatures, 200 and 260 °C, and had elemental compositions similar to peat (HC peat) and lignite (HC lignite), respectively. Basic assessments of phytotoxicity were performed through biological tests including germination tests of *Lepidium sativum* seeds with aqueous extracts of HC and growth tests of L. *sativum* plants cultivated on substrates enriched with HC, according to the Italian regulation (D. Lgs. N. 75/2010) and the methodology reported by APAT (APAT 20/2003).

The germination test conducted on the aqueous extract of HC lignite revealed no significant phytotoxic effects on the germination of L. *sativum*. This suggests that short-term exposure to HC lignite had no significant effects compared to the control. However, the growth index indicated a notable phytotoxic effect on plant growth when exposed to HC peat. This result can be attributable to chronic exposure to toxic compounds present in the HC. However, these tests represent only a preliminary screening to evaluate possible applications of HC from *M. aquaticum* and further investigations are needed to evaluate the feasibility of the reusing of this biomass as a sustainable amendment for plant cultivation.

Keywords

Aquatic ecosystems, Biomass, Hydrochar, Invasive species, Myriophyllum aquaticum, Phytotoxicity test

S8 - SC07

The Water-Energy-Food-Ecosystems Nexus approach to managing water resources: a qualitative assessment in Northern Italy

Enrico Lucca[1,2]*, Luigi Piemontese[1], Janez Sušnik[2], Sara Masia[2,3], Giulio Castelli[1,4,5], Elena Bresci[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), Università degli Studi di Firenze, Via San Bonaventura, 13, Firenze 50145, Italy
[2]Land and Water Management Department, IHE Delft Institute for Water Education, PO Box 3015, 2601DA Delft, the Netherlands
[3]CMCC Foundation – Euro-Mediterranean Centre on Climate Change, IAFES Division, Viale Italia 39, 07100 Sassari, Italy
[3]CMCC Foundation – Euro-Mediterranean Centre on Climate Change, IAFES Division, Viale Italia 39, 07100 Sassari, Italy
[4]UNESCO Chair in Hydropolitics, University of Geneva, Bd Carl-Vogt 66, 1205 Genève, Switzerland
[5]Environmental Governance and Territorial Development Hub (GEDT), University of Geneva, Bd Carl-Vogt 66, 1205 Genève, Switzerland
*E-mail: enrico.lucca@unifi.it

Abstract

The simultaneous achievement of multiple societal, environmental, and economic goals is challenged by global resources systems and their interconnections (e.g., water for food and energy production), and by the rules and actors that determine the allocation of natural resources. The Water-Energy-Food-Ecosystems (WEFE) Nexus promotes a systemic approach to the management and governance of intertwined systems that focuses on the mutual interdependence between sectors, and that emphasises trade-offs and synergies across sectoral goals. To be fully operationalised, however, assessments of WEFE Nexus systems must address the multiple dimensions under which the interconnections among water, energy, food and ecosystems emerge, from the flow of resources across sectors to the socio-economic and institutional levels. In our study, we develop a methodological framework to characterise the interlinkages among water, energy, food and ecosystems both at the biophysical and at the governance level. We build causal loop diagrams to show physical relationships between processes and activities in the four sectors, while we apply the network of action situation approach to assess interactions between sectoral venues of decision making and policy formulation. We apply this integrated approach to the Torrente Orco, a medium-scale mountain watershed in Northern Italy, where trade-offs between agricultural production, energy transition and the preservation of freshwater ecosystems are becoming now more evident due to the impact of climate change and sectoral developments.
The approach adopted enabled reaching a comprehensive overview of water resources management processes, showing not only the relevance of local interconnections between sectors, but also how these relationships shape and are shaped by institutions, policy goals and regulations. Such qualitative assessment could support policy makers and governors in identifying interventions that reconcile sectoral needs while increasing the sustainability and resilience of water use.

Keywords

drought, ecological flow, coordination, stakeholders, water policy

S8 - SC08

EMERGING BACTERIAL DISEASES: A THREAT TO THE SUSTAINABILITY OF SALENTO'S FORESTS

Giambattista Carluccio[1]*, Marzia Vergine[1], Erika Sabella[1], Luigi De Bellis[1,2], Andrea Luvisi[1]

[1]Department of Biological and Environmental Sciences and Technologies, University of Salento, 73100 Lecce, Italy
[2]National Biodiversity Future Center, Palermo 90133, Italy
*E-mail: giambattista.carluccio@unisalento.it

Abstract

In Salento, Southern Italy, holm oaks (*Quercus ilex* L.) and olive trees (*Olea europaea* L.) are a consistent part of the landscape and economy. However, since 2013, the epidemic caused by *Xylella fastidiosa*, the causal agent of 'Olive Quick Decline Syndrome' has led to the destruction of the olive sector and the rural landscape. In this context, a phenomenon affecting holm oaks has recently been observed, consisting of a mass decline of oak groves. Research is therefore aimed at understanding the biotic causal agents of this decline and the plant-pathogen interaction to protect the forest heritage, ensuring sustainable forest management.

Field surveys were conducted in Salento and to evaluate the severity and type of decline observed, was used a pathometric scale. Also, plant tissue samples consisting of twigs, bark fragments and soil, were collected to assess the presence of various pathogens.

Analyses revealed, in addition to the occurrence of several pathogenic fungi, the presence of some bacteria belonging to the *Enterobacteriaceae* linked to certain characteristic symptoms, which can be traced back to 'Acute Oak Decline', an emerging phenomenology first described in England in 2014. This represents the first finding of such syndrome in the Central Mediterranean basin.

Since the pathogenic potential of these bacteria is not fully know, further investigations are necessary to understand what the evolution of this pathology might be in Salento and how those bacteria affect holm oak.

Keywords

Salento, Oak, Bacterial Diseases

POSTER PRESENTATIONS

S1 - P01

Consumer perception and preferences towards upcycled foods

Marta Bonioli [1]*, Claudia Bazzani [1]*, Diego Begalli *

[1]Department of Management, University of Verona, Via Cantarane 24, 37129 Verona
*E-mail: marta.bonioli@univr.it
*E-mail: claudia.bazzani@univr.it
*E-mail: diego.begalli@univr.it

Abstract

According to the Upcycled Foods Association (UFA), "Upcycled foods" are defined as products using ingredients that would otherwise not be consumed, procured and produced through verifiable supply chains, with a positive impact on the environment. The re-use of industry waste presents environmental advantages, yet businesses encounter potential hurdles as consumers may resist paying a premium to cover production costs.
However, consumer scepticism poses a substantial obstacle to the market growth of this kind of products. This study addresses the imperative need to assess consumer perceptions and preferences for upcycled foods and aims to formulate effective communication and marketing strategies to enhance consumer acceptance. The research incorporates a comprehensive systematic literature review covering 37 articles published from 2019 to 2023, focusing on consumer perceptions and willingness to pay for upcycled foods. Employing sentiment analysis, the study delves into nuanced consumer perspectives by analysing sentiments expressed in scholarly articles, online content retrieved from a Google search, and Twitter data. Regional variations in consumer awareness and willingness to purchase upcycled foods are highlighted, with environmental benefits emerging as the primary motivator. Consumers strongly associate upcycled foods with environmental advantages, particularly in reducing food loss and waste. This insight serves as a valuable foundation for marketers, emphasizing the importance of foregrounding environmental benefits in communication strategies. The study not only addresses the current state of consumer behaviour but also presents a forward-looking perspective, acknowledging the scepticism barrier and proposing strategies to foster sustainable food consumption patterns. Understanding the intricacies of consumer behaviour is crucial for the growth of the upcycled food market and the broader promotion of environmentally conscious consumer choices.

Keywords

Upcycled foods, consumer perceptions, sentiment analysis, environmental benefits. circular economy

S1 - P02

Sustainable aquaculture over the last 30 years: a review by text mining approach

Isabella Tucciarone[1*], Giulia Secci[1], Barbara Contiero[2], Giuliana Parisi[1]

[1]Department of Agriculture, Food, Environment and Forestry, University of Florence, 50144 Florence, Italy
[2]Department of Animal Medicine, Production and Health (MAPS), University of Padua, Padua, Italy
*E-mail: isabella.tucciarone@unifi.it

Abstract

Climate changes and extreme weather events have been aggravating undernourishment. In that scenario, strategic food production systems like aquaculture have been reinforced. This study aimed to explore how researchers have followed the "Blue Transformation" since the mid-twentieth century using a Text Mining (TM) approach. A literature search using Scopus® was conducted to identify the peer-reviewed articles published in English between 1960 and 2023. "Sustainable aquaculture", "aquaponic", "integrated multi-trophic aquaculture", "biofloc systems", and "recirculating aquaculture systems" were used for the literature research. TM combined with Topic Analysis (TA) was utilized to extract information from the identified papers. After eliminating documents that could not be used, 1111 remained. There was a gradual increase in sustainable aquaculture publications, peaking at over 200 in 2023. The first articles on alternative aquaculture practices began to appear in 2010, except for aquaponics which will only appear in 2015. Most publications (40%) came from Asia; however, also Europe (Italy, Portugal and Germany mainly) showed considerable interest in sustainable aquaculture, contributing with 111 papers on the subject in the past 30 years. Thanks to TA, it was possible to extract the main research topics on the subject and observed how these have evolved. As a result, themes regarding the optimization of aquatic life, genetic aspects in aquaculture, and disease management emerged as pivotal in the researches related to sustainable aquaculture. The topic of protein replacement in feed was also of considerable importance, with the term "diet" proving to be the most frequently utilized among all the papers. In conclusion, these findings serve as valuableprimary data sources for further examination, such as systematic reviews, focused on specific research subjects or geographic regions.

Keywords

text mining, sustainable aquaculture, scientific literature, topic analysis

S1 - P03

OLIVE MILL BIOWASTES UPCYCLING: ENERGETIC VALORIZATION AND ENVIRONMENTAL IMPLICATIONS

Martina Friuli[1]*, Elio Dinuccio[1], Luisella Celi[1]

[1]Department of Agriculture, Forest and Food Science, University of Turin, Largo Paolo Braccini 2 – 10095 Grugliasco, Italy
*E-mail: martina.friuli@unito.it

Abstract

Olive cultivation and olive oil industry are activities of great economic importance, especially in Mediterranean area where more than 98% of the world's olive oil is produced. Olive processing generates a huge amount of biowastes, including olive mill wastewater (OMWW), an effluent, and olive pomace (OP), a solid residue. Both by-products are harmful to the environment due to their low pH, high volatile solids and polyphenols content, which can negatively impact soil properties and water quality if improperly managed. Their seasonal production, mainly concentrated during specific periods, represents a crucial point in performing adequate management practices. For this reason, spreading OMWW on agricultural lands to fertilize the soil is a common practice in olive-producing areas, with relevant impacts on water and soil. To minimize environmental pollution from the management of olive oil biowastes, different treatment processes have been proposed. The anaerobic digestion process (AD) is an interesting method for olive oil biowastes upcycling, allowing energy recovery, biogas and digestate production. Research activities will be focused on the energetic valorization of OP and OMWW via AD process and the evaluation of the environmental implications of replacing OMWW application (reference scenario) with digestate distribution. Laboratory experimental batch trials will be performed to investigate the BMP (Biological Methane Potential) of OP, OMWW according to UNI/TS 11703:2018 guidelines. The resulting digestates will be applied to soil in mesocosms and compared with traditional OMWW distribution.
Greenhouse gas (CO_2 , CH_4), ammonia (NH_3) and nitrogen oxides (NOx) emissions will be monitored to evaluate the environmental implications of different fertilizing practices, as well as soil nutrient dynamics. This research is funded by Next Generation EU - National Recovery and Resilience Plan (PNRR) - Mission 4, Component 2, Investment 1.4, National Research Centre for Agricultural Technologies -AGRITECH, identification code: CN00000022, CUP: D13C22001330005.

Keywords

Olive pomace, olive mill wastewater, anaerobic digestion, greenhouse gas and ammonia emissions, nutrient dynamics

S1 - P04

Biodiversity conservation and Value-Belief-Norm Theory: a systematic review of the literature

Arianna Tiralti[1]*, Lucia Rocchi[1]

[1]Department of Agricultural, Food and Environmental Sciences, University of Perugia, Borgo XX Giugno, 74, 06121 Perugia PG
*E-mail: arianna.tiralti@studenti.unipg.it

Abstract

Negative anthropogenic environmental changes have been widely documented in recent decades pointing out the urgency of a drastic socio-ecological transformation in response. The critical state of the ecosystems worldwide threatens the long-term conservation of biodiversity, which is vital for humanity's future. A consequence of this scenario is the need to incorporate ecological knowledge with human behaviour and social processes, as these have a direct influence on the state of biodiversity. One of the most popular approaches to understanding the role of social-psychological dimensions in predicting ecological behaviour is the value-belief-norm (VBN) model, based on the premise that an individual's behaviour towards the environment is influenced by values, beliefs and moral norms. The main aim of this study is to understand if and how biodiversity protection and conservation of natural habitats have been investigated under the theoretical lens of VBN theory, paying particular attention to the European context. Moreover, the study aims to identify the principal topics discussed and study contexts, explaining the successes and failures of VBN theory and the opportunities for research improvement. A systematic literature review of studies is carried out by selecting documents from the multidisciplinary Scopus and Web of Science databases. The review is conducted by applying both bibliometrics and qualitative approaches to recognize the main articles, authors, co-citation and co-occurrence networks, as well as the main topics investigated. Results focused on the most frequent contents (biodiversity, protected areas, ecosystems, pro-environmental behaviour and climate protection measures) and the most involved stakeholders (students, inhabitants, park users, farmers, landowners, etc.). The analysis revealed a lack of research in the European Union context. Similarly, poor research is shown in terms of enterprise leaders' involvement, identifying little participation of the business sector, despite its clear contribution to biodiversity loss and, therefore, the potential to reduce such loss.

Keywords

review, vbn theory, pro-environmental behaviour, biodiversity, protected areas

S1 - P05

EVALUATION OF THE IMPACT OF PESTICIDES IN AGRICULTURAL ECOSYSTEMS THROUGH LIFE CYCLE ASSESSMENT STUDIES: A SYSTEMATIC LITERATURE REVIEW

Camplone C.[1], Rocchi L.[1], Paolotti L.[1], Santi R.[2], Covarelli L.[1]

[1]Department of Agricultural, Food and Environmental Sciences, University of Perugia, Borgo XX Giugno 74, 06121, Perugia.
[2]Colussi SpA, Via dell'Aeroporto 7, 06081, Petrignano d'Assisi, Perugia.
*E-mail: claudia.camplone@studenti.unipg.it

Abstract

Due to population growth and increased demand for food, in the last decades agriculture has evolved towards a direction that involves the use of several inputs to optimize production in order to meet current demand. Among these, pesticides are extensively used to manage various pests including plant diseases, weeds and insects, to improve crop yield.
However, their impact on the ecosystems might be significant and should be therefore estimated. Life Cycle Assessment (LCA) is a method that considers all phases of the production process to assess the overall environmental impact of a product or service. However, in some cases, it can be challenging to estimate the burden of a specific stage, such as pesticide use in agriculture, due to the high variability present that is difficult to account for. This study aims to explore various models that have been developed over time to more accurately estimate the impact of pesticides on the environment and to explore how these models have evolved.
Subsequently, several LCA studies on different types of agricultural products (vegetables, cereals, legumes, and fruits) are examined to investigate how the different models are used in real applications, exploring their diffusion over time and space, as well as how they adapt to various farming systems. To do this, a literature search and a bibliometric analysis were conducted to obtain the desired data and visualize them in order to identify the strengths of existing systems and to provide a comprehensive overview of the current situation to potentially propose new analysis methods.

Keywords

Pesticide, Life Cycle Assesment, Agriculture, Environmental Impact

S1 - P06

Mapping Consumer Food Cooperatives: Unveiling the Italian Experience

Tiziana Pagnani[1]*, Teresina Mancuso[1], Filippo Brun[1], Giovanna Sacchi[1]

[1]Department of Agricultural, Forest and Food Sciences, University of Turin, Largo Braccini, 2 - 10095 Grugliasco (TO), Italy
*E-mail: tiziana.pagnani@unito.it

Abstract

In recent years, a new form of food consumer collective has been gaining ground within small-scale and local agriculture: Consumer Food Cooperatives. These coops represent a vital component of the alternative agri-food movement, alongside community-supported agriculture, farmers' markets, and other initiatives. Unlike traditional outlets, a Food Coop is a store that sells sustainably produced food and non-food goods at a fair price. What sets it apart is its democratic management by its customers, who are also the owners. In other words, ownership, and decision-making power are shared among customer-members, enabling them to exercise collective agency and mobilisation not found in other Alternative Agri-Food Networks (AAFNs). Originating in the United States, these cooperative forms have garnered intense growth-driven consumer interest as alternatives to a market system that may not adequately meet their needs. This interest has sparked a transition towards more environmentally and socially sustainable food systems. Following the example of *Park Slope* in New York and *Bees coop* in Brussels, Food Coops made their debut in Italy in 2018. Notably, Camilla in Bologna stands as the first Italian food consumption cooperative to own and self-manage a large outlet. Since then, Food Coops are thriving throughout Italy. While numerous studies have been conducted to map, define the structure, understand the functioning, and gauge the level of participants' commitment to AAFNs, little is still known about this emerging form of consumer collective. Our findings aim to fill this gap by exploring the current practices, motivations and governance of the six Italian Food Coops: Camilla, Mesa Noa, Oltre Food, Stadera, Le vie dell'Orto and Edera.

Keywords

« Alternative Agri-Food Networks»; « Collective Action »; « Food Coops »; « Critical Consumption»; « Sustainable Consumption»

S1 - P07

Unveiling Extra Virgin Olive Oil Quality: Consumers' Preferences in a Real Tasting Environment

Carla Cavallo[1]*, Matilde Tura[2,3], Alessandra Spinetti[1], Gianni Cicia[1], Mario Guida[2], Tullia Gallina Toschi[2,3], Enrico Valli [2,3]

[1]Department of Agricultural Sciences, University of Naples Federico II
[2]Department of Agricultural and Food Sciences, Alma Mater Studiorum – Università di Bologna
[3]Interdepartmental Centre of Industrial Agrifood Research, Alma Mater Studiorum – Università di Bologna
*E-mail: carla.cavallo@unina.it

Abstract

Despite a wealth of literature dealt with emphasizing the quality aspects of extra virgin olive oil (EVOO), it is of current crucial importance to empower consumer in choosing the healthiest products, especially in the light of the recent increase in prices which is causing an advantage of sales to seeds and refined oils (Il Sole 24 Ore, 2024).
Consumers' food preferences are influenced by several factors, with a rising interest in health-related information such as polyphenol content, that is signalled by bitterness (Vitaglione et al., 2015). Additionally, in order to investigate them in their natural consumption setting, we structured a Home-Use-Test (Park et al., 2023) in which 60 Italian consumers tasted three EVOOs on two foods. The sample was divided into three groups in which demographic characteristics were balanced, with three informative conditions:

1) Sensory: consumers were given bare sensory information;

2) Health: consumers were given information about how the sensory

profile was influenced by the polyphenols;

3) Control: no information.

Subjects were asked to evaluate liking and sensory perception of bitter and pungent of EVOOs paired with a salad (raw use) and a legumes soup
(cooked use).
Then a survey collected consumers' habits, preferences and socioeconomic traits (Roininen et al, 1999; Bell et al, 2003; Wilson-Barlow et al, 2014; Grunert et al, 2007; Onwezen et al, 2019; Dickson-Spillmann et al. 2011; Verplanken & Orbell, 2003).
Results confirmed that the preferred EVOOs were "delicate" and "medium" intensity of bitter and pungent (Barbieri et al., 2015). The groups informed about the sensory aspects consistently considered lower the intensity of pungent and bitter, i.e., a "low" level of adequacy (Just-About-Right scale), regardless of information on health. This suggests that information on may lead a perception below to expectations. This may be relevant to educate consumers about bitterness.
Considering consumers' traits, the preference for bitterness was associated with: tendency of using food as a mood regulator, preference for good taste, importance of controlling weight, importance given to environment, nutritional knowledge, monthly income and negatively associated with older age and higher education.
This work has been done within the OnFoods project (www.onfoods.it).

Keywords

Extra Virgin Olive Oil, Health Benefits, Pairing, Sensory Profiles, Bitterness

S1 - P08

The role of environmental sustainability for developing marginal areas: the case of Viterbo province

Francesca Pietrangeli

PhD in Economic, Management and Quantitative Methods Department of Economics, Engineering, Society and Enterprise (DEIM) University of Tuscia (UNITUS), Via del Paradiso, 47 – 01100 Viterbo
*E-mail: f.pietrangeli89@unitus.it

Abstract

This research is part of the European program Agritech, in particular is related to the task concerning the assessment of the well-being in specific Italian marginal areas in order to define tools and actions for overcoming social development gaps and improving the quality of life. The main aim is to define the best practices and the policy interventions that favours the development of marginal areas.
The objectives of this paper are: (i) to analyse and discuss the socio – economic marginality; (ii) to define marginality indicators; (iii) to delimitate the administrative boundaries of marginal areas; (iv) to indicate a possible policy, within the agrifood system, that can promote the local economic development and increase the quality of life for the population.
The area of study corresponds to the province of Viterbo for which some indicators of marginality have been elaborated (age index, depopulation index and low income). The values of each indicator were classified on a scale from 1 to 5 and then integrated to assess the level of marginality of each municipality. The spatial representation of the result was then compared with various predefined delimitations (internal areas, mountain communities, biodistricts, Local Action Groups, rural districts, local labour systems) in order to identify which of these delimitations best highlights the marginal areas of the province. The area with a highest level of marginality was delimited and corresponds to the "Alto Lazio" Local Action Group, which includes 15 municipalities. Within this territory, the environmental sustainability of local agrifood productions has been assessed in order to define a certification process that through appropriate policy interventions by the Local Action Group, can be a driving force for the economic development of the area.

Keywords

Agritech project, marginality, sustainability, policy impact

S1 - P09

Biotransformation of agri-food by-products to produce health-promoting bioactive compounds

Jonathan Squillante[1]*, Ida Romano[1], Francesco Esposito[1], Salvatore Velotto[2], Olimpia Pepe[1], Teresa Cirillo[1]

[1]Department of Agricultural Sciences, University of Naples Federico II, Via Università, 100 Portici (NA), 80055, Italy
[2]Department of Promotion of Human Sciences and the Quality of Life, University of Study of Roma "San Raffaele", Via di Val Cannuta, 247-00166 Roma, Italy
*E-mail: jonathan.squillante@unina.it

Abstract

The agri-food supply chain plays a significant role in waste generation across different stages, engaging both developed and developing countries. Decreasing the waste rate would have a positive impact on the environment and economy, reducing the use of natural resources, greenhouse gas (GHG) emissions and disposal costs. To date, various approaches have been proposed for valorizing waste, including by-products. Among these, the biotransformation process by microorganisms has proved to be a valid and sustainable method. Therefore, in this study, agri-food wastes such as tomato pomace (TP) were used to produce health-promoting bioactive compounds, specifically monocolin K and γ-Aminobutyric acid (GABA), through a fermentation process. The two wastes underwent a Solid-state Fermentation (SsF) process for 22 days, using *Monascus ruber*. Monocolin K and GABA were determined by UHPLC-HRMS(Q-Orbitrap) and HPLC-Fluorescence detection, respectively. The results demonstrated the ability of *M. ruber* to grow on TP substrates. Both Monocolin K and GABA were reported in the fermented by-product, although at different concentrations, depending on the sampling time. Overall, *M. ruber* showed to produce bioactive compounds from agri-food wastes, highlighting the biotransformation process as a potential approach for product circularity. This study was carried out within the Agritech National Research Center and received funding from the European Union Next Generation EU (PIANO NAZIONALE DI RIPRESA E RESILIENZA (PNRR)—MISSIONE 4 COMPONENTE 2, INVESTIMENTO 1.4—D.D. 1032 17/06/2022, CN00000022).

Keywords

Recycling, agri-food waste, fermentation, bioactive compounds

S1 - P10

USE OF IMPLICIT TOOLS IN RESTAURANTS TO PROMOTE THE CONSUMPTION OF FISH WITH LOW MARKET VALUE

Chiara Gelici[1], Fabio Boncinelli[1], Giulia Secci[1], Giuliana Parisi[1]

[1]Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali, Università di Firenze
*E-mail: chiara.gelici@edu.unifi.it

Abstract

In recent years, European consumers have increasingly concentrated their fish consumption on a few marine species, which have a high economical value. Unfortunately, the intensive fishing pressure exerted on few species can jeopardize the stability of marine ecosystems and produce a huge amount of discard fishes. To address this, promoting the consumption of all the caught fishes, even the species considered of less commercial values, could be a valid solution to tackle excessive and illegal fishing and to promote a responsible and sustainable consumption. Fishes with low market value have all the qualities to be considered a healthy and sustainable food, both for their high nutritional value and limited environmental impact. However, encouraging its consumption at home is not easy, as these species are not easy to handle and need a lot of time to be cooked. Hence, the present study aimed to test a way of promoting the consumption of fish with low market value in restaurants using implicit conditioning tools. In this context, a Choice Experiment was conducted on a sample of 774 Italian consumers, using a Between-Subjects Design. The participants were randomly divided into two different information treatments, concerning sustainability and traditionality respectively, plus a control group, i.e., a group where we did not provide respondents with any information. We presented participants with a menu containing three dishes featuring high-value and one with low-value fish. The low-value fish option was accompanied by a small image and a message highlighting its sustainability (first group) or traditionality aspects (second group). Participants were then asked to select their preferred dishes from the menu. The data collected with the Choice Experiment was processed using the Mixed Logit model with Error-Component in Willingness-To-Pay space. The results indicate that the instrument related to traditionality is the only one effective in influencing consumer choices toward the low-value fish option, particularly for high-income consumers. Other consumer segments such as those who care about the environment, do not seem to show different behaviors from other participants.

Keywords

marine sustainability, traditional food products, choice experiment, WTP space

S1 - P11

The Travel Cost Method for the assessment of Touristic Activities of Wetlands: the Case Study of Sardinia

Silvia Baralla[1]*, Myriam Ruberto[1], Raffaella Zucaro[1], Vincenzo Rusciano[2]

[1]Council for Agricultural Research and Economics-Research Centre for Agricultural Policies and Bioeconomy, 00198 Rome, Italy; myriam.ruberto@crea.gov.it; raffaella.zucaro@crea.gov.it
[2]Department of Economic and Legal Studies, University of Naples Parthenope, 80133 Naples, Italy; vincenzo.rusciano@uniparthenope.it
*E-mail: silvia.baralla@crea.gov.it

Abstract

Wetlands are indispensable for the countless benefits or "ecosystem services" that they provide humanity, ranging from freshwater supply, food and building materials, and biodiversity, to flood control, groundwater recharge, and climate change mitigation. The International Convention of Ramsar estimates that wetlands occupy about 6% of the world's land surface and have strategic importance. Italy adheres to the Convention since 1977. To date it is characterized by 57 wetlands of international importance, distributed in 15 regions. The study of the present abstract, funded within the project PON WATER4AGRIFOOD, was carried on in one of the 9 sites individuated in the Sardinia region (Stagno S'Ena Arrubia), fed also by high amount of irrigation water, and its aim was the assessing of the value of Ecosystem Services (ES) that this wetland provides. In addition, the study area is characterized by the presence of numerous ponds and wetlands that are deeply interconnected with local agriculture, attracting an important number of tourists. This work aims to evaluate the touristic value in the area by applying the travel cost method (non-market evaluation method used to derive consumers' preferences), also obtaining a total estimate of economic benefits from the recreational uses of the site. The work contributes to the process of quantifying ecosystem services, explaining the positive and negative externalities that agriculture produces through interconnected aquatic ecosystems and providing indications for wetland protection policies.

Keywords

wetland; travel cost method; sustainability; ecosystem services; environmental benefits

S1 - P12

The National Water Heritage. Opportunities for tourism in rural areas

Silvia Baralla[1], Myriam Ruberto[1], Raffaella Zucaro[1]

[1]Council for Agricultural Research and Economics-Research Centre for Agricultural Policies and Bioeconomy, 00198 Rome, Italy; myriam.ruberto@crea.gov.it; raffaella.zucaro@crea.gov.it
*E-mail: silvia.baralla@crea.gov.it

Abstract

Rural areas have also long been used as places for recreation and tourism activities, which add further elements of competitiveness and territorial development in rural areas, stimulating investments in economic and social infrastructures, the development of other industrial sectors indirectly linked to tourism, and a greater offer of services to the population and the community (Telese, 2013). Among the elements that can affect landscape appreciation, the naturalness of the environment and the presence of water are often elements that, together with its management, increasingly determine the success or otherwise of the attractiveness of areas. The aspects to be considered are numerous and diverse: creation and maintenance of wetlands, capable of attracting a flow of tourists with strong environmental and naturalistic motivations, tourist infrastructures, presence of fountains and water houses, etc. (Zumpano et. al. 2022). In an era characterised by the relentless effects of climate change, water, although among the most threatened resources, becomes one of the most important tourism opportunities. The study in this abstract is based on a research of the subjects that take care of the territories and constantly strive to promote them, and on the analysis of virtuous projects and case studies conducted by them and through which ecosystem services are also provided. In particular, the interventions of Land Reclamation Consortia, hydraulic works and dams managing bodies, Local Authorities, Associations, Local Action Groups and national and international Networks have been analysed, allowing to know and explore the role of some of the main actors which operate on the territory ensuring the use of the national water heritage, from hydrogeological protection to agri-food quality up to the development of sustainable tourism in the areas close to the water courses.

Keywords

water heritage, rural tourism, cases studies, actors

S1 - P13 Exploring consumer perceptions of wine packaging sustainability: a cross-country study

Andrea Dominici[1]*, Armando Maria Corsi[2], Larry Lockshin[3], Liz Thach[4], Leonardo Casini[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI) - University of Florence, Florence, Italy
[2]University of Adelaide Business School, Adelaide, SA, Australia
[3]University of South Australia- Business, Adelaide, SA, Australia
[4]Sonoma State University, Rohnert Park, CA, USA
*E-mail: andrea.dominici@unifi.it

Abstract

The wine industry has become increasingly aware of the sustainability issues in its supply chain, for which packaging represents the major contributor to the overall carbon footprint. Several studies have highlighted that the packaging phase accounts for the highest environmental impact of the wine life cycle (Fusi et al., 2014; Ferrara et al., 2023), with packaging materials responsible for 57% of total emissions (Ponstein et al., 2019). Among the wine packaging formats available, traditional glass bottles have the most negative environmental impact (Massaglia et al., 2023; Ferrara and De Feo, 2020). However, little is known about how packaging sustainability influences consumer perceptions and behaviors in wine choice. This study aims to explore consumer perceptions and behavior regarding wine packaging and its sustainability by evaluating i) the relative importance of wine packaging attributes compared to traditional factors in the choice of wine, and ii) the perceptions consumers have of different wine packaging formats. An online survey was developed and tested in the spring of 2023 and administered to a cross-country sample of Australian, Italian, and American wine consumers (total respondents: 2,238). A combination of the Best-Worst methodology, Likert scales, and the Pick-any approach was used. The results of the Best-Worst analysis showed packaging and other environmentally friendly factors for wine packaging are not as important as traditional factors, such as having tried a wine before, price, or the origin of a wine. The results of the Pick-any approach revealed a clear distinction between the perception of glass bottles – either regular or lightweight – and the other packaging formats in terms of quality/price attributes. This research expands the knowledge on the relative importance of environmental packaging attributes and provides practitioners and marketers with evidence on consumers' perceptions of alternative wine packaging.

Keywords

Alternative Packaging, Best-Worst Scaling, Sustainability, Wine

S1 - P15

Valorisation of conifers (Pinus mugo and Picea abies) through steam distillation and hydroalcoholic maceration for flavouring Italian spirit grappa

Anna Perbellini[1]*, Fabio Pelloso[1], Stefano Grigolato[1], Tommaso Sitzia[1], Stefano Bona[2], Lorenzo Guerrini[1]

[1]Department of Land, Environment, Agriculture and Forestry, University of Padova,Viale dell'Università 16 - 35020 Legnaro, ITALY
[2]Department of Agronomy, Food, Natural Resources, Animals and Environment, University of Padova, Viale dell'Università 16 - 35020 Legnaro, ITALY
*E-mail: anna.perbellini@unipd.it

Abstract

In the Italian Alps, conifers are traditionally used as flavouring agent in *grappa.* However, this is limited to specific plant organs, such as cones and young shoots, subjected to maceration within the spirit. Valorising *Pinus mugo* and *Picea abies* by-products through the development of Non-Wood Forest Products would represent a value-adding strategy in a multipurpose forest-based supply chain. This study aims at segregating the extraction of volatile and non-volatile compounds from *Pinus mugo* and *Picea abies* wood chips, by steam distillation and hydroalcoholic extraction, in order to enhance the flavour profile of the Italian spirit *grappa*.
Wood chips were subjected to steam distillation, to separate the volatile compounds within the essential oil, and hydroalcoholic maceration, to extract the non-volatile compounds. Throughout the maceration process, pH, ORP and °Brix were monitored. Colour analysis in the Lab colour space was computed. Different types of *grappa* were developed: grappa flavoured with *Pinus mugo* essential oil or *Picea abies* aromatic water, and two *grappas* flavoured through hydroalcoholic maceration of fresh and post-distillation spent wood chips. Total Phenol Content (TPC) was measured by Folin-Ciocalteu method. Chemical composition was analysed by GC-MS and sensory evaluation was performed through discriminant and descriptive tests.
Essential oil yields significantly differed among the two plant species. *Pinus mugo* showed a higher yield (0,04%), while *Picea abies* resulted in a lower yield (0,01%). Extraction kinetics was modelled by Peleg's equation, based on colour, pH, ORP and temperature data. Sensory analysis highlighted significant differences between *grappas* obtained through maceration and those flavoured with essential oils or aromatic water. This study supports the optimisation of steam distillation and hydroalcoholic maceration processes, to valorise the application of forest by-products in *grappa* flavouring. It promotes product diversification, enabling a greater customisation of *grappa* sensory profile and faster adjustment of its olfactory and tactile characteristics.

Keywords

grappa, steam distillation, solid-liquid extraction, conifers, by-products

S2 - P01

Camera position effect in three-dimensional reconstruction of berry fruits based on photogrammetry

Aref Sepehr [1]*, Alessandro Zanchin[1], Lorenzo Guerrini[1]

[1]Department of Land, Environment, Agriculture and Forestry, University of Padova
Viale dell'Università 16 - 35020 Legnaro, ITALY.
*E-mail: aref.sepher@phd.unipd.it

Abstract

Upgrading berry fruit quality evaluations aids decision-making throughout harvesting, processing, and consumption stages. Although visual evaluation is time-consuming and can be subjected to inter-operator variability, digital twins can improve accuracy and automation. This study uses 2D-RGB images to rebuild a 3D model of berry fruits thanks to photogrammetry. In addition, two photo-capturing positions were compared: the top capturing, to simulate the transport on a conveyor belt, and three sides capturing. Comparisons were made between the estimated features with the actual ones. Subsequently, the correlation between high- and low-quality models will be assessed, taking into account factors such as measurement error and software processing time. The goal is to determine how workflow parameters, model quality reduction, relative error escalation, and online process management relate to the two photo capture methods.
In this trial, 10 actual samples of 4 different berries (i.e., blackberry, blueberry, raspberry, and strawberry), are used. In both three and one-sided images, results revealed that images with brightness adjustment and reduced shadow exhibited a smaller impact on relative errors compared to unadjusted ones, additionally, these adjusted images display only slight absolute errors. Regarding processing time, approximately 50% is devoted to data acquisition, considering computational capabilities and extended processing periods for higher quality. This phase, which relies on time and resources, is the central part of the processing workflow. The research results on time and relative mistakes provide useful insights for assessing photogrammetry and 3D detection approaches in analyzing the morphology of berry species fruits.

Keywords

Photogrammetry, Agricultural products, Berry fruits, Digital Twins, 3D model

S2 - P02

Optimizing the workflow for shape evaluation of walnuts with photogrammetry

Aref Sepehr[1]*, Alessandro Zanchin[1], Lorenzo Guerrini[1]

[1]Department of Land, Environment, Agriculture and Forestry, University of Padova
Viale dell'Università 16 - 35020 Legnaro, ITALY.
*E-mail: aref.sepehr@phd.unipd.it

Abstract

Determining morphology in walnuts is important for assessing their suitability for consumption and shelf life. Current categorization methods mainly depend on visual evaluation, however utilizing improvements in computer vision, and three-dimensional (3D) digital models might improve efficiency and automatize the determinations. This work applied photogrammetry to achieve a 3D categorization of walnut shapes. The evaluation involves varying workflow settings for reconstructing the digital twin of the nut and assessing by measuring outcomes like diameters, height, and width. A comparative study examines correlations between high and low-quality models, considering the relative error of measurements and software processing time.
Actual samples, including fresh and dried walnuts (Juglans regia var. Lara), are used, with RGB camera images for capturing. The aim is to determine the relationship between workflow settings, model quality reduction, potential escalation of relative errors, and their applicability for an online process control. Findings suggest that in nuts like walnuts, slight absolute errors have a greater effect on relative errors compared to other types of products and also larger fruits like strawberries due to the shape of walnuts. A significant amount of processing time in this evaluation is focused on data collecting, which is crucially linked to computing capabilities and the allocation of additional time for maintaining high quality and making it the key element of the entire workflow. The results of this workflow assessment provide important information for determining photogrammetry and 3D detection methods for walnut shapes.

Keywords

Photogrammetry, Agricultural products, walnuts, Digital Twins

S2 - P03

A MULTIDISCIPLINARY APPROACH FOR STRESS DETECTION IN VEGETABLE CROPS

Roberta Bulgari[1]*, Jouhaina Riahi[1], Massimo Pugliese[1,2], Luca Alfarano[1,2], Lorenzo Comba[1,3], Gica Stefanescu Miralles[1,4], Mery Malandrino[5], Riccardo Cecire[1,5], Luisella Celi[1]

[1]DiSAFA, Univ. Torino, IT
[2]Centro Agroinnova, Univ. Torino, IT
[3]Institute of Electronics, Computer and Telecommunication Engineering, CNR, IT
[4]Computer Science Department, Univ. Torino, IT
[5]Chemistry Department, Univ. Torino, IT
*E-mail: roberta.bulgari@unito.it

Abstract

Crop losses due to biotic and abiotic stresses impact significantly on yields, quality, and safe productivity. Identifying strategies to prevent or mitigate these stresses is thus a crucial task towards smart crop systems. Lettuce, a widely consumed leafy vegetable, was chosen as a representative species. The effects of different stresses were evaluated through a multidisciplinary approach, aiming to proactively detect and manage symptoms. The stress treatments included water stress (-40%), nutrient stress (-40%), and biotic stress (Fusarium wilt). Stress effects were evaluated in vivo during the growing cycle, by means of both non-destructive chlorophyll assessment and proximal sensing leaf reflectance measurements. Biotic stress severity was also quantified based on disease development and vascular browning. At harvest, fresh and dry weight, chlorophylls, carotenoids, phenolics, anthocyanins, and nitrate, as well as nutrients (N, P, K, Ca, Mg, Cu, Zn, Fe, Mn, Se, Mo) were determined. Biotic stress affected plant performance more than abiotic stresses. The lowest fresh weights were recorded for diseased lettuce plants under abiotic and biotic stresses, with an average loss of around 69%, when compared to the healthy ones. The elemental composition highlighted that plants under combined biotic and abiotic stresses presented a higher content of N. This was accompanied by a higher content of nitrate and chlorophylls. The same tendency was observed for phenolic index and anthocyanins, as well as for meso and micronutrients.
Multivariate analysis techniques on acquired data showed that biotic stress determined the highest qualitative and quantitative changes compared to water and nutrient stress, alone or combined. A supervised machine learning classification method, applied on spectral signatures of lettuce leaves, allowed to identify the water stress. The proposed methodology shows promise for integration into a larger framework that combines different techniques and analyses to study and identify stresses at various levels.

Keywords

Biotic stress, Abiotic stress, Multidisciplinary approach, Smart crop systems, Soilless cultivation

S2 - P04

Precision agriculture and Archaeology, can there be possible synergies? A case study

Carolina Perna[1], Daniele Sarri[1], Andrea Pagliai[1], Stefano Campana[2], Rachel Optiz[3]

[1]Department of Agricultural, Alimentary, Environmental and Forestry Sciences -Biosystem Engineering Division -DAGRI, University of Florence, Piazzale delle Cascine 15, 50144 Florence - Italy
[2]Department of History and Cultural Heritage, University of Siena, Palazzo San Galgano, via Roma, 4753100 Siena – Italy
[3]Open Geospatial Consortium 2300 Wilson Blvd. Suite 700-1026
Arlington, VA 22201, USA
*E-mail: carolina.perna@unifi.it

Abstract

Tuscany modern landscape and agroecosystems originated in the past, as ancient populations lived and transformed this land since the Bronze Era (3000 AC). From extensive surveys, in-depth archaeological documentations (i.e. Tuscany Region's Carte Archeologiche) were created, assessing that many archaeological artefacts can be found in the dept of agrarians' soils. In this case study, a vineyard that presented in its soil a scattered archaeological artefact was surveyed with two sensors: a multispectral sensor (OptRx® Crop Sensors AgLeader Technology, Ames, IO, USA) studying plant's vigour through two vegetation indexes (VI – NDVI and NDRE) and an Automatic Resistivity Profiler (ARP® – Geocarta SA, Paris, France) sensor, that measure the soil Apparent Electric Resistivity (AER). The survey took place in March 2023; the multispectral sensor collected data from the cover crops in the vineyard inter-row. ARP data were collected in the same inter-row at three depts (0-0.5 m, 0-1 m, 0-2 m). Global Moran's Index was applied for each variable. Bivariate Local Moran's Index ($p \leq 0.05$) maps were created to study the spatial interaction between the VI and AER results. Maps were overlapped with the archeologic artefact area obtained by a previous survey (carried out in 2003) with a Magnetometer. Global Moran Index states a high spatial-autocorrelation for each variable (varying from 0.96 to 0.83 with $p \leq 0.05$). Bivariate Local Moran maps showed significant spatial relationships between the variables, with higher VIs and AERs values concentrated in the artefact area and lower values for both variables outside the artefact (Figures show partial results). Differences in electrical resistivity are often related to the presence of archaeological remains; in this case, higher values of AER corresponded to the artefact position. In the same area, an increased plant vigour was observed. This spatial relationship highlights a possible interaction between multispectral sensors' response and hypogenous archaeological artefact.

Keywords

Precision agriculture, archaeology, soil property, Anthropocene

S2 - P05

The aeroponic cultivation system as a viable alternative for potato seed production

Roberto Natale[1,2]* , Massimo Gori[1,2], Andrea Pezzoli[3], Luisa Andrenelli[1], Stefano Biricolti[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI)- University of Florence, Viale delle Idee 30, 50019, Sesto Fiorentino (FI), Italy
[2]Interdepartmental Service Center for Agricultural, Chemical and Industrial Biotechnology (CIBIACI)- University of Florence, Via Romana 21, 50125 Florence (FI), Italy
[3]©EDO Radici Felici Srl. Viale Europa 35, Pontinia (LT) -Italy
*E-mail: roberto.natale@unifi.it
*E-mail: massimo.gori@unifi.it

Abstract

Nowadays potato seed production is under control of northern European countries, which have perfected it ensuring a sanitised product. Potato (*Solanum tuberosum*) is easily propagated via agamic, allowing it to retain important characteristics such as: productivity, size, shape, and quality of tubers.
However, the agamic propagation exposes this culture to viral infections that accumulate over generations, affecting in particular the productivity.
So, it is essential to start from virus-free seed tubers obtained through meristem excision and in vitro culture. The aim of this project is to test the feasibility of seed tuber production by mean of vitro plants grown in anVaeroponic system, patented by “ © EDO radici felici Srl”, and contemporary preserve the Italian potato varieties.
Italian potato land races have been sanitised and in vitro propagated in the DAGRI micro propagation laboratory, in order to test them for seed production in aeroponic condition. The aeroponic system allow to reduce space, soil and water consumption, optimisation of growth condition (light source and nutrient solution), in continuous production and season independent. The cultivar used was the “viola calabrese”, and the results showed an increased productivity compared to conventional cultivation; in fact, while in soil only 3 to 4 tubers per plant were produced in the greenhouse in 90 days, in aeroponics condition the yield of each individual potato plant was doubled. In addition, the harvesting can be repeated over the months on the same plant. The first results obtained are very promising, confirming the potential of the patented system.

Keywords

potato seed production, aeroponic system, soilless cultivation

S2 - P06

LIGHT TUNING FOR FOOD IMPROVING: SELECTIVE RESPONSE OF NOVEL DYE-DOPED POLYMERIC FILMS FOR AGRIFOOD IN GREENHOUSE

Ludovica Milzi[1]* , Rosita Diana[1], Giorgio Simeoli[2], Barbara Panunzi[1]

[1]Department of Agricultural Sciences, University of Naples Federico II, Via Università 100, 80055 Portici, Italy
[2]Lirsa SPA, Via Genio Militare 40, 80044 Ottaviano, Naples, Italy
*E-mail: ludovica.milzi@unina.it

Abstract

Nowadays greenhouse horticulture is crucial for meeting the growing global food demand in the face of climate change, guaranteeing sustainability and productivity. Horticulture production is influenced by spectral composition and intensity of light, providing the energy for photosynthesis and regulating plant photomorphogenesis. In a greenhouse, appropriate light can be modulated by specific lighting devices (LED). But the most current trend involves the use of functional covers. As well as playing a role in protecting the plant from adverse weather conditions, functional covers have a role in light tuning by resulting permeable or obscuring at specific wavelengths. Functional films can be obtained by doping the polymers with dyes and/or fluorophores capable of absorbing and emitting light to modulate transmittance/absorbance and diffusivity of the greenhouse covering film. Film covers that respond to sunlight to selectively adjust transmitted light and increase diffuse light can play an essential role in greenhouse food growth. The aim of this study was to design and realize film covers with high diffusivity and high transmittance in specific spectral zones required by the plant, as compared with commercial film covers. Novel functional films were obtained by adding targeted organic dyes to polymers commonly used in greenhouses, such as PE, EVA and PMMA. Compared to similar functional products, the use of our doping molecules guarantees excellent stability, remarkable spectroscopic performance at very low concentrations, excellent processability, solubility, and fluorescence quantum yield in the polymeric matrices. Among the novel film samples the blue dye-doped film caught our attention as a potential refreshing film for some vegetables and fruits. Different samples of such film showed a transmittance value of about 80% and a diffusivity value of about 50%.
These film covers will be used for the implementation of a pilot plant to evaluate their effect on vegetable crops.

Keywords

greenhouse, dyes, fluorophores, light tuning.

S2 - P07

Open data and forests: the creation of a National Forestry Information System

Matteo Pecchi[1]*, Raoul Romano[1]

[1]CREA - Research Centre for Policy and Bioeconomy, via Ardeatina 546, I- 00178, Rome (Italy)
*E-mail:matteo.pecchi@crea.gov.it

Abstract

The positive and cross-cutting value of forests in providing vital fundamental services is now widely recognized within the various national and international policies aimed at energy transition, socioeconomic development, biodiversity protection, prevention of hydrogeological disruption, land protection and climate change mitigation and adaptation.
This contribution is linked to the biological and evolutionary timescales of forest ecosystems and therefore cannot be separated from long-term strategic and programmatic policy choices that can ensure the protection and conservation of the natural heritage and the rational use of resources.
Data and information regarding forest ecosystems and the related forestry sector are now increasingly important to define effective policies.
For this reason, Italy has decided to start an important process of reorganization and harmonization regarding its statistical and cartographic knowledge concerning the national forestry sector, in line with the proposal for a Regulation of the European Parliament and of the Council regarding the implementation of a monitoring system for the resilience of European forests (COM/2023/728 final).
This contribution describes the governance process that led to the creation of the National Forestry Information System (SINFor) and the identification of the minimum information to be collected.

Keywords

open data, forest information, sharing information, collaborative approach, web-gis

S2 - P08

Diatom-bacterium co-culture: analysis of the exopolysaccharide matrix

Giulia Daly[1]*, Francesca Decorosi[1], Carlo Viti[1], Alessandra Adessi[1]

[1]Department of Agriculture, Food, Environment and Forestry, University of Florence, P.le delle Cascine 18, Italy
*E-mail : giulia.daly@unifi.it

Abstract

The phycosphere is the niche harbouring complex and unique interactions between microalgae and associated bacteria, and it is considered a metabolic hotspot surrounding the algal cell where the trafficking of nutrients and signalling molecules occurs. The formation of this extracellular microenvironment is widely influenced by the secretion of extracellular polymeric substances, which is usually driven by phototrophic organisms. The exopolysaccharides (EPS) represent the largest fraction of the microalgae-derived exudates, which can be specifically used by heterotrophic bacteria as substrates for metabolic processes. Moreover, the involvement of bacteria and their extracellular factors has been proposed to affect both the release and composition of the EPS.
In addition, the complexity of the microalgal-bacterial associations makes it difficult to study their surrounding extracellular environment in real marine conditions. Accordingly, we chose to set up a synthetic system designed to mimic the chemistry of the phycosphere.
In this study, two model microorganisms, the diatom *Phaeodactylum tricornutum* CCAP 1055/15 and the bacterium *Pseudoalteromonas haloplanktis* TAC125, were co-cultured in a dual-system to assess how their interactions modify the phycosphere chemical composition by analyzing the EPS monosaccharide profile released in the culture media by the two partners. The EPS chemical composition in the lab-reconstructed phycosphere was analysed by comparing three different conditions: diatom-bacterium co-culture, single cultures (diatom and bacterial controls) and the diatom grown inside spent bacterial medium.
We showed that microalgal-bacterial interactions in this simplified model significantly influenced the architecture of their extracellular environment. It was revealed that the composition of the exo-environment, as described by the EPS monosaccharide profiles, changed both with the different culture conditions and times of incubation.
This study reports a first characterization of the molecular modifications occurring in the extracellular environment surrounding two relevant representatives of marine systems, highlighting how the microalgal-bacterial interactions are able to alter and shape the phycophere.

Keywords

Phycosphere, extracellular environment, dual-system co-culture, exopolysaccharides, monosaccharide composition

S2 - P09

Determination of physical properties and porosity of mountain soil porosity through SEM image analysis and NMR analysis

Alessio Manzo[1], Elettra Longobardi[1], Erika Di Iorio[1], Paolo Maria Giuseppe Lomeo[2], Pellegrino Conte[2], Claudio Colombo[1]

[1]University of Molise, Department of Agricultural, Enviromental and Food Science, via de Sanctis 1, 86100 Campobasso (CB).
[2]University of Palermo, Department of Agricultural, Food and Forestry Sciences, Viale delle Scienze, Ed. 4 90128 Palermo (PA)
*E-mail: a.manzo4@studenti.unimol.it

Abstract

Mountain soils are characterized by greater fragility and vulnerability to climate change. The relationship between porosity, permeability, and the physicochemical interactions of soils with water are fundamental properties regulating their flows and hydrological capacities. In this study, 12 volcanic soils from a mountain grazing area in the central-southern Apennines were analyzed. The purpose of this work is to assess how the changes in thermopluviometric regimes influence the physicochemical processes associated with the movement of water and the type and pore distribution. Porosity was estimated using Digital Image Analysis (DIA) through the processing of soil thin sections of small aggregate acquired via scanning electron microscopy (SEM). 2D image reconstruction was conducted using both secondary electron and backscattered electron images allowing a porosity estimation with the "Image J" program. Additionally, hydrological connectivity within the soils was determined using the Fast Field Cycling (FFC) Nuclear Magnetic Resonance (NMR) relaxometry technique. The image analysis allowed the evaluation of pore sizes with diameters ranging from 2 to > 200 µm. The following types of pores were also obtained: rounded, elongated and intermediate. Preliminary results revealed three class of pore. A prevalence of pores (90-95%) in the smaller elongated size range, ranging from 2 µm to 15 µm with high microporosity and asymmetric pore structure. Rounded, intermediate, and large pore was observed between 50-200 µm. Similarly, NMR analyses of the soils confirmed three class of water molecule mobility, corresponding to the major dimensional categories of porosity estimated with DIA. The combination of SEM-EDS and free software proved to be a powerful tool for soil pore size characterization that was related with water affinity measured with NMR.

Keywords

Mountain soil, Porosity, SEM analysis, NMR relaxometry technique, Climate change

S2 - P10

Using remote sensing and productivity modelling in evaluating landscape-level potential of alpine local foraging resources

Eugenio Carlon[1]*, Rodolfo Isaac Ceriani[1], Ermes Movedi[1], Luciana Bava[1], Stefania Colombini[1], Martina Pavesi[1], Guillermo Pardo[3], Jaber Rahimi[2], Francesco Pietro Fava[1]

[1]Department of Environmental Science and Policy, University of Milan, Italy.
[2]Institut für Meteorologie und Klimaforschung – Atmosphärische Umweltforschung (IMK-IFU), Karlsruher Institut für Technologie (KIT), Germany
[3]Basque Centre for Climate Change (BC3), 48940 Leioa, Spain
*E-mail: eugenio.carlon@unimi.it

Abstract

Traditional alpine pastoralism methods are intrinsically highly circular. Simultaneously, grazing at mountain pastures contributes to the maintenance of Alpine grasslands, indirectly aiding environmental and economic sustainability. However, the last decades have seen a rapid decline in use of traditional pastoral practices in the Alpine region, with a shift toward intensive livestock farming. Consequentially, mid- and high-elevation pastures have been rapidly decreasing, leading to ecological transition to shrubland and neoformation forest.
Here, we combine the use of remote sensing techniques and landscape-level agroecosystem modelling for the evaluation of the potential of local foraging resources within a 715km2 Italian Alpine region (Val Camonica), compared against the effective demand of the zootechnical sector. The study ultimately aims at targeting directly land-use circularity-oriented decision making.
Machine learning classification techniques were used to combine information from optical and radar satellite imagery with topographic data to derive present-day and historical land cover
maps, with an overall 89% and 87% classification accuracy respectively. Specifically, grassland typologies were characterized by vegetation type and productivity and land-cover change analysis was used to identify lost and retrievable or improvable grasslands surfaces.

Land-cover analysis indicates clear loss and impoverishment of pastoral surfaces, with low-pastoral value pastures prevailing, and grasslands being overall largely reduced and fragmented by increased forest and shrubland cover.
The results of this analysis will be integrated in the LandscapeDNDC model to estimate local foraging resources at landscape level and carrying capacity to be compared to the effective demand of the local zootechnical sector, assessed through questionnaires completed for 16 local livestock farms and livestock density data. The results of this analysis will be finally used to derive circularity indicators at landscape-level and evaluate the potential impact of policies aimed at recovering or improving abandoned grasslands in the region.

Keywords

Agro-pastoral systems, circularity, remote sensing, productivity modelling, alpine

S2 - P11

Effects of blue and red light-emitting diodes on two *Cichorium intybus* L. cultivars

Felicia Menicucci[1]*, Cecilia Brunetti[1,2], Giovanni Marino[1], Fabiano Sillo[3], Andrea Carli[2], Cassandra Detti[2], Raffaella Balestrini[4]

[1]Institute for Sustainable Plant Protection (IPSP), National Research Council, Sesto Fiorentino, 50019, Italy
[2]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Firenze, 50144, Italy
[3]Institute for Sustainable Plant Protection (IPSP), National Research Council, Torino, 10135, Italy
[4]Institute of Biosciences and Bioresources (IBBR), National Research Council, Bari, 70126, Italy
*E-mail: felicia.menicucci@cnr.it

Abstract

Plant growth and metabolism can be shaped to maximize specific benefits by manipulating light intensity and wavelength. The use of light-emitting diodes (LEDs) allows easy regulation of the light spectrum, providing narrow-bandwidth lighting ranging from the ultraviolet to infrared region. LED technology is widely tested for the production of high-quality food in controlled environments, such as greenhouses and vertical farming systems. *Cichorium intybus* L. (*Asteraceae* family), better known as chicory, was used since ancient times as medicinal plant. It is a rich source of vitamins, minerals and phytochemical compounds of interest, such as polyphenols (cicoric, chlorogenic, and coumaric acids, quercetin and apigenin derivatives), tannins and terpenoids. The aim of this study was to assess the effects of blue and red LEDs on two cultivars of chicory (Rossa di Treviso and Precoce) to investigate possible variations in leaf polyphenol levels and chlorophyll content, thus optimizing the levels of these phytonutrients in chicory through LED treatments. The plants were grown under blue and red light for 3 to 4 weeks of treatment, whereas white light was supplied to control plants. The leaf polyphenols were characterized and quantified by HPLC-DAD-Q-ToF analysis, whereas Dualex® was used to measure chlorophyll content. In both cultivars, the highest levels of polyphenols were registered in response to blue light exposure, and a time-dependent increase was observed. The major contribution to polyphenol accumulation was due to the fraction of quercetin derivatives, compounds showing strong antioxidant properties. The treatment with red light led to an accumulation of polyphenols only in the Rossa di Treviso cultivar, this increment being time-independent. The highest contents of chlorophylls were observed in both cultivars after four weeks of blue light irradiation, whereas no changes were detected in response to red light treatment. These results suggest that blue LED may be considered a valuable tool to drive the cultivation of two chicory cultivars towards the production of a polyphenol-enriched high-quality food.

Keywords

Cichorium intybus L., chlorophylls, high pressure liquid chromatography coupled with diode array detector and quadrupole time-of-flight mass spectrometry (HPLC-DAD-Q-ToF), Light-emitting diodes (LED), polyphenols

S2 - P12

A solar powered autonomous ground vehicle in sugar beet sowing and weeding with respect to conventional practices

Mattia Chiarini[1], Giulia Piovaccari[1], Giovanni Campagna[2] , Tommaso Iaboli[2], Lorenzo Barbanti[1]* , Valda Rondelli[1]

[1]Department of Agricultural and Food Sciences, University of Bologna, Viale Fanin 44, 40127 Bologna (BO)
[2]Co.Pro.B., Soc. Coop. Agricola, Via Mora 56, 40061 Minerbio (BO)
*E-mail: lorenzo.barbanti@unibo.it

Abstract

Sugar beet (*Beta vulgaris* L.) is a slow-growing crop which is much exposed to weed competition in the early growth stages. It results that weed control is a demanding task, and represents a relevant share of the total crop budget.
This adds to the increasing restrictions in the use of plant protection products. Therefore, alternatives are sought to reduce the use of herbicides in conventional cropping, as well as the cost for hand weeding in organic cropping. Precision agriculture is seen a framework for developing solutions to both problems.
This study addressed sugar beet sowing and post-emergence weeding by an autonomous, solar powered rover (FarmDroid FD20). The results were compared with conventional crop practices (tractor operated precision sowing, pre-emergence and post-emergence herbicide spraying, and inter-row hoeing). Weeding effectiveness and operational capacity were specifically focused.
The field area hosting the experiment exhibited a modest, variable weed density (average, 11.9 ±11.8 weeds m^{-2} emerging between February and April, 2023). The autonomous rover attained a median 82.6% weed suppression, while the conventional management performed a median 76.9% weed abatement.
However, the autonomous rover had a lower operational capacity. It required a total of 44.8 hours ha -1 for sowing and six inter-row hoeing passes (three of which including on-the-row weeding). In comparison, conventional practices required a total of 2.3 hours ha^{-1} for sowing, two herbicide sprayings and an inter-row hoeing.
Although the autonomous rover does not require an operator, its user friendliness is still low, and field supervision by an expert will be needed, until rover simplification or farmers' training can make it unnecessary. In conclusion, sugar beet farmers can be involved into investing in such new technology only if autonomous rovers get simpler and more reliable to be operated.

Keywords

sugar beet, precision agriculture, weeding, autonomous vehicle

S2 - P13

Estimation of soil erosion by water using RUSLE model in the State of Sao Paulo (Brazil)

Enzo Antonio Lecciolle Paganini[1],*; Rafael Barroca Silva[1,2]; Ludmila Ribeiro Roder[1]; Iraê Amaral Guerrini[2]; Gian Franco Capra[1]; Antonio Ganga[1];

[1]Dipartimento di Architettura, Design e Urbanistica, Università degli Studi di Sassari, Viale Piandanna n: 4, 07100, Sassari, Italy;
[2]Department of Forest, Soil and Environmental Sciences, College of Agricultural Sciences, São Paulo State University - UNESP, 18610-034, Botucatu, SP, Brazil;
*E-mail: e.lecciollepagani@studenti.uniss.it

Abstract

Soil erosion is one of the major threats to the global food chain. Soil conservation policies are being implemented in several countries and international organizations like FAO are addressing their resource-improving sustainable soil management technique. Therefore, it is crucial to map the distribution of the soil loss process. In this work, soil water erosion was mapped by using the Revised Universal Soil Loss Equation (RUSLE) in the State of Sao Paulo (Brazil). This state is characterized by intense human pressure in terms of population density and industrial and agricultural activities. The state mean soil loss rate is low (1.89 Ty-1ha-1) compared to more exposed other areas in subtropical climates. However, there are several differences among regions. The spatial pattern analysis carried out with the Local Indicators of Spatial Association (LISA) shows the presence of hot spots, featured by specific demographic, topographic, and ecological scenarios, concentrated mainly along the coast. On the contrary, in other parts of the State, there are cold spot clusters, in a completely different scenario, characterized by low population density, large, protected areas, and semi-extensive agriculture. This approach points to the need for a policy framework that considers the diversity of environmental and socio-economic characteristics of the areas affected by erosion. A rigid environmental management policy could exacerbate inequalities between communities, especially in the state affected by unequal distribution of wealth.

Keywords

Soil erosion, RUSLE, soil management, LISA

S2 - P14

Ozone: unveiling its unexplored potential in its plant disease control

Chiara Pastacaldi[1]*, Dario Gaudioso[1], Cosimo Beltrami[1], Stefania Tegli[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Molecular Plant Pathology Lab, Via della Lastruccia, 10, 50019 Sesto Fiorentino, Firenze, Italy
*E-mail: chiara.pastacaldi@unifi.it

Abstract

The use of pesticides has been the most used approach to protect plants from phytopathogens. However, these chemicals negatively affect the environment through the release of pollutants into water and soil.
Consequently, policies aiming at a “Green agriculture” are increasingly introduced by governments, leading to the urgent need to develop new sustainable strategies to protect plant health, also by adopting strategies based on Circular Bioeconomy.
Ozone (O_3) is a natural gas having a powerful oxidizing activity. At high concentrations, it has phytotoxic effects, affecting plant growth and development. However, at lower concentrations it can trigger plant defense mechanisms by altering gene expression and metabolic pathways, such as salicylic acid and ethylene. Thus, O_3 could be used in agriculture to trigger plant defenses against phytopathogens. Nevertheless, the molecular mechanisms supporting these beneficial effects of ozone are still not known. In this study, we aimed to understand the molecular mechanisms involved in O_3 bioactivity on common bean (*Phaseolus vulgaris*). For this purpose, plants have been artificially inoculated with two different phytopathogenic bacteria: *Pseudomonas savastanoi* pv. *phaseolicola* and *Curtobacterium flaccumfaciens* pv. flaccumfaciens. Before or after theinoculation, *P. vulgaris* plants have been treated with gaseous O_3 with different exposure times. The phenological characteristics have been constantly monitored to evaluate potential changes in plant growth and development. Moreover, the expression of defense-related genes, such as *PAL, CHS, PR1* and auxin-responsive genes, have been analyzed to successfully unveil the pathways triggered in plants by O_3.
In conclusion, the understanding of the molecular mechanisms involved in O_3 bioactivity can lead to the development of innovative strategies and technologies to protect plant health.

Keywords

plant health, ozone, defense, sustainability, innovation

S2 - P15

AQUACULTURE 4.0 IN NORTHEAST BRAZIL: PROSPECTS AND DIFFICULTIES

Priscilla Joyce Lêdo de Lima[1], Deyvid Willame Silva Oliveira[1]*, Barbara de Cassia Soares Brandão[1], Elizabeth Pereira dos Santos[1], Jéssika Lima de Abreu[1], Alfredo Olivera Gálvez[1]

[1]Department of Fishing and Aquaculture, Federal Rural University of Pernambuco, Street Dom Manuel de Medeiros, Dois Irmãos, 52171-900, Recife/PE Brazil.
*E-mail: deyvid.oliveira@ufrpe.br

Abstract

The widespread adoption of Aquaculture 4.0, characterized by integrated technological advancements, is critical for ensuring future food security. This paradigm necessitates increased production efficiency alongside a reduction in natural resource utilization. However, implementation presents significant challenges, particularly in developing regions like Northeast Brazil. Overcoming these obstacles necessitates collaborative efforts from both public and private sectors.
This study explores the prospects and challenges of adopting Aquaculture 4.0 in Northeast Brazil. The analysis is informed by official data, community statistics, and published literature. The region boasts significant aquaculture potential, with diverse species like shrimp and fish contributing approximately US$ 505,89 millions to the regional Gross Domestic Product (GDP). Furthermore, the abundance of natural resources and a skilled workforce paves the way for substantial growth. The emergence of agritech startups in key cities like Recife and Fortaleza, with their universities and business hubs, is another promising indicator.
Despite these strengths, significant hurdles exist. The prevalence of small-scale, informal aquaculture farms hinders progress. Limited access to financing and a lack of support for intensive farming practices further impede development. Import taxes on technological inputs inflate costs, making advanced equipment unaffordable for many producers.
In conclusion, while Aquaculture 4.0 presents a promising pathway for development in Northeast Brazil, substantial challenges must be addressed. Collaborative efforts aimed at formalizing the industry, facilitating access to financing, and promoting technological adoption are essential for unlocking the region's full aquaculture potential. By addressing these challenges, Northeast Brazil can position itself as a leader in sustainable and efficient aquaculture practices.

Keywords

small-scale; informal; financing; agritech; startups

S2 - P17

PROBIOTIC BEHAVIOUR: A STUDY OF ULTRASOUND ATTENUATION-INDUCED GENE EXPRESSION CHANGES THROUGH RNA SEQUENCING ANALYSIS

Irene Giordano[1]*, Ilaria Di Biase[1], Mohammed Salman[1], Gianluigi Mauriello[1]

[1]Department of Agricultural Science, University of Naples Federico II, Via Università 100, Portici, Italy)
*E-mail: irene.giordano@unina.it

Abstract

As consumer preferences shift towards dairy alternatives as vehicle for probiotics, there is a growing interest in modulating the performance of probiotics to attenuate the "probiotic off-flavors" associated with rapid acidification. Attenuation induced by sub-lethal stress delays probiotic metabolism and induces a metabolic shift for enhanced survival. A model probiotic, *Lacticaseibacillus casei* ATCC 393, in a water suspension was subjected to ultrasound at 57 W, 50% duty cycle, and 20 kHz for both 6 (T) min and 8 (ST) min. RNA sequencing analysis and differential gene expression analysis were used to identify the transcriptional regulatory mechanisms employed by the strain to cope with the stress induced by ultrasound attenuation. Gene expression comparison revealed a significant (False Discovery Rate < 0.05) different expression of 742 and 409 genes in T and ST, respectively. 198 up-regulated and 321 down-regulated genes were found in T, while 140 up-regulated and 249 down-regulated in ST. These data revealed a strong defensive response at 6 min, suggesting, instead, the adaptation of the strain after 8 min of treatment. Membrane transport, carbohydrate and purine metabolism, translation, and phage-related genes were affected by ultrasound attenuation. Genes for PTS transporters, glycolysis and pyruvate metabolism were upregulated, indicating an increased energy demand as reflected by increased transcription of purine biosynthetic genes. Vice versa, ribosomal protein biosynthetic genes were downregulated, inhibiting protein translation, a high-energy process. Moreover, phage- and transposons-related genes were down-regulated suggesting a tight transcriptional control on DNA structure. The observed phenomena highlight the cellular demand for ATP to counteract various ultrasound stresses, as well as the activation of processes aimed at stabilizing and preserving DNA structure. Our work demonstrates that ultrasound has remarkable effects on the tested strain and elucidates the involvement of different pathways in its defensive stress-response and in the modification of its phenotype.

Keywords

probiotic; attenuation; RNA sequencing; metabolic change

S3 - P01

Wild leafy vegetables of the north-western Italian Alps: traditional food system to innovate horticulture

Stefania Stelluti[1], Nicole Mélanie Falla[1], Simone Ravetto Enri[1], Michele Lonati[1], Giampiero Lombardi[1], and Valentina Scariot[1]*

[1]Department of Agricultural, Forest and Food Sciences, University of Torino.
Largo Paolo Braccini 2, Grugliasco, TO 10095, Italy
*E-mail: valentina.scariot@unito.it

Abstract

Wild leafy vegetables, a traditional food source for rural communities worldwide, are gaining growing commercial interest. This is due to consumers' increasing attention towards a more balanced and healthy diet and the preservation of traditional food systems, linked to the concept of intangible cultural heritage. In northwestern Italy, the Alpine valleys are important repositories of knowledge on the use of wild leafy vegetables. Above all, Valchiusella valley, little affected by mass tourism, has preserved a precious heritage. Analysing ethnobotanical and phytoalimurgical documents, the focus shifted to eight species - namely, *Achillea millefolium* L., *Alchemilla xanthochlora* Rothm., *Bistorta officinalis* Delarbre, *Blitum bonus-henricus* (L.) Rchb., *Phyteuma betonicifolium* Vill., *Plantago lanceolata* L., *Silene vulgaris* (Moench) Garcke, and *Taraxacum* F.H.Wigg. sect. *Taraxacum* (hereafter *Taraxacum officinale* - as potential candidates to strengthening local economies. Interesting prospects could arise from the commercial production of these wild leafy vegetables as fresh-cut products. However, post-harvest perishability may be a major limiting factor. Therefore, in the present study we analysed the shelf life of different wild leafy vegetables, evaluating their health promoting properties (polyphenols and antioxidant activity) and visual quality characteristics (pigmentation) during post-harvest storage. On average, antioxidants and pigments (chlorophylls and carotenoids) fell from the tenth day after harvest with some species lasting longer, such as *Alchemilla xanthochlora* Rothm. for antioxidants and *Blitum bonus-henricus* (L.) Rchb. for pigments.

Quinones, which derive from the oxidation of phenols and are responsible for the browning of tissues, continue to increase. Browning was particularly evident in *Blitum bonus-henricus* (L.) Rchb. and *Plantago lanceolata* L. The information acquired will be able to guide the selection of the most suitable species and direct towards the development of proper techniques for prolonging their shelf life, encouraging their commercial use and promoting culinary traditions and rural agrobiodiversity.

Keywords

wild edible plants; bioactive compounds; ethnobotany; foraging; post-harvest quality

S3 - P02

Phenotype Microarray-based Assessment of metabolic variability in plant protoplasts

Giulia Alfreducci[1]*, Francesca Decorosi[1], Roberto Natale[1], Stefano Biricolti[1], Carlo Viti[1], Donatella Paffetti[1], Alessio Mengoni[2], Alice Checcucci[1]

[1]Department of Agricultural, Environmental, Food and Forestry Science and Technology, University of Florence, Florence, Italy
[2]Department of Biology, University of Florence, Florence, Italy
*E-mail: giulia.alfreducci@edu.unifi.it

Abstract

The productivity and the fitness of cultivated plants are influenced by both genetic heritage and interaction with the environment, determining the occurrence of particular phenotypes.
Phenomics is one of the -omics sciences capable of providing applicative approaches for the analysis of multidimensional phenotypic information, becoming essential to understand, foresee and improve the genetic potential of organisms of agricultural interest. Cellular level phenotyping is important when we need to identify and dissect the metabolic basis of different phenotypes and the effect of genetic modifications.
Phenotype Microarray (PM) is a high-throughput technology developed by Biolog™ for metabolic characterization studies at cellular level, and it is based on colorimetric reactions which occur during cellular respiration on several tested substrates. Nowadays, PM is widely used for bacteria and fungi, but a protocol for plant cells characterization has not yet been developed, due to difficulties linked to the presence of the cell wall.
Here, we tested the PM technology on plant protoplasts as a potential solution for PM-based evaluation of metabolic activity in plant cells.
Solanum tuberosum' protoplasts from leaf tissue were isolated and then collected until desired concentration. PM plates were inoculated with protoplasts suspension and several markers of redox potential (both commercialized and innovative) were tested. Results allowed to set up PM-metabolic tests on protoplasts from different cultivar of *S. tuberosum* and other plant species.
The development of a standardized high-throughput method for the plant protoplasts metabolic characterization would be essential to lay the foundation for basic phenotyping studies in different plant cultivar/species, allowing for comparative studies among wild-type organisms and the relative genome-edited plants.

Keywords

Phenotype Microarray, protoplasts, metabolic activity, phenotype, cellular level phenotyping

S3 - P03

Crowdsensing for linear landscape elements survey: a study case in Nord East Italy

Ester Curci[1,2], Anna Lilian Gardossi[1]*, Eros Caputi[3], Carlo Macor[3], Maurizia Sigura[1]

[1]Department of Agricultural, Food, Environmental and Animal sciences, University of Udine, Address : via delle Scienze, 206 (UD) Italy
[2]Department of Life sciences, University of Trieste, Address: via Licio Giorgieri, 5 (TS) Italy
[3]Department of Agriculture and forest sciences, University of Tuscia, Via S.M. in Gradi n.4, 01100 (VT) Italy
*E-mail : anna.gardossi@uniud.it

Abstract

Mapping and spatial data collection radically changed during the last decades moving from primarily professional domains to increased involvement of the public. This shift in activity patterns has occurred as a result of significant technological advances and strategies to involve citizens, as the proliferation of mobile devices that can record the location of features, the open access of satellite imagery and the ability to create contents online by web applications. Crowdsensing is a promising strategy to involve large groups of individuals in crowdsourcing activities to collect spatial data on landscape features and land uses.
In this context, the EyeLand project (Prin 2020) explore the potential of satellite Earth observation and remote data collection involving citizens by a dedicated web application. This last offers a simple and user-friendly graphical interface for the collection data on land cover/land use and landscape features. Living labs involving high school students were organized to test and share the data survey protocols and introduce the web application.
Two high-schools of Friuli Venezia Giulia region (North-east of Italy) and 30 students were involved, and two public meetings were developed.
Specifically, labs activities were organized in phases. Potential of satellite imagery for environmental knowledge and the EyeLand app were presented, then ground-truth collection sections were performed to map hedges, and tree rows as basic features for biodiversity conservation and ecosystem services delivery. Finally, participants acted as Citizen Scientists promoting their new knowledge on tools and obtained results during public events, open to school and local communities. These labs worked as a technological transfer experiments promoting communication tools enabling students and citizens to actively participate in shaping their territory.
Aligned with three Sustainable Development Goals: Quality Education, Climate-Action and Life on Land of the 2030 Agenda, this project integrates education, environmental awareness, new technology and communication to foster positive change.

Keywords

remote sensing, citizen science, landscape survey

S3 - P04

EXPLORING LENTIL GENETIC DIVERSITY IN MEDITERRANEAN ENVIRONMENT

Michele Prestera[1]*, Stefania Marzario[1], Rocco Sabato[2], Valeria Morante[1], Carmen Verrastro[1], Gerardo Placido[1], Mario A. Galante[1], Giuseppina Logozzo[1], Sofia Ghitarrini[3], Roberto Papa[4], Tania Gioia[1]

[1]Scuola di Scienze Agrarie, Forestali, Alimentari ed Ambientali, Università degli Studi della Basilicata, Via dell'Ateneo Lucano 10, 85100 Potenza, Italia
[2]PhD School in Agricultural, Forest and Food Sciences, Università degli Studi della Basilicata, Via dell'Ateneo Lucano 10, 85100 Potenza, Italia
[3]Società Produttori Sementi S.p.A., Via Macero 1, 40050 Argelato, Bologna, Italia
[4]Dipartimento di Scienze Agrarie, Alimentari ed Ambientali, Università Politecnica delle Marche, Via Brecce Bianche 2-8, 60121 Ancona, Italia
*E-mail: michele.prestera@unibas.it

Abstract

Lentils (*Lens culinaris* Medik.; 2n = 2x = 14) are not only a crucial source of protein, micronutrients and beneficial compounds for human health, but they also play a pivotal role in soil fertility maintenance and enhancement by fixing atmospheric nitrogen, representing an essential tool for sustainable agriculture. They are also agriculturally vital for their resilience to drought and adaptability to diverse soil types and climates, playing a crucial role in establishing sustainable food and feed systems across numerous countries.
The H2020 INCREASE project (Bellucci et al., 2021) develops new approaches to conserve, manage and characterize legume genetic resources. In this context, UNIBAS is leading the second Multi-Location Field Trial for lentils in Italy, with the aim to deeply characterize, under local conditions, 450 lentil lines of the Training T-CORE collection developed within the INCREASE project and representing a subset of the broader R-CORE collection (~2000 lines). The trial started in December 2023 at the ALSIA Research Station in Metaponto, Matera, South Italy, situated in a Mediterranean climate area. The SSD seeds are growing in single row plots and are phenotyping using forty-one vegetative and reproductive descriptors for lentils according to the protocol published by Guerra-Garcia et al. (2021).
Data collected in these trials will be grouped with those coming from twin experiments carried out in Spain and Lebanon. Through extensive phenotypic trait collection, the trials aim to advance our understanding of lentil adaptation and its unknown genetic potential, to boost breeding and enhance the development of sustainable agricultural systems in Europe.

Keywords

legumes, genetics, breeding, lentils, biodiversity

S3 - P05

INTELLIGENT CHARACTERIZATION OF LENTIL GENETIC RESOURCES TO PROMOTE AGROBIODIVERSITY

Valeria Morante[1]*, Carmen Verrastro[1], Stefania Marzario1, Rocco Sabato[2], Michele Prestera[1], Mario A. Galante[1], Giuseppina Logozzo[1], Roberto Papa[3], Tania Gioia[1]

[1]Scuola di Scienze Agrarie, Forestali, Alimentari ed Ambientali, Università degli Studi della Basilicata, Via dell'Ateneo Lucano 10, 85100 Potenza, Italia
[2]PhD School in Agricultural, Forest and Food Sciences, Università degli Studi della Basilicata, Via dell'Ateneo Lucano 10, 85100 Potenza, Italia
[3]Dipartimento di Scienze Agrarie, Alimentari ed Ambientali, Università Politecnica delle Marche, Via Brecce Bianche 2-8, 60121 Ancona, Italia
*E-mail: valeria.morante@unibas.it

Abstract

Lentil (*Lens culinaris* Medik.; 2n = 2x = 14) is a diploid, self-pollinating, cold-season adapted legume grown worldwide. According to FAO, global lentil productivity increased reaching 6,650,000 tons in 2022 thus marking a 17 percent increase from 5.65 million tons in the previous year (FAO, 2024). Lentils are an essential part of diets in many countries because of their high protein content, balanced carbohydrates (including dietary fiber), minerals, and a variety of health-benefit bioactive compounds. In addition, lentils play a role in sustainable organic farming systems reducing the use of fertilisers and decreasing the ecological impact of agriculture. It is essential to identify new germplasm potentially useful in lentil breeding programs to improve cultivar productivity and resilience to climate change.

In this study, a greenhouse experiment was carried out at the University of Basilicata, Italy, in 2022-2023. A collection of 450 lentil accessions with comprehensive passport and georeferenced information was grown in pots and evaluated according to the INCREASE protocol by Guerra-Garcia et al. (2021). Morpho-agronomic and phenological traits were detected: plant habit and intensity of ramification, presence/absence of anthocyanin pigmentation, leaf pubescence, color, shape and size, days to flowering, number of flowers per node, flower size and color, pod formation, plant height and lowest pod height, pod color and days to maturity. Other traits on pods (length, width, total number of pods) and seeds (total number of seeds and total seed mass) were recorded in post-harvest. The acquired phenotypic data could be helpful for efficient use of genetic diversity by increasing yields and addressing emerging climate-induced stresses.

Keywords

lentil, genetic diversity, morpho-agronomic traits, sustainability

S3 - P06

HETEROZYGOSITY RICH REGIONS IN AUTOCHTHONOUS AND COSMOPOLITAN CATTLE BREEDS

F. Bernini[1]*, C. Ferrari[1], A. Delledonne[1], C. Punturiero[1], R. Milanesi[1], M. Vevey[2], V. Blanchet[2], A. Bagnato[1],M.G. Strillacci[1]

[1]Department of Veterinary Medicine and Animal Science, Università degli Studi di Milano, Via dell'Università 6, 26900 Lodi, Italy;
[2]Associazione Nazionale Bovini di Razza Valdostana, Fraz. Favret, 5, 11020 Gressan, Italy
*E-mail: francesca.bernini@unimi.it

Abstract

Heterozygosity Rich Regions (HRR) are continuous stretches of heterozygote genotypes associated with balancing selection because of the haplotype diversity that they represent. The cosmopolitan and specialized Holstein cattle breed, raised in intensive farming systems, has been strongly directionally selected to increase milk yield. The two autochthonous Aosta breeds (i.e. Red Pied and Black Pied-Chestnut) are raised in an extensive farming system and have been subjected also to adaptive selection to cope with the harsh mountain environmental conditions. Holstein and Aosta populations have two very different selection schemes and strategies: we hypothesize that balancing selection could have acted differently on them. For this study a total of 4755 Holstein and 4246 Aosta cows have been genotyped with NEOGEN's GGP Bovine 100K SNP chip. The analysis has been carried out with detectRUNS library in R software. A total of 79,013 HRR have been identified in the Holstein's and 47,824 in the Aosta breeds. Each of the two Aosta breeds had four HRR_islands and no common regions with Holstein's. Holstein's have HRR_islands on BTA 1, 3, 8 and 9 while the Aosta breeds share three regions on BTA 2, 3 and 28. In the HRR_islands the annotated genes represent membrane proteins and receptors, DNA transcription, translation and methylation factors, microtubules organization factors and RNA polymerase activators (e.g. TERT, REEP3, ZRANB2 and CEP72). Results show that the possible effect of balancing selection appears different for Holstein and Aosta cattle.
Acknowledgements: Funded by 1) DUALBREEDING - PSRN 2014/2020 CUP-J71J18000020005; 2) GENORIP project Funded by EAFRD Rural Development Program 2014-2020, Management Authority Regione Lombardia - OP. 16.1.01 - 'Operational Group EIP AGRI'.

Keywords

Heterozygosity Rich Regions, Autochthonous and cosmopolitan cattle, *balancing selection*

#AISSA under40

S3 - P07

FIELD PHENOTYPING OF COMMON BEAN GERMPLASM COLLECTION

Rocco Sabato[1]*, Stefania Marzario[2], Valeria Morante[2], Carmen Verrastro[2], Michele Prestera[2], Mario A. Galante[2], Giuseppina Logozzo[2], Roberto Papa[3], Tania Gioia[2]

[1]PhD School in Agricultural, Forest and Food Sciences, Università degli Studi della Basilicata, Via dell'Ateneo Lucano 10, 85100 Potenza, Italia
[2]Scuola di Scienze Agrarie, Forestali, Alimentari ed Ambientali, Università degli Studi della Basilicata, Via dell'Ateneo Lucano 10, 85100 Potenza, Italia
[3]Dipartimento di Scienze Agrarie, Alimentari ed Ambientali, Università Politecnica delle Marche, Via Brecce Bianche 2-8, 60121 Ancona, Italia
*E-mail: rocco.sabato@unibas.it

Abstract

Common beans (*Phaseolus vulgaris* L.) are essential for the sustainability of agri-food systems. They require less input to grow and are an important source of vegetable proteins and other nutritional compounds like vitamins, minerals, and fibres. Access to genetic resources well characterized at the genotypic and phenotypic level, is necessary for breeding new common bean varieties, more efficient in terms of production and quality. The INCREASE project (Bellucci et al., 2021) seeks to create intelligent food-legume genetic resource collections that can be utilized in European agri-food systems. In the frame of the project, a collection of common beans has been field-phenotyped in South Italy during the 2021 and 2022 growing seasons. The collection was composed of 450 single seed descent-purified, domesticated accessions. The experimental design was Randomized Complete Block with repeated checks and three replicates. Each plot was constituted by a single row of 15 plants. Several traits were scored, including: phenological (time of emergence, time of flowering, pod formation, pod maturation, complete maturation, etc.), morphological (leaf type, flower colour, growth habit, height) and post-harvest (number of pods, number of seeds, yield). Additionally, leaf samples were taken during the pre-flowering phase on each plot and immediately nitrogen frozen for further metabolomic analysis. To investigate the genotype x environment interactions of the accessions, data from the trials will be combined with data from twin experiments carried out in Poland and Spain. All the data obtained from field trials, together with all the other phenotypic and genotypic information collected in the INCREASE project, will help unveil the structure of the collection and the potential of the single accessions for specific uses (breeding, farming, food industries, etc.).

Keywords

common bean, germplasm collection, phenotyping, field trials

S3 - P08

Maize landraces as sources of important bioactive compounds

Clarissa Clemente[1]*, Silvia Tavarini[1], Alessandro Rossi[1], Luciana G. Angelini[1]

[1]Dipartimento di Scienze Agrarie, Alimentari e Agro-ambientali (DiSAAA-a) - Università di Pisa
*E-mail : clarissa.clemente@phd.unipi.it

Abstract

Facing the challenges posed by climate change, loss of biodiversity, resource depletion and food insecurity, the valorisation of traditional crop varieties emerges as a key strategy for building resilient and sustainable food systems. Therefore, the conservation of local germplasm adapted to specific environments, is crucial for preserving agrobiodiversity as well as for identifying valuable genetic traits that could potentially contribute to future breeding efforts. Maize (*Zea mays* L.), one of the major staple cereals worldwide, has evolved for centuries into hundreds of landraces, adapting to many agroecological niches under careful farmer selection.
Maize landrace adaptations to different and, often, difficult environmental conditions, such as marginal areas, offers several advantages, including low input requirements, good tolerance to abiotic and biotic stresses, enhanced food security, and preservation of local biodiversity. Since Tuscany is characterized by the presence of several traditional maize varieties, in the present study, seeds of 14 local maize varieties, conserved *ex situ* by Tuscany Region Germplasm Bank's herbaceous species section located at the Department of Agriculture, Food and Environment of the University of Pisa) were evaluated in terms of phytochemical properties (free phenols and flavonoids, anthocyanins, xanthophylls, antiradical and antioxidant activities) in comparison with a modern hybrid (PR 36Y03 - Pioneer). The local varieties were Trentolino, Formenton, Maggese, Quarantino di Monteviale, Quarantino di Sansepolcro, Quarantino di Frassineto, Quarantino di Anghiari, Quarantino Ville di Roti, Villa di Pietranera, Nano di Verni, Orecchiella, Palazzaccio, Marranino Giallo and Marranino Rosso. Our results showed that these local varieties exhibited higher nutraceutical value than the commercial hybrid, with the highest content of bioactive compounds achieved by Quarantino Ville di Roti, Quarantino di Sansepolcro, and Trentolino. The study highlighted as local maize varieties can be sources of valuable bioactive compounds and their in situ preservation can represent an opportunity for the creation of agri-food chains based on functional and healthy food products.

Keywords

traditional maize varieties, Tuscany Region Germplasm Bank, preservation of local biodiversity, bioactive compounds, nutraceutical value

S3 - P09

Integrating phenotypic, genotypic, and environmental data for predictive modeling in durum wheat (*Triticum durum Desf.*) cultivation using Artificial Intelligence

Walter Vieri[1]*, Matteo Buti[1], Donatella Paffetti[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence. Via Maragliano, 77 - 50144 Florence, Italy
*e-mail: walter.vieri@unifi.it

Abstract

The Mediterranean region is facing rising temperatures and decreasing water availability, which could significantly impact durum wheat (*Triticum durum* Desf.) cultivation. There is a growing need for a comprehensive understanding of how durum wheat yield and protein quality change in different environmental conditions to optimize agronomic decisions and mitigate potential losses. This study aims to explore the potential of integrating phenotypic, environmental, and genotypic data using artificial intelligence algorithms and to develop predictive models for changes in phenotypic parameters such as durum wheat yield and protein content under changing climatic conditions.
Phenotypic data from various *Triticum durum* varieties cultivated in approximately 70 sites across the entire Italian territory have already been collected for at least the past 10 years in a national study. This data will be integrated with historical climate series and genetic data sourced from literature to develop predictive models using machine learning algorithms.
The objective of the study is to develop approaches for identifying durum wheat cultivars that exhibit the best performance under various climatic and environmental conditions.
Overall, our study aims to utilize artificial intelligence as a powerful tool to gain deeper insights into how climate change impacts durum wheat cultivation and to guide agronomic decisions within this context.

Keywords

Durum wheat, artificial intelligence, climate change, omics data

S3 - P10

Development of a new rapid method based on FT-NIR analysis to safeguard and enhance the traceability of sourdough bread

Giuseppe Perri[1]*, Davide De Angelis[1], Giacomo Squeo[1], Erica Pontonio[1]

[1]Department of Soil, Plant and Food Science, University of Bari Aldo Moro, Via Amendola 165/a, 70126, Bari, Italy;
E-mail:davide.deangelis@uniba.it;
E-mail:giacomo.squeo@uniba.it;
E-mail:erica.pontonio@uniba.it
*E-mail: giuseppe.perri@uniba.it

Abstract

Research on fraud detection in the bread and bakery market, especially for traditional products like sourdough bread, has been largely overlooked over the years. The lack of legislation that regulates and protects traditional/typical sourdough breads, combined with the absence of official methods to discriminate breads made with and without sourdough, led the scientific community to act on it. Moreover, due to the elevated prices of these items resulting from specific production methods and premium ingredients, there is a pressing need to develop rapid, accurate, and reliable methods for verifying their authenticity. Modern analytical instrumentation, along with chemometric tools and machine learning algorithms, can aid in achieving these objectives by providing complex datasets. In this context, the Italian scientific community is actively contributing to innovative solutions aimed at enhancing food authenticity and ensuring the integrity of the agri-food chain (https://agritechcenter.it). The aim of this study was to use Fourier Transform Near Infrared (FT-NIR) spectroscopy to discrimante sourdough bread from baker's yeast-leavened counterparts. Breads were prepared with wheat flour and semolina, ingredients traditionally used for bread-making at the national level. Molecular interactions between FT-NIR and key chemical constituents, including water content, proteins and derivatives, lipids, carbohydrates, and organic acids were evaluated. The analysis targeted distinctive absorption patterns at specific wavelengths to establish a correlation between FT-NIR data and the unique chemical fingerprint of each bread type. This approach could not only enable rapid differentiation between different bread types but also offer valuable information on their specific chemical properties. The use of FT-NIR holds great promise for the bakery industry, ensuring authenticity, quality control and process optimization. This tool is expected to become an integral part of maintaining the integrity and high standards of traditional bakery products.

Keywords

FT-NIR; sourdough bread; traceability; quality control

S4 - P02

Selection of indigenous *Metschnikowia pulcherrima* strains for grape bioprotection

Damiano Barbato[1,2] *, Eleonora Mari[2], Giacomo Buscioni[1], Simona Guerrini[1,2], Lisa Granchi[2]

[1]FoodMicroTeam s.r.l., Via di Santo Spirito, 14, 50125 Florence, Italy
[2]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Via San Bonaventura 13, 50145 Florence, Italy
*E-mail: damiano.barbato@unifi.it

Abstract

Bioprotection is an alternative strategy to chemical additives to prevent the growth of spoilage microbes. Recent studies have shown that *Metschnikowia pulcherrima* can inhibit the growth on the grape of non-Saccharomyces yeasts that are not desirable in winemaking, without compromising the fermentation capabilities of *Saccharomyces cerevisiae*. Using indigenous yeasts for bioprotection could avoid introducing microorganisms from different areas into the environment and, at the same time, would allow for a greater chance of success because these yeasts have a higher fitness advantage than commercial strains. Therefore, this study aimed to test the bioprotection capabilities of *M. pulcherrima* indigenous strains isolated from social wasps found in some vineyards of three different DOCG areas in Tuscany. The strains were screened to evaluate their antimicrobial properties and ability to produce the pigment pulcherrimin. From these evaluations, three strains of *M. pulcherrima* high pulcherrimin-producers were selected. These strains were then applied as axenic cultures (10^7 CFU/mL) on the grapes previously contaminated with *Starmerella bacillaris*, *Kloeckera apiculata*, and *Brettanomyces bruxellensis* mixed strains. The same test was conducted using a commercial *M. pulcherrima* strain as a control. To evaluate the bioprotection effect, grapes were pressed and analysed as soon as after 15 hours at 18°C and after seven days of cryomaceration at 6°C. All tested strains reduced non-*Saccharomyces* yeast growth in both conditions but with different intensities. In particular, one *M. pulcherrima* strain significantly reduced the growth of *K. apiculata* and S. bacillaris found on the grapes of 1 and 2 logarithmic units, respectively, while during cryomaceration of 2 logarithmic units. Finally, the growth reduction of *B. bruxellensis* was lower in grapes (30%) than during cryomaceration (83%). Therefore, this strain has demonstrated its ability to be used for the bioprotection of grapes.

Keywords

bioprotection, Metschnikowia pulcherrima, grape contamination, antimicrobial activities, non-Saccharomyces yeasts

S4 - P03

Wood distillate as corroborant to improve hemp (*Cannabis sativa* L.) microgreen growth and antioxidant activity

Anna Agosti[1], Lorenzo Del Vecchio[1]*, Andrea Di Fazio[1], Leandra Leto[1], Samreen Nazeer[1], Benedetta Chiancone[1], Martina Cirlini[1]

[1]Department of Food and Drug, University of Parma, Parco Area delle Scienze 27/A, Parma 43124, Italy.
*E-mail: lorenzodelvecchio@unipr.it

Abstract

Hemp (*Cannabis sativa* L.) has been cultivated worldwide for millennia, thanks to its versatility, being used as food, feed, fibre production and, due to its phytochemical richness, also for pharmaceutical purpose. The increased consumer request for healthy food has led to a renewed interest for hemp, and specifically, for its microgreens.
Microgreens are young leafy greens, usually harvested 7–21 days after sowing (depending on the variety). Recent studies have demonstrated the many benefits of hemp microgreens on human health, due to a remarkable content of phenolic acids and flavonoids as well as beneficial non-psychoactive phytocannabinoids. The purpose of this work was to evaluate the effect of wood distillate (WD), a liquid bio-based product from agri-forestry waste, rich in bioactive molecules, on hemp (cv. Fedora and Futura) microgreen growth and biochemical composition. To this aim, Fedora and Futura seeds were sown in ™Riza power plateaux and watered with WD at three concentrations 0, 2, 4, 8 ml/l. Eight days after sowing, the germination was uniform and synchronous. Well-developed microgreens were extracted from the substrate and analysed for their root development, polyphenol content (TPC) and antioxidant activity (AO). Results evidenced that WD influenced root development and, in particular, length, volume, and surface area. Furthermore, it seems that Fedora and Futura microgreens, treated with WD, were characterized by an increased AO.

Keywords

Antioxidant activity, hemp, microgreens, Total phenolic content, wood distillate

S4 - P04

Novel microbial-based biostimulants for sustainable agriculture

Giuseppina Magaraci[1]*, Ida Romano[1], Marisa Amato[1], Olimpia Pepe[1,2], Valeria Ventorino[1,2]

[1]Department of Agricultural Sciences, Division of Microbiology, University of Naples Federico II, Naples, Piazza Carlo di Borbone 1, Portici (NA), Italy
[2]Task Force on Microbiome Studies, University of Naples Federico II, Naples, Italy
*E-mail: giuseppina.magaraci@unina.it

Abstract

Biostimulants play a pivotal role in ensuring crop yield and nutritional quality, offering a sustainable alternative to chemical fertilizers. Specifically, biofertilizers contain live microorganisms capable of colonizing the plant rhizosphere, enhancing nutrient availability, and promoting plant growth.
This research focuses on developing novel microbial-based biostimulants and *assessing* their effectiveness on maize plants.
Three bacterial strains, *Bacillus megaterium* EL5, *Azotobacter chroococcum* 76A, and *Kosakonia pseudosacchari* TL13, were selected based on their plant growth-promoting activities. Antagonism tests were performed to ensure the absence of antimicrobial activity among the three selected strains, followed by microbial biomass production through liquid-state fermentation.
Two different formulations, freeze-dried and hydrogel, were developed and experimental tests were conducted to evaluate the effectiveness of the innovative microbial-based biostimulants on maize plants cultivated under controlled growth conditions, encompassing scenarios of both optimal irrigation and water stress. Biometric indices were evaluated, affirming the efficacy of both freeze-dried and hydrogel formulations. In addition, q-PCR analyses were conducted to quantify target genes associated to nitrogen (*nif*H, *nar*G, and *nir*K) and phosphorus (*pho*D and BPP) biogeochemical cycles, along with the 16S rRNA gene to assess total bacterial population. The results indicated a significant impact of biostimulants on the soil microbial community increasing the copy numbers of target genes. These results highlighted the crucial role of this microbial consortium in augmenting two fundamental soil activities making the selected bacterial strains promising candidates for the development of new biofertilizers and contributing substantively to the paradigm of sustainable agriculture.

Keywords

sustainable agriculture, biostimulant, microbial application, microbial consortia

Acknowledgements

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S4 - P5

FOLIAR BIOSTIMULANTS AFFECT PRODUCTIVE AND CHEMICALS CHARACTERISTC OF ORGANICALLY GROWN SAGE

Davide Farruggia*, Nicolò Iacuzzi, Federica Alaimo, Mario Licata, Teresa Tuttolomondo

Department of Agricultural, Food and Forest Sciences, Università degli Studi di Palermo, Viale delle Scienze 13, Building 4, Palermo (Italy)
*E-mail: nicolo.iacuzzi@unipa.it

Abstract

Sage is a medicinal and aromatic plant (MAP) belonging to Lamiaceae family. It usually provides various health benefits for humans due to its antifungal, antimicrobial and antioxidant properties. In the Mediterranean area, sage is often grown in organic agricultural system. The use of biostimulants seems to be one of the most interesting innovative practice due to fact they can represent a promising approach for achieving sustainable and organic agriculture. In the last years, these products have been applied on various horticulture crops providing excellent results, however the use of biostimulants on MAPs has been poorly investigated. A 2-year field experiment was done to assess the effect of foliar treatments with different types of biostimulants and two frequencies of application on morphological, productive and chemical characteristics of *Salvia officinalis* L. grown organically in Mediterranean environment. Morphological, productive, and chemical parameters were affected by biostimulant and frequency factor. The more frequent application of biostimulants produced higher biomass and essential oil yield. During the second year of the research, the more frequent application of fulvic acids allowed to obtain an increase of 3.9 t ha^{-1} in dry biomass and of 1.1 t ha^{-1} in fresh biomass compared to control plants. The essential oil yield has almost doubled with the more frequent application of protein hydrolysates. In this study, 44 EO compounds were identified, and the frequency factor significantly influenced the percentage of 38 compounds. The highest percentage of some of the most representative monoterpens, such as 1,8-Cineole, α-Thujone and Camphor, were observed in biostmulated plants, with average increases between 6% and 35% compared to control plants. The highest Total Phenolic, Rosmarinic Acid, Antioxidant Activity values were obtained in control plants and with a less frequent application of biostimulant. This study emphasizes how biostimulants application may be used to improve sage production performance when cultivated in agricultural organic system.

Keywords

medicinal and aromatic plants, foliar biostimulants, yield, essential oil, antioxidant, phenolic

S4 - P06

EFFECT OF BIOSTIMULANT TREATMENTS ON SEED GERMINATION

Giulia Franzoni[1]*, Nicolò De Pizzol[1], Antonio Ferrante[1]

[1]Department of Agricultural and Environmental Sciences - Production, Landscape, Agroenergy, Via Celoria 2, 20133, Milan, Italy
*E-mail: giulia.franzoni@unimi.it

Abstract

Germination is a critical stage for plants that influences crop yield and quality. Seed germination may be enhanced, and a uniform percentage can be achieved by treatment with different compounds. The aim of this study was to explore the effects of pre-sowing seed treatments on germination of eight vegetable species. Seeds of *Solanum melongena* L., *Capsicum annuum* L., *Daucus carota* L., *Raphanus sativus* L., *Ocimum basilicum* L., *Lactuca sativa* L., *Cucumis sativus* L., and *Diplotaxis tenuifolia*, L., were placed in 48-well plates (24 seeds each species) under constant temperature condition (22 °C). Each species was subjected to five pre-sowing treatments: (1) 50 μL pure water as control (C), (2) 50 μL water extract obtained by the maceration of IV range processing waste (M), (3) 50 μL water extract obtained by the heat extraction of IV range processing waste (H), (4) 50 μL aqueous extract obtained by the maceration of IV range processing waste diluted 10 mL L^{-1} (M10), (5) 50 μL water extract obtained by the heat extraction of IV range processing waste diluted 10 mL L^{-1} (H10). Seeds were moistened with pure water until the end of the experiment. Treatment 2 showed an inhibitory effect on seed germination for almost all the species considered in the study, except for C. *annuum* seeds after five days. On the contrary, an initial boost in germination, expressed as higher number of seeds germinated, resulted after the application of treatment 4 in L. *sativa*, R. *sativus*, C. *annuum*, D. *carota*, and O. *basilicum*.

Keywords

germination, seedling, water extracts, vegetable waste

S4 - P07

Ascophyllum nodosum based extract mitigates salt stress effects in MicroTom roots even under sub-optimal nutrient conditions

Letizia Pagliaro[1], Giovanna Marta Fusco[1], Rosalinda Nicastro[1], Valerio Cirillo[2], Emilio Di Stasio[2], Albino Maggio[2], Petronia Carillo[1]

[1]Department of Environmental, Biological and Pharmaceutical Sciences and Technologies, University of Campania "Luigi Vanvitelli", Via Vivaldi 43, 81100 Caserta, Italy
[2]Department of Agricultural Sciences, University of Naples Federico II, 80055 Portici, Italy
*E-mail: letizia.pagliaro@unicampania.it

Abstract

Biostimulants have been found able to promote root growth, rimprove resource use efficiency and boost tolerance to abiotic stresses. However, understanding their intricate mechanisms of action remains elusive. Our study focused on the effects of two commercial *Ascophyllum nodosum*-based extracts, Rygex and Superfifity, on the roots of *Solanum lycopersicum* cv. MicroTom. Specifically, we investigated how these biostimulants modulated the growth and profile of primary metabolites in tomato roots in response to salt stress (0, 42.5 and 85 mM NaCl) in optimal or suboptimal nutrient concentrations (100 and 70% BNS). Superfifty treatment allowed roots to better discriminate sodium and absorb more potassium, in the 100% BNS condition, leading to an increase in the sodium to potassium ratio compared to other salt affected treatments.
Moreover, plants treated with Superfifty under 70% BNS and salinity showed higher concentration of free amino acids, in particular higher levels of GABA and amides (glutamine and asparagine). Whereas, Rygex induced the best performance for root growth (Fresh and dry weight) under mild salinity treatment (42.5 mM NaCl) and suboptimal nutrient conditions (70% BNS). Therefore, algal biostimulants have the potential to promote changes in root cell metabolism able to improve nitrogen use efficiency (NUE) and sustain growth even under salinity and/or in nutrient-deficient environments.

Keywords

Biostimulants, nitrogen use efficiency, salinity, Ascophyllum

S4 - P08

Effects of nitrogen-fixing bacteria used as seed coating on Sulla (*Hedysarum coronarium* L.) growth and soil quality

Domenico Ronga[1]*, Giada Guarnieri[2], Isacco Rossi[3], Flavio Fornasier[4], Annamaria Di Serio[5], Vincenzo Alfano[1], Sofia Del Gaudio[6], Alessandro Zatta[3]

[1]Pharmacy Department, University of Salerno, Via Giovanni Paolo II n. 132, 84084 Fisciano, SA, Italy
[2]Continental semences SpA, Via Monzato n. 9, 43029 Traversetolo, PR, Italy
[3]Centro Ricerche Produzioni Animali (CRPA) ScpA, Viale Timavo n. 43/2, 42121, RE, Italy
[4]SOLIomics Srl, Via Puintat n. 2, 33100, UD, Italy
[5]Chemestry and Biology Department, University of Salerno, Via Giovanni Paolo II n. 132, 84084 Fisciano, SA, Italy
[6]PhD School in Agricultural, Forest and Food Sciences, University of Basilicata, via dell' Ateneo Lucano 10, Potenza, PZ, Italy, and University of Salerno, Via Giovanni Paolo II, 132, 84084 Fisciano, SA, Italy
*E-mail: dronga@unisa.it

Abstract

Many legume breeding and selection programmes are designed to select germplasm adapted to marginal soils, where biological N_2 fixation can make an important contribution to agricultural productivity. However, it is important to consider not only the plant but also plant/*Rhizobium* combinations The aim of the present study was to assess the effect of nitrogen-fixing bacteria (*Rhizobium* spp.) used as seed coating on Sulla, cv. Corona, growth as well as on the soil quality. The interaction between crop and rhizobium was studied in a growth chamber using pot of 12 L and with a completely randomized experimental design comparing three theses: i) seed inoculated with rhizobium and protected with a coating based on natural products; ii) seed not inoculated but covered with the same coating; iii) seed not inoculated and without coating. Loam soil was used, and the plants were grown according to climatic requirements, not fertilized and irrigated with well water. At the beginning and end of the experiment, soil chemical and biological parameters were assessed to evaluate the effect of inoculations by NIRs, enzymatic activities and microbial DNA. During the crop cycle several parameters were evaluated: agronomic (aboveground and belowground biomasses in terms of both fresh and dry weight, plant height, root length and soil water content) and physiological (canopy temperature, leaf area, leaf transpiration, SPAD index and NDVI and PRI). All data were subjected to analysis of variance (ANOVA) and the averages were separated using Duncan's test $p<0.05$. Considering the soil, the seed coating with rhizobium favored an increase in soil microbial biomass, urease and alkaline phosphatase activities and nitrogen content compared to the control (seed without coating). Regarding the plant parameters, the seed coating with rhizobium also favored an increase in chlorophyll index, plant vigor, fresh and dry weight of leaves and roots, and root length.

Keywords

Rhizobium spp., seed coating, nitrogen-fixing bacteria

S4 - P09

Enhancing bioactive compound production in *Tanacetum balsamita* L. through sustainable soil cropping management strategies

Martina Grattacaso[1]*, Alessandra Bonetti[1], Sara Di Lonardo[1], Eliana L. Tassi[2], Francesca Bretzel[2], Roberto Pini[2], Luigi Paolo D'Acqui[1]

[1]C.N.R., Istituto di Ricerca sugli Ecosistemi Terrestri, Via Madonna del Piano, 10 50019 Sesto Fiorentino Firenze, Italia
[21]C.N.R., Istituto di Ricerca sugli Ecosistemi Terrestri, Via Moruzzi 1, Pisa, 56124, Italia
*E-mail: martina.grattacaso@iret.cnr.it

Abstract

The study focused on sustainable agricultural practices using biostimulants and biofertilizers to improve soil health and crop yield in the Mediterranean region. Specifically, the research aimed to enhance soil properties and bioactive compound production in *Tanacetum balsamita* L., a medicinal plant in Tuscany, Italy. Results from the first growing season showed that treatments with bioinoculants and bioinoculants + compost increased plant biomass and photosynthetic apparatus. While there were no significant changes in total phenol levels, the treatments resulted in higher chlorophyll a and b content, as well as increased plant biomass.
These positive outcomes were attributed to enhanced bioavailability of P and Mg in the soil, which facilitated greater nutrient uptake by the plants.

Keywords

bioinoculants; biofertilizers; soil health ; aromatic plants; bioactive compounds

S4 - P10

Effects of hydrogels made of carboxymethyl cellose on lettuce seeds

Marika De Angelis[1]*, Pasquale Napoletano[1], Erika Di Iorio[1], Francesco Lopez[1], Claudio Colombo[1], Stefano Marino[1]

[1]Department of Agricultural, Environmental and Food Sciences, University of Molise, Via de Sanctis, snc, 86100 Campobasso, Italy
*E-mail: marika.deangelis@unimol.it

Abstract

The urgent need to implement sustainable agricultural practices arises from the confluence of factors such as global economic expansion, challenges induced by climate change, and the escalation of drought conditions. The widespread use of such chemical substances poses significant environmental risks, necessitating the exploration of alternative solutions. In this context, absorbent biopolymers, exemplified by hydrogels, have emerged as promising candidates to mitigate adverse environmental impacts associated with intensive agricultural practices. Hydrogels, indeed, possess the intrinsic capacity to improve water retention in the soil and facilitate efficient nutrient transport to plants, thus offering a sustainable approach to enhance agricultural productivity. The main objective of this study was to evaluate the potential phytotoxic effects of hydrogels composed of carboxymethylcellulose (CMC) beads, containing various compounds such as Glucoraphan-GLR, Sulforaphane-SLR, Benfluralin-BEN, and Napropamide-NAP, on lettuce seeds. The analysis included monitoring root elongation, germination rates, and seed germination indices (%) at 72 hours (T0 - T72) after sowing, across three different concentrations (1%, 2% 4% v:v). The results of the study uniformly revealed low germination indices (GI% < 50) in all treatments, accompanied by moderate levels of phytotoxicity (50-80%). This toxicity was attributed to reduced root elongation compared to the control. This observation is consistent with existing literature suggesting that hydrogel technology may exert a stimulating effect on plant metabolism over prolonged periods. Further studies to confirm these processes urge for better understanding also other phenological stages of *Lactuca sativa* L.

Keywords

Sustainable agricultural practices, Hydrogels, Phytotoxicity, Water retention, Germination test

S4 - P11

BALOs as biocontrol agents in bivalve shellfish depuration

Ivan Ciliberti[1]*, Maria Aponte[2]

[1]Department of Agriculture Sciences, University of Naples Federico II, Via Università 100, 80055 Portici, Napoli
[2]Department of Agriculture Sciences, University of Naples Federico II, Via Università 100, 80055 Portici, Napoli
*E-mail: ivan.ciliberti@unina.it

Abstract

In Italy, bivalve shellfish farming, mussels particularly, plays a significant role in marine aquaculture in terms of output, area used, and number of farms. Bivalve molluscs, as filter organisms, have the potential to pose a serious risk to human health due to the transmission of pathogens to the consumer. Gram-negative bacteria, primarily belonging to the *Enterobacteriaceae* family (which includes genera like *Salmonella* and *Escherichia*) and the *Vibrionaceae* family (which includes the genus *Vibrio*), make up a significant portion of these.
Predatory bacteria are a quite large and varied group that goes by the abbreviation "BALOs" (*Bdellovibrio* and like organisms). It includes aerobic, Gram-negative bacteria characterized by extremely small size and highly mobile, capable of using a variety of predation techniques to feed on other Gram-negative bacteria. Since BALOs cannot grow in eukaryotic cells, it has been widely established that they pose no threat to human safety. Furthermore, because BALOs can parasitize bacteria that are organized in biofilms or that are viable but uncultivable, they are immune to the common defense mechanisms that pathogens can trigger on shellfish.
Over the past few years, we isolated a large number of native BALOs from various environmental sources, including seawater. Some strains proved to be extremely successful predators of a variety of vibrios. The primary goals of this study are to investigate the potential function of marine BALOs as a natural regulator of *Vibrionaceae* in bivalve shellfish and to standardize a biological protocol using marine BALOs to decontaminate mussels during depuration.

Keywords

Mussels, BALOs, predatory bacteria, biocontrol agents

S4 - P12

Suitability of hydrogels made of carboxymethyl cellose on lettuce germination and soil microflora assessed by scanning electron microscopy (SEM)

Pasquale Napoletano[1]*, Marika De Angelis[1], Erika Di Iorio[1], Francesco Lopez[1], Stefano Marino[1], Claudio Colombo[1]

[1]Department of Agricultural, Environmental and Food Sciences, University of Molise, Via de Sanctis, snc, 86100 Campobasso, Italy
*E-mail: pasquale.napoletano@unimol.it

Abstract

Hydrogel technology has been exploiting for agricultural use to improve soil quality. Such materials, also known as superabsorbents, are made up of polymers cross-linked with hydrophilic groups that stabilize their networks after swollen. This property makes them to absorb a large amount of water and additional compounds and release them following soil and plant requests. In addition, they can be used also as biocides for soil and plant pathogens. The polymers may be different and therefore the application of them for long-term investigations should be studied deeply. The goal of this research was to evaluate the effect of hydrogels made of carboxymethyl cellulose (CMC) enriched with glucoraphan (CMC-GLC) and sulforaphane (CMC-SLF) on seeds of a Lactuca sativa L. using a modified germination test after 216 h since the application of polymers. In addition, scanning electron microscopy (SEM) was applied in order to highlight the degradation state of the hydrogels. The results showed the highest toxicity of CMC-GLR evidenced by the lowest germination percentage, germinated seeds and root length. CMC and CMC-SLR displayed similar trends with medium toxicity and values of germinated seeds similar to the control (water). In addition, these polymers, especially CMC-SLR, degrade most by possibly stimulating soil fungi as seen by SEM technology. In conclusion, the carboxymethyl cellulose enriched with glucoraphan seems to impact more seeds than soil, probably affecting some physiological responses. On the other hand, the carboxymethyl cellulose alone and enriched with sulforaphan affect more soil, inducing fungi proliferation instead of limiting as commonly reported in the scientific literature. Future studies are needed to clarify and give more explanations to these preliminary results.

Keywords

polymers ; glucoraphan ; sulforaphane ; toxicity test ; fungi

S4 - P13

Pros and cons of *Ailanthus altissima* management with *Verticillium* species

Gian Piero Ricci[1,2], Claudia Pisuttu[1], Lorenzo Cotrozzi[1], Cristina Nali[1], Elisa Pellegrini[1], Giacomo Lorenzini[1],

[1]Department of Agriculture, Food and Environment, University of Pisa, Via del Borghetto 80, Pisa, 56124, Italy
[2]Department of Biological and Environmental Sciences and Technologies, University of Salento, Lecce, 73100, Italy
*E:mail: gianpiero.ricci@phd.unipi.it

Abstract

Ailanthus altissima is regarded as one of the worst invasive alien plant species of the world. The ineffectiveness of the conventional control strategies (i.e., mechanical and chemical methods) has led to the evaluation of new alternatives, among which the use of *Verticillium* species as biological control agents (BCAs). Here, two *V. nonalfalfae* (isolated in the United States and Austria, respectively) and a *V. dahliae* (identified in Italy) strains were assessed through a strengths, weaknesses, opportunities and threats (SWOT) analysis in order to identify the internal (resources and experience readily available) and external factors (typically uncontrollable items) that are favourable (or not) to these potential BCAs. The fungi considered were the isolated from naturally infected *A. altissima* trees and resulted highly specialized on the target. The strength of *Verticillium*-based products is mainly due the extraordinary ability of these species to kill plants within few months/years, also when trees are grouped in clonal stands, since they can be transmitted through root graphs. The application occurs by injecting a concentrated spore suspension directly in the plant stems without risks of chemical residues release, thus resulting the unique (eco-friendly) strategy completely effective in *A. altissima* management. Conversely, a common weakness of these BCAs is the risk to infect other non-target hosts. Preliminary tests revealed the susceptibility of ten woody and few horticultural/floral species to *V. nonalfalfae*, and few crops to *V. dahliae*. This evidence may obstacle the process to recognize at regulative level the *Verticillium*-based products. Appropriated indications of safe spaces in which these BCAs can be applied, may be provided in order to overcome these kind of issues, opening to new opportunities for the use of *Verticillium*-based products in areas with scarce presence of non-target species (as industrial and archaeological sites). Further researches are needed to promote these BCAs to various stakeholders.

Keywords

Tree of Heaven, vascular disease, biocontrol, eco-friendly management

S4 - P14

Unlocking the growth potential of green beans: PGPB intervention in Rhizoctonia-infested soils, a preliminary study

Afsaneh Nematpour[1], Rihab Djebaili[2], Giovanni Pascucci[2], Beatrice Farda[2], Francesco Calzarano[1], Giancarlo Pagnani[1], Marika Pellegrini[2], Michele Pisante[1]

[1]Department of Bioscience and Technologies for Food, Agriculture and Environment, University of Teramo, Campus Universitario di Coste Sant'Agostino, via R. Balzarini 1-, 64100 Teramo, TE, Italy
[2]Department of Life, Health and Environmental Sciences, University of L'Aquila, Via Vetoio, Coppito 1, 67100 L'Aquila, Italy
*E-mail: gpagnani@unite.it;
*E-mail: marika.pellegrini@univaq.it

Abstract

Rhizoctonia solani is a soil-borne phytopathogenic species that poses a significant threat to crop yields globally. Plant-growth promoting bacteria (PGPB) have emerged as a sustainable and environmentally friendly solution for controlling Rhizoctonia. This study aimed to assess the impact of seed inoculation with PGPB (*Streptomyces* sp. + *Bacillus* sp.) on the agronomic traits of green bean in Rhizoctonia-infested soil under controlled conditions. The experiment followed a randomized complete block design with nine replications. Results indicated that Rhizoctonia reduced the number of leaves per plant and shoot dry weight compared to the control group. However, the application of PGPB in infested soil mitigated the negative effects of Rhizoctonia and improved the aforementioned traits. Stem diameter and number of beans per plant were not significantly affected by Rhizoctonia or PGPB. The highest shoot dry weight and number of leaves per plant were observed in the control group. The application of PGPB resulted in the maximum bean diameter and length (4.23 mm and 6.12 cm, respectively). Additionally, the highest bean fresh weight per plant was recorded in the PGPB treatment, followed by the control, Rhizoctonia + PGPB, and Rhizoctonia groups. In conclusion, our findings demonstrate the positive influence of PGPB on the agronomic growth of green beans.

Keywords

Beneficial bacteria, Green bean, Rhizoctonia solani

S4 - P15

Enhancing plant photosynthetic performances by boosting plant carbonic anhydrase activity

Sara Beltrami[1,2]*, Francesca Alderotti[1,2], Damiano Tanini[3], Cecilia Brunetti[2,1], Francesco Ferrini[1,2], Ermes Lo Piccolo[1], Antonella Gori[1,2]

[1]University of Florence, Department of Agriculture, Food, Environment and Forestry (DAGRI), Viale delle idee 30, 50019 Sesto Fiorentino (Florence, Italy)
[2]National Research Council of Italy (CNR), Institute for Sustainable Plant Protection, Via Madonna del Piano 10, 50019 Sesto Fiorentino (Florence, Italy)
[3]University of Florence, Department of Chemistry 'Ugo Schiff', Via Della Lastruccia 3–13, Sesto Fiorentino, Florence (Italy)
*E-mail: sara.beltrami@unifi.it

Abstract

Photosynthesis, which provides the basis of plant productivity, holds important significance across a spectrum of agro-industrial applications. Despite genetic manipulation, alternative opportunities exist to enhance photosynthetic performances and plant biomass. One promising approach involves enhancing the activity of carbonic anhydrases (CAs), metalloenzymes that catalyze the reversible interconversion of carbon dioxide (CO2) and bicarbonate (HCO_3^-). Besides catalyzing this interconversion, CAs play a crucial role in facilitating the movement of both CO_2 and HCO_3^- across membranes. Activation studies on CAs highlighted that several organic compounds can modulate the CA-catalysed hydration of CO_2, raising the hypothesis that treating plants with different CA-activators could enhance plant productivity. To test this, the CAs activator effect of SeAMA (Selenium-containing AMine derived from Alanine) on the photosynthetic yield of the model plant *Arabidopsis thaliana* was evaluated through gas exchange analysis focusing on photosynthetic activity (A) and stomatal conductance (g_s). The data collected showed that foliar treatments with SeAMA hydrochloride at three different concentrations (25, 50 or 100 μM of SeAMA in aqueous solution), sprayed twice a day for ten consecutive days, positively affected plant photosynthetic performances without compromising plant health. Specifically, the 100 μM treatment demonstrated the most significant increase in both A and g_s. Furthermore, the application of SeAMA at higher concentration (300 μM) once per day for 5 consecutive days also enhanced plant photosynthesis and stomatal opening, highlighting the potential of selenium-containing amines to boost the physiological performance of plants. Future investigations are needed to clarify whether, and which specific carbonic anhydrases are involved in this process. Furthermore, replicating the study using biomass crop species, such as *Populus trichocarpa* and Cannabis sativa would help to assess whether the activator effect on photosynthesis induced by SeAMA can effectively increase plant biomass production.

Keywords

Carbonic Anhydrase; Photosynthesis; Synthetic activators, Stomatal conductance; Biomass

S5 - P01

Control of Food Spoilage by Anti-Quorum Sensing Activity of Probiotics

Mohammed Salman, Irene Giordano, Ilaria Di Biase, Gianluigi Mauriello*

Department of Agricultural Science, University of Naples Federico II, Via Università 100, 80055 Portici, Italy
*E-mail: Giamauri@unina.it

Abstract

Quorum sensing (QS) is the mechanism that bacterial cells use for inter- and intra-species communication after the cell density reaches a specific threshold. This communication is signaled through molecules produced by the cells and named autoinducer (AI) molecules. These AIs bind then to a detector protein that initiates the QS transduction pathway. QS plays an important role in food quality. For example, biofilm formation and microbial proteolytic activity are factors of food spoilage, which can be regulated by QS. As a matter of fact, *Pseudomonas* and *Enterobacteriaceae* species can increase the proteolytic activity in raw milk that is used for the production of dairy products through synthesis of heat-stable proteases, whose expression is regulated by the QS autoinducers called acyl-homoserine lactones (AHLs). In addition, spoilage in meat and vegetables is also caused by Gram-negative bacteria, where AHLs act as a signaling molecule to QS induction. Another type of QS signal is autoinducer-2, which could be also produced by Gram-negative bacteria and involved in expression of spoilage factors. However, the type of QS system in spoilage *Pseudomonas* species is not systematically analyzed. Furthermore, studies applying QS inhibition as a strategy to control food spoilage are still lacking. It has been recently suggested that probiotics are a potential source of quorum sensing inhibitors that potentially reduce production of spoilage factors (e.g., biofilm formation, and enzymes) and overcome antimicrobial resistance. This project aims at the following: 1) isolation of spoilage Pseudomonas and *Enterobacteriaceae* strains from raw milk for the purpose of characterization of spoilage activity and QS system; 2) screening of QS inhibitors from postbiotics produced from lactic acid bacteria; 3) control of spoilage activity of *Pseudomonas* and *Enterobacteriaceae* strains by identified QS inhibitors in-vitro and in food model.

Keywords

Quorum sensing, spoilage, raw milk, probiotics

S5 - P02

The swine waste Resistome: spreading and transfer of antibiotic resistance genes in *Escherichia coli* strains and the associated microbial communities in three different pig farms

Enrico Buscaroli[1]*, Monica Modesto[1], Diana Luise[1], Sonia Blasioli[1], Donatella Scarafile[1], Maura Di Vito[2], Francesca Bugli[2,3], Paolo Trevisi[1], Ilaria Braschi[1], Paola Mattarelli[1], Alice Checcucci[4]

[1]Dipartimento di Scienze e Tecnologie Agro-alimentari, Università di Bologna, Bologna, Italy
[2]Dipartimento di Scienze Biotecnologiche di Base, Cliniche Intensivologiche e Perioperatorie, Università Cattolica del Sacro Cuore, Rome, Italy
[3]Dipartimento di Scienze di Laboratorio e Infettivologiche, Fondazione Policlinico Universitario A. Gemelli IRCCS, Rome, Italy
[4]Dipartimento di Scienze e Tecnologie Agrarie, Ambientali e Forestali (DAGRI), Università degli Studi di Firenze, Florence, Italy;
*E-mail: enrico.buscaroli2@unibo.it

Abstract

The overuse of antimicrobials in livestock farming has resulted in the development of resistant bacteria and the subsequent transmission of antibiotic-resistant genes (ARGs) among animals. Following manure application, the presence of antibiotics in agricultural environments exerts selective pressure on bacteria, which mainly acquire ARGs through horizontal gene transfer. Most ARGs are studied primarily for their potential role in antibiotic resistance in clinical settings as well as for their transfer from the environment to human-associated bacteria, like faecal indicator bacteria *Escherichia coli*.
The present work aims to conduct an in-depth study on ARGs spread via class 1 integron associated with twenty-seven E. coli strains isolated from pig livestock manure. Six ARGs of the most frequently found in livestock farms (i.e., *ermB, cmlA, floR, qnrS, tetA,* and *TEM*) and class 1 integron gene were detected and tracked to assess their abundance and distribution in manure samples from 3 pig farms. Each farm had a distinct waste management practice: a) nitro-denitro treatment plant, b) anaerobic digestion and biogas production, and c) collection and disposal. Interestingly, correlations and anticorrelation among genes were found, evidencing a predisposition of the integron in the spread of some of the selected ARGs.
The results of the present study may provide insight into the ARGs profile from swine livestock, establishing a basis for developing a method for the traceability of ARGs in the environment and provide basis for waste management practice.

Keywords

Manure, livestock ARGs, integrons, antibiotics, horizontal gene transfer

S5 - P03

ANTIMICROBIAL ACTIVITY OF PRUNUS SPINOSA EXTRACTS

Anna Di Blasio[1]*, Martina Rossi[2], Maria Aponte[1], Teresa Cerchiara[2], Giuseppe Blaiotta[1]

[1]Department of Agricultural Sciences, University of Naples "Federico II", 80055 Portici, Italy.
[2]Drug Delivery Research Lab., Department of Pharmacy and Biotechnology, Alma Mater Studiorum, University of Bologna, 40127 Bologna, Italy.
*E-mail: anna.diblasio@unina.it

Abstract

Prunus spinosa L. (also known as blackthorn, Rosaceae family), is a medicinal shrub native in Europe, West Asia, and the Mediterranean, recognized since the nineteenth century for its therapeutic uses including cough suppression and anti-inflammatory effects. Specifically, the fruit of Prunus spinosa L. are rich in phenolic antioxidants—such as flavonols, phenolic acids, and coumarin derivatives—underscoring their potential in antimicrobial and anti-inflammatory applications amidst growing antimicrobial resistance.
The aim of this study was to evaluate the antimicrobial activities of the hydroalcoholic (50:50 v/v) extract of *Prunus spinosa* L. fruit against pathogenic bacteria, focusing on both Gram-negative (*Escherichia coli*) and Gram-positive *(Enterococcus hirae* and *Staphylococcus aureus*) strains. The antimicrobial activity and the minimum inhibitive concentration were assessed through agar well diffusion method and time-kill test, respectively.
Prunus spinosa extract (20 mg/mL) has demonstrated pronounced antimicrobial activity, especially against *Staphylococcus aureus*, with an efficacy that varies based on initial bacterial concentration. A significant reduction in bacterial growth was observed, with a difference of 1 log at an initial concentration of 10^7 CFU/mL, reaching a difference of almost 4 logs compared to the control samples, at a concentration of 10^3 CFU/mL. These findings highlight the extract's capacity as a natural antimicrobial agent.
To conclude the *Prunus spinosa* L. fruit extract exhibits significant antimicrobial properties, especially against *Staphylococcus aureus*, suggesting its potential as a natural remedy to combat bacterial infections and resist microbial resistance. This positions blackthorn extract as a promising candidate for further exploration as a natural source of antimicrobial compounds and functional additives in food and pharmaceutical applications.

Acknowledgements

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Keywords

wild Italian Prunus spinosa L. fruit; blackthorn; phenolic compounds; antimicrobial activity; natural extract

S5 - P04

A FAST DETECTION TOOL FOR FLAVESCENCE DORÉE MANAGEMENT

Matteo Voltarelli[1]*, Rocco Caracciolo[2], Giulia Casini[2], Anna Maria D'Onghia[3], Laura Mugnai[1]

[1]Department of Agricultural, Food, Environmental, and Forestry Science and Technology (DAGRI), Plant Pathology and Entomology section, University of Florence, P.le delle Cascine, 28, 50144 Firenze, Italy
[2]Enbiotech S.r.l., Via Quarto dei Mille 6, 90129 Palermo, Italy
[3]Centre International de Hautes Etudes Agronomiques Méditerranéennes Bari (CIHEAM Bari), Via Ceglie 9, 70010 Valenzano, Bari, Italy
* E-mail: matteovoltarelli@gmail.com

Abstract

In today's rapidly evolving world, agricultural sectors encounter challenges from many invasive pests and diseases resulting in economic losses and ecological disruptions. Traditional detection methods are often expensive and inaccessible, particularly in remote regions and certain areas of the world. The emergence of the Real-Time Loop-Mediated Isothermal Amplification Technique (LAMP) presents a rapid and user-friendly tool for detecting pathogens such as phytoplasmas, which are crucial for quarantine diseases like Flavescence dorée (FD). Early detection and containment are paramount, especially for FD, which poses a threat to grapevine cultivation in Europe. Without effective cures, prevention strategies depend on prompt diagnosis in order to quickly eliminate or reduce inoculum sources by removing the infected vine. Visual symptom identification, combined with Real-Time LAMP, provides reliable detection, distinguishing FD from similar diseases and confirming infections swiftly.
Studies on grapevine cultivars like Sangiovese, Merlot, and Cabernet highlight the effectiveness of integrating visual observation with fast molecular diagnostics. This approach can be adapted for early disease detection in other plant species, particularly in regions with limited laboratory resources. Integrating Real-Time LAMP with visual assessment enhances screening efficiency, allowing for the accurate and rapid processing of large sample volumes. Such approaches are especially valuable for defending stakeholders' interests, particularly farmers, who are often the most economically impacted by disease outbreaks like FD.
Moreover, since Real-Time LAMP can be easily implemented at the farm level, it outperforms traditional Real-time PCR while being less susceptible to false results and contaminations by moderately trained operators. In summary, the combination of Real-Time LAMP with visual assessments offers practical solutions for detecting and managing FD and similar diseases. These approaches not only mitigate economic losses for farmers but also contribute to sustainable agricultural practices.

Keywords

Flavescence dorée, Real-Time LAMP, Crop protection

S5 - P05

THE POTENTIAL ROLE OF A NEW NATURAL FORMULATION IN VINEYARD DEFENCE: A FIRST GRAPEVINE TRUNK DISEASES *IN-VITRO* SCREENING

Gemma Bianchi[1]*, Guido Bartalena[2], Florence Fontaine[3], Vincenzo Mondello[3], Cristina Nali[1], Giulia Scimone[1], Elisa Pellegrini[1]

[1]Department of Agriculture, Food and Environment, University of Pisa, Via del Borghetto 80, Pisa, 56124, Italy
[2]Kwizda Agro GmbH, Universitätsring 6, Vienna, Austria
[3]University of Reims Champagne-Ardenne, Unit Resistance Induction and Bioprotection of Plants, USC INRAE 1488, Reims, France
*E-mail: gemma.bianchi@agr.unipi.it

Abstract

Grapevine trunk diseases (GTDs), caused by several wood-colonizing fungi are present in all the main vine-growing areas of the world. These agents are taxonomically different but with similar symptomatology, epidemiology and economic impacts. GTDs could be dividing in three groups: *Eutypa dieback*, *Botryosphaeria* dieback and Esca complex. After the banning of some fungicides with good control capability towards GTDs, no effective strategies have been developed. Here, a new liquid formulation based on cell wall yeast extract (YE) of *Saccharomyces cerevisiae* was studied to elucidate the mechanism(s) of action against some GTD agents [*Neofusicoccum parvum* (Np), *Eutypa lata* (El), *Fomitiporia mediterranea* (Fomed) and *Phaeomoniella chlamydospora* (Pch)]. The fungi were put into the centre of Petri dishes containing potato dextrose agar (PDA) amended with different concentrations of YE (0.25, 0.50, and 1.00% v/v). As a control, dishes with only PDA were utilized. The growth of mycelium was monitored at three-day intervals, starting from 24 h post-inoculation, until the colonies reached the edges of the plates. The effect of YE on the mycelial growth of Np was investigated in liquid cultures using a conidial suspension (concentration of 10^3 conidia mL^{-1}). Spore germination and colony formation were assessed every two-three days. Our outcomes indicate that YE for all tested concentrations significantly inhibits the mycelium growth of all the tested pathogens (-86, -85, and -81% compared to controls, in the case of Np, Fomed, and Pch, respectively). Furthermore, at the highest YE concentration tested, El-mycelium growth was completely prevented, and Np-conidia germination was inhibited. These results from our initial screening on GTD pathogens strongly suggest that YE strain may possess direct antifungal properties against these detrimental pathogens.

Keywords

Esca complex, Eutypa dieback, Botryosphaeria dieback, Saccharomyces cerevisiae, Vitis vinifera

S5 - P06

Technological affinity index for interaction between lactic acid bacteria and *Saccharomyces cerevisiae* strains to modulate the fruity and floreal aroma of Catarratto wine

Vincenzo Naselli[1]*, Antonino Pirrone[1], Enrico Viola[1], Venera Seminerio[1], Valentina Craparo[1], Micaela Carusi[1], Davide Alongi[1], Antonella Porrello[2], Antonella Maggio[2], Antonio Alfonzo[1], Luca Settanni[1], Giancarlo Moschetti[1], Nicola Francesca[1]

[1]Department of Agricultural, Food and Forest Sciences (SAAF), University of Palermo, Viale Delle Scienze Bldg. 5, Ent. C, 90128, Palermo, Italy
[2]Department of Biological, Chemical and Pharmaceutical Sciences and Technologies (STEBICEF), University of Palermo, Viale Delle Scienze, Building 17 Parco d'Orleans II, 90128, Palermo, Italy
*E-mail: vincenzo.naselli@unipa.it

Abstract

The sensory quality of wine is significantly influenced by microbial interactions. Specifically, the time (t), rate (m), and volatile organic compounds (VOC) associated with malolactic fermentation are linked to the interaction between yeast and lactic acid bacteria. The study investigated the interactions between *Lactiplantibacillus plantarum* or *Oenococcus oeni* and *Saccharomyces cerevisiae* by using the Technological Affinity Index (TAIndex) to assess these interactions. Interestingly, the parameter "m" exhibited a negative correlation with both TAIndex values and the duration of malolactic fermentation. The microbial associations observed in different trials were as follows: in the CO5 trial, where L. *plantarum* MLPK45H was coupled with S. *cerevisiae* NF213, the TAIndex value was 0.351, and the 'm' value was -0.65 ($g/L\times d^{-1}$), while in the CO10 trial, the combination of L. *plantarum* MLPK45H and S. cerevisiae QA23 resulted in a TAIndex value of 0.348 and an 'm' value of -0.66 ($g/L\times d^{-1}$). Under the provided conditions, malolactic fermentation occurred within two days. Furthermore, the CO1 trial involved consociations between the O. *oeni* MLB6 and S. cerevisiae NF213. In this case, the TAIndex value was 0.009, the "m" value of -0.0781 ($g/L\times d^{-1}$), and the malolactic fermentation process extended over 44 days. This prolonged fermentation produced increased levels of ethyl octanoate and ethyl decanoate. The fruity and floral sensory perceptions were increased in CO1, probably due to lower concentrations of 3-methyl-1-butanol, hexanoic acid, octanoic acid and decanoic acid compared to the CONT A1 study, as evaluated by the panel.
In conclusion, the LAB-S. *cerevisiae* microbial consociation offers a valuable microbial approach to produce wines that are highly appreciated by panelists. The time and rate of malolactic fermentation significantly influence the synthesis of VOC with a pronounced olfactory impact. Consequently, knowledge of TAIndex could prove pivotal in enhancing oenological planning to produce wines with exceptionally intense fruity and floral characteristics.

Keywords

Lactic acid bacteria, Saccharomyces cerevisiae, malolactic fermentation, wine, technological affinity index

S6 - P01

ADAPTIVE STRATEGIES IN GRAPE AGRICULTURE: HARNESSING MUSCADINE INNOVATIVE PROCESSING STRATEGIES FOR CLIMATE RESILIENCE IN THE SOUTHEASTERN UNITED STATES

Matteo Voltarelli[1,2]*, Frank Humphries[2], Violeta Tsolova[2]

[1]Department of Agricultural, Food, Environmental, and Forestry Science and Technology (DAGRI), Plant Pathology and Entomology section, University of Florence, P.le delle Cascine, 28, 50144 Firenze, Italy
[2]Center for Viticulture and Small Fruit Research, College of Agriculture and Food Sciences, Florida Agricultural and Mechanical University l 6361 Mahan Drive, Tallahassee, FL 32308
* E-mail: matteovoltarelli@gmail.com

Abstract

In today's era of climatic instability, commercial crops are increasingly vulnerable to extreme weather events, posing significant challenges for farmers. Grapes, a cornerstone of agricultural revenue globally, face particular risks, especially in the Southeastern United States where hurricanes coincide with the ripening season. Muscadine (Vitis rotundifolia), well-suited to the region's climate, offers resilience amidst these challenges.
Despite advancements in grape breeding, traditional cultivars like Carlos and Noble remain prevalent due to their adaptability and resistance to pests and diseases and, on top of this they are the most suitable for wine production. However, vineyard establishment requires substantial investment, compelling farmers to optimize existing resources. Recognizing the imperatives of sustainable development goals, such as poverty reduction and responsible production, emphasizes the need for innovative approaches.
We investigated for these grapes alternative processing methods to mitigate climate risks and enhance economic viability. Over four years of trials, the impact of various processing techniques on muscadine juices and wines at different ripening stages was analyzed. Muscadine's unique attributes, including its high levels of polyphenols, offer opportunities for secondary income streams.
By harvesting grapes at different maturity stages, farmers can diversify their product offerings, minimize losses due to spoilage, and optimize returns. Tailoring wines to meet consumer preferences while ensuring quality and sustainability is vital for market success. Extension services play a crucial role in disseminating best practices and guiding growers and processors towards economically and environmentally viable solutions.
This research underscores the importance of adaptive strategies in agriculture, particularly in the face of climate change. By harnessing the resilience of Muscadine and exploring innovative processing techniques, farmers can safeguard their livelihoods and contribute to sustainable agricultural practices in the Southeastern USA.

Keywords

Vitis rotundifolia, Muscadine, Climate smart grape, Grape processing

S6 - P02

Assessing Changes in Climate Parameters in Campania: Analysis from 2008 to 2023

Alessandra Lepore[1]*, Vittoria Pastore[2], Massimo Altobello[3], Giuseppe Celano[4]

[1]PhD course in Agricultural, Forest and Food Sciences, University of Basilicata, via dell'Ateneo Lucano 10, 85100 Potenza, Italy, in associated form with University of Salerno, Via Giovanni Paolo II, 132, 84084 Fisciano (SA), Italy
[2]Spin-off Ages, University of Basilicata, Via dell'Ateneo Lucano 10, 85100 Potenza, Italy
[3]CEO Maniola Smart Sensing S.r.l., Via Nazionale 24, 84015 Nocera Superiore (SA), Italy
[4]Course of Agriculture, Pharmacy Department, University of Salerno, Via Giovanni Paolo
II, 132, 84084 Fisciano (SA), Italy
*E-mail: alepore@unisa.it; alessandra.lepore@unibas.it

Abstract

The Mediterranean area is notoriously subject to the effects of climate change, with significant consequences for the agricultural sector.
The detailed analysis of the evolution of climatic parameters makes it possible to highlight the determinants that have had and may have an impact on the performance of the most sensitive crops, such as arboreal.
The study focused on the geographical area of the Campania Region in the period 2008-2023 using the Minimum, Average and Maximum Temperature and Precipitation data daily provided by the weather stations of the Campania Region's Functional and Agro-meteorological Centre.
The meteo-climatic data were processed using an *open-source* application in Python language, which allowed the automation of the data cleaning, verification, time series reconstruction and data processing process.
The software, called *AgroWeatherPro (AWP)*, provides the evolution of climate indicator values defined by ISPRA (Istituto Superiore per la Protezione e la Ricerca Ambientale) most relevant to agricultural production.
The results generated by the application include the analysis of the environmental cold and heat supply for each month, calculated according to the *Crossa-Raynoud* method, in the period between October and March, and the *Growing Degree Days (GDD)*.
Based on the quality of the available data, *AWP* offers the opportunity to calculate the evapotranspiration value according to the various methods in the literature and to conduct the study of the relationships of the values obtained with the physical characteristics of the territory.
The implementation of the software offers a significant opportunity to optimise the exchange of output with applications such as QGIS, enabling rapid spatialisation of data. Its flexibility and ability to integrate with other tools makes it easy to adapt the analysis to different needs.
The integration of *AWP* into automated irrigation management systems can promote the efficient use of resources.

Keywords

Climate change, Software, Python, Tree orchards, Mediterranean area.

S6 - P03

FIG TREES AS HEMI-EPIPHYTES PREDICTED BY LOGISTIC REGRESSION WITHIN URBAN PARKS

Rafael Barroca Silva[1,2]*, Maicon dos Santos[3], Servio Justino[1], Leonardo Costa[1], Mellina Nicácio[1], Ludmila Roder[2], Enzo Paganini[2], Bruna Camargo[2], Iraê Guerrini[1], Gian Franco Capra[2], Antonio Ganga[2]

[1]Department of Forest, Soil and Environmental Sciences, College of Agricultural Sciences, São Paulo State University - UNESP, 18610-301, Botucatu, SP, Brazil
[2]Dipartimento di Architettura, Design e Urbanistica, Università degli Studi di Sassari, Viale Piandanna n. 4 , 07100, Sassari, Italy
[3]Plant Protection Department, College of Agricultural Sciences, São Paulo State University – UNESP, 18610-301, Botucatu, SP, Brazil
*E-mail: rafael.barroca@unesp.br

Abstract

Fig Trees (*Ficus* spp. ; Moraceae) are featured by a high diversity and are widespread along the tropical ecosystem. Several species show hemi-epiphythic life forms, i.e., can develop part of their life cycle on hosting tree. They are also present within urban landscapes of tropical urban areas, growing on trees, buildings, and ruines. Since they are important as food resources for fauna and add aesthetic value to the landscape of green urban areas, the study of their ecology is useful to the management of forested urban environments. Logistic regression is a useful tool to predict a binary response, like the presence or absence of fig trees on a tree, additionally representing the first step to more in-depth analysis of this topic. In this work we recorded data from 539 trees within 9 public gardens in two cities from São Paulo State (Brazil), where the presence of fig trees was assessed. We performed a logistic regression model considering the host tree basal area, the height, the bark's texture, and the deciduousness as predictors of the presence or absence of fig trees. The model's outcomes showed a significative association between the basal area of the tree host and its deciduousness. For each unit of basal area an increase of 4.9 log-odds ratio was estimated ($p < 0.001$), while if the tree is semideciduous, the log-odds ratio was 1.4 ($p = 0.02$). These features suggest that older trees have an increased chance to host (hemi) epiphytic figs. The link between semideciduous species highlights the possible effects of increased lightness under the tree during some periods of the year. As the response variable showed to be very unbalanced, the next steps will be applying statistical techniques to improve the modeling of the hemi-epiphytic fig trees' presence on urban trees.

Keywords

urban silviculture ; hemi-epiphytism ; urban landscape ; urban diversity ; Ficus ecology

S7 - P01

Introducing buckwheat (*Fagopyrum esculentum Moench*) in soybean-based cropping systems to contain pests and weeds while supporting pollinators

Alessandra Virili[1]*, Elisa Marraccini[1], Desiderato Annoscia[1], Marco Bietresato[1], Maurizio Borin[2], Gemini Delle Vedove[1], Roberta Masin[2], Carmelo Maucieri[2], Alberto Pozzebon[2], Marco Sozzi[3], Wendy Carolina Vernaza Cartagena[2], Vittoria Giannini[2]

[1]Department of Agricultural, Food, Environmental and Animal Sciences (DI4A), University of Udine. Via delle Scienze, 206, 33100, Udine (UD), Italy
[2]Department of Agronomy, Food, Natural Resources, Animals and Environment (DAFNAE), University of Padua, Viale dell'Università, 16, 35020, Legnaro (PD), Italy
[3]Department of Land, Environment, Agriculture and Forestry (TESAF), University of Padua, Viale dell'Università 16, 35020, Legnaro (PD), Italy
*E-mail: alessandra.virili@uniud.it

Abstract

Crop diversification is one of the main strategies to increase the agro-ecosystem services (AES) provided by farming and the resilience of farms to face climate change and price fluctuations. Intercropping (IC) could represent a promising strategy when applied to soybean-based cropping systems (SBCS) which are generally poorly diversified. Italian soybean producers are likely to face important issues in terms of pest control (e.g., *Tetranychus urticae* and *Halymorpha halys*) and weed management (development of resistant weeds) if current crop management is not changed.
The "ECOsystem services Enhancement in DiveRsifiEd soybean-based system" (ECO-DRESS) project aims to test agroecology-based SBCS able to support different AES. We aim to achieve this goal by introducing buckwheat, which is a multifunctional crop, in SBCS to answer five main research questions: 1) Which is the best IC ratio to benefit soybean yield? 2) Which is the best soybean/buckwheat configuration to effectively contain common soybean pests? 3) Does introducing buckwheat in SBCS increase support of honey bees and wild bee pollinators? 4) Can narrow strip intercropping be considered as an efficient solution to suppress arable weeds? 5) What are the proper strip intercropping arrangements for mechanical operations?
The adoption of innovative SBCS requires an integrated and multidisciplinary approach, combining scientific knowledge and farmers' feedback based on their field experience.
Different cropping systems and pest management combinations will be tested in the experimental farms of each partner university, located in Veneto and Friuli-Venezia Giulia, where 2/3 of Italian soybean is cropped. Concurrently, four farmers will adopt one of the innovative SBCS for two cropping seasons giving feedback to researchers. The data collected from both plot and farm experiments will be used for a multicriteria analysis aiming at identifying the best intercropping configurations in different pedo-climatic conditions and cropping systems.

Keywords

intercropping; diversification; agro-ecosystem services

Funding:

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S7 - P02 UNIFI.GrapeML model implementation for estimating grapevine and inter-row grass cover carbon cycle

Luisa Leolini[1]*, Marco Moriondo[2], Lorenzo Brilli[2], Marcella Biddoccu[3], Margherita Coli[1], Andrea Triossi[4], Riccardo Rossi[1], Gloria Padovan[1], Marco Bindi[1], Sergi Costafreda-Aumedes[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Piazzale delle Cascine 18, 50144 Florence, Italy
[2]Institute of BioEconomy, National Research Council of Italy (CNR-IBE), Via Madonna del piano 10, 50019 Sesto Fiorentino, Italy
[3]Institute of Sciences and Technologies for Sustainable Energy and Mobility, National Research Council of Italy, Strada delle cacce 73, 10135 Torino, Italy
[4]D.R.E.Am – Italia, Via Garibaldi 3, 52015 Pratovecchio (AR), Italy
*E-mail: luisa.leolini@unifi.it

Abstract

The wine sector plays a fundamental role in the European agriculture considering that the total area under vines accounts for 3.2 million hectares (2020; https://ec.europa.eu/) and three main countries (Italy, France and Spain) contribute to ~ 81% of the EU27 wine production (2017-2021; https://www.oiv.int/). However, the continuous rise of greenhouse gasses (GHGs) concentration in the atmosphere due to anthropogenic activities is exacerbating the impact of climate change on vineyards and future wine production. In this context, the frequent adoption of high emitting agronomic practices is expected to contribute to a higher volume of GHGs emissions for the production of a ton of grapes by increasing the environmental impact of the vineyards' system. Among agronomic practices, inter-row management represents a crucial aspect affecting the carbon cycle in a multi-layer system (vine+grass). In this context, crop models can be used for providing dynamic estimates of carbon fluxes (uptake and emissions) from the system and to improve the traditional Life Cycle Assessment methodology. In these perspectives, the aim of this study is to implement the UNIFI.GrapeML version (Leolini et al., 2018), originally simulating vine growth and development as affected by thermal and water stresses, in order to provide a more comprehensive understanding of multi-layer vineyard system by accounting for carbon fluxes and water competition with inter-row grass cover. For such a purpose, the viability of the updated UNIFI.GrapeML version in predicting the growth and development of inter-row grass cover was evaluated under different pedo-climatic conditions. This study represents a first step towards the development of a new tool for the evaluation of agronomic management contribution to the carbon cycle in Mediterranean vineyards.

Keywords

carbon fluxes, climate change, crop modeling, soil organic content, vineyard

Acknowledgements

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S7 - P03

Impact of egg parasitoids on Halyomorpha halys (Stål) in eastern Emilia-Romagna after three years of *Trissolcus japonicus* (Ashmead) releases

Giulia Galeone[1]*, Antonio Masetti[1], Francesco Lami[1], Giovanni Burgio[1]

[1]Department of Agricultural and Food Science, University of Bologna, Italy
*E-mail: giulia.galeone2@unibo.it

Abstract

Halyomorpha halys (Stål) (Hemiptera: Pentatomidae), known as the brown marmorated stink bug (BMSB), is native to eastern Asia and was recently introduced into many countries, including Italy. It is a polyphagous pest with a wide host plant range which can cause considerable damage to the economy, because of its reproductive and feeding behavior, high mobility and human-mediated dispersal capacity. In the framework of one of the largest classical biological control projects ever attempted in Italy, 700 inoculative releases of *Trissolcus japonicu*s (Ashmead) (Hymenoptera: Scelionidae) were carried out in hundreds of sites across Emilia-Romagna during the three-year period 2020-2022. Field monitoring was performed at both release and non-release sites by collecting naturally laid egg masses by BMSB and other stink bugs. Data obtained in 2022 showed that, in addition to the *T. japonicus*, the *H. halys* parasitoid complex in eastern Emilia-Romagna essentially consists of the European native parasitoid *Anastatus bifasciatus* (Geoffroy) (Hymenoptera: Eupelmidae) and the exotic species *Trissolcus mitsukurii* (Ashmead) (Hymenoptera: Scelionidae). The presence of *A. bifasciatus* was constant in the three years of investigation, while abundance and diffusion of *T. mitsukurii* decreased significantly. A progressive range expansion in addition to a significant increase in parasitism rate by *T. japonicus* was found across years, especially in 2022, showing that the releases played an important role in the establishment of this species. Although the level of parasitization is still too low to significantly reduce *H. halys* damage, the prospects are promising. It is desirable to continue with investigations on the evolution of host-parasitoid dynamics and the effects of *T. japonicus* releases in the long term.

Keywords

Classical biological control, brown marmorated stink bug, Trissolcus japonicus, Trissolcus mitsukurii, Anastatus bifasciatus

#AISSA under40

S7 - P04

Physiological adaptations and metabolic responses to prolonged water stress in *Vitis vinifera* L.: Preliminary assessments of berry membrane lipid profiles

Danilo Caruso*[1], Stefania Savoi[1], Alessandra Ferrandino[1], Paolo Sabbatini[1]

[1]Department of Agricultural, Forestry and Food Science, University of Turin, Largo Paolo Braccini 2, 10095 Grugliasco (TO)
*E-mai : danilo.caruso@unito.it

Abstract

Climate change, marked by increases in global temperatures and changes in precipitation patterns, has significant and immediate impacts on viticulture. The grapevine (*Vitis vinifera L.*) is particularly vulnerable to variations in water availability, which plays a crucial role in determining the yield and quality of grapes. Adapting to these evolving environmental conditions requires an in-depth understanding of the physiological and biochemical mechanisms that enable grapevines to adjust and thrive under altered water regimes. This study, conducted at DISAFA in Grugliasco, Italy, focused on analyzing the impact of moderate and prolonged water stress, from post-set to maturation, on 50 two-year-old Barbera vines grafted onto Kober 5BB rootstock and grown in sandy loam soil. Through a controlled water regime, involving optimal irrigation conditions and a water stress treatment equivalent to 50% of evapotranspiration, variations in vegetative growth, fruit maturation, and eco-physiological responses were assessed using IRGA measurements for photosynthetic efficiency. The findings highlighted how water stress affects vine phenology, advancing veraison and significantly reducing leaf biomass and the growth of shoots and berries in the pre-veraison period, without compromising sugar accumulation, although a significant reduction in total acidity and an increase in pH were observed. Concurrently, the reorganization of fatty acids in the berry cell membranes was investigated, demonstrating how changes in lipid composition can help mitigate the effects of water stress by preserving membrane integrity and functionality. These results offer strategic insights for the development of innovative agronomic methodologies aimed at enhancing the resilience of viticulture to the effects of climate change.

Keywords

Climate change, abiotic stress, plant adaptation, lipid metabolism, sustainability in viticulture.

S7 - P05

REMOTE SENSING-BASED WORKFLOW FOR MONITORING HYDROLOGICAL PROCESSES IN AGRICULTURAL TERRACED CULTURAL LANDSCAPES: A CASE STUDY IN ITALY

Eugenio Straffelini[1]*, Paolo Tarolli[1]

[1]Department of Land, Environment, Agriculture and Forestry, University of Padova, Viale dell'Università 16 - 35020 Legnaro (PD), ITALY
*E-mail: eugenio.straffelini@unipd.it

Abstract

Cultural landscapes, shaped by the interaction between humans and nature, hold significant cultural and historical value, especially in rural areas. Agricultural terraces, a distinguishing feature of these landscapes, embody centuries-old practices and sustain local communities through food production and economic opportunities such as local products and tourism.
However, these terraces face severe challenges such as farm abandonment, unsustainable practices, and the increasing impacts of extreme weather events exacerbated by climate change. To safeguard these invaluable landscapes, it is crucial to closely monitor soil erosion and terrace instability. Remote sensing technologies offer powerful tools for this task, providing detailed maps and imagery to track changes over time and support land managers. Our research applied these methods to a UNESCO World Heritage site, "Portovenere, Cinque Terre and the islands" in Italy, a unique but sensitive area that has experienced damaging floods in recent years. A primary challenge was to combine data from various sources and different years, including laser scanning and aerial photogrammetry by UAV. Subsequently, we propose a specific monitoring workflow based on geomorphic analysis and hydrological simulations to identify vulnerable areas and guide targeted strategies for protection. Our study emphasizes the significance of integrating remote sensing technology for monitoring hydrological processes and addressing challenges within cultural landscapes in the Anthropocene era.

Keywords

Cultural Landscapes, Agricultural Terraces, Remote Sensing Technology, Soil Erosion Monitoring, Climate Change Impacts

S7 - P06

Investigation of rhizosphere microbiota for the establishment of novel microbial consortia for sustainable agriculture systems

Marisa Amato[1]*, Valeria Ventorino[1,2], Ida Romano[1], Patrizia Ambrosino[3], Fatima E. Chouya[1,4], Giuseppina Magaraci[1], Olimpia Pepe[1,2]

[1]Department of Agricultural Sciences, Division of Microbiology, University of Naples Federico II, Naples, Piazza Carlo di Borbone 1, Portici (NA), Italy
[2]Task Force on Microbiome Studies, University of Naples Federico II, Naples, Italy
[3]Agriges S.r.l. – Nutrizione Speciale per L'Agricoltura Biologica e Integrata, San Salvatore Telesino, Italy
[4]Department of Biology, Faculty of Sciences and Techniques, Hassan II University of Casablanca, Casablanca, Morocco
*E-mail: marisaamato27@gmail.com

Abstract

The role of the soil microbiome in biogeochemical cycles is of key importance for soil health and productivity, which has a direct impact on crop yield and quality. Understanding the complex relationship between plant species and soil microbial diversity is crucial. A recent study conducted in southern Italy used high-throughput sequencing to investigate the endophytic microbiome associated with tomato plants, with the ultimate goal of identifying microbial taxa for potential use in the development of innovative microbial biostimulants.

The study compared two tomato cultivars under both conventional and organic management in open field conditions. Samples were collected at different growth stages - post-transplant, flowering and harvesting - with eight replicates per condition. Bioinformatic analysis revealed that 11 bacterial genera, including *Bacillus, Streptomyces, Pseudomonas, Devosia, Agrobacterium, Lechevalieria, Variovorax* and *Sphingobium,* were prevalent in the tomato rhizosphere. Interestingly, the relative abundance of these taxa varied with plant growth stage. At the post-transplant stage, *Cellvibrio* and *Salinibacterium* were predominant, while at later stages there was an increase in *Pseudonocardia, Stenotrophomonas, Lechevalieria, Variovorax, Flavobacterium* and *Pseudomonas*, which are known to be beneficial to plant growth. In particular, these findings suggest their potential involvement in enhancing plant development. Fungal diversity did not show significant differences between phenological plant stages.

This innovative approach provides insights into the composition of the endophytic microbiome, enabling the identification of microbial taxa that are adept at colonizing tomato roots. Such knowledge may help to isolate species with high potential to promote plant growth, thus providing the basis for the development of novel microbial biostimulants.

In conclusion, this study highlights the importance of understanding the dynamics of plant-microbe interactions in order to optimize agricultural practices. By harnessing the power of endophytic microbiomes, we can open up new avenues for sustainable crop production and soil health management.

Keywords

Keywords: Soil microbiology, Rhizosphere microbiota, Next generation sequencing, innovative biostimulant, microbial consortia

Acknowledgements

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S7 - P07

Preliminary assessments of spatial variability in a super-high-density olive orchard

Simone Nesi*, Giacomo Palai, Giovanni Caruso

Department of Agriculture Food and Environment, University of Pisa, Via del Borghetto 80, 56124, Pisa)
*E-mail: simone.nesi@phd.unipi.it

Abstract

Nowadays, new technologies allow monitoring tree physiology with high resolution at both space and time levels for early detection of abiotic stresses. Spatial and temporal variability present in orchards has implications for the fruit yield and the profitability of the farm. Hence, understanding and managing these variabilities are the main objectives of precision agriculture. A preliminary assessment of spatial variability in a 3-year-old super-high-density (SHD) (4 m x 1.5 m) olive (*Olea europaea* L., cv Arbequina) orchard has been carried out using vegetative (Normalized Difference Vegetation Index, NDVI) and topographic (Topographic Wetness Index, TWI) indices. NDVI and TWI maps were derived from Sentinel 2A images and high-resolution UAV images, respectively. Three homogeneous zones (Zone A, B, and C) resulted from a clustering k-means analysis using SAGA-GIS software, where both NDVI and TWI were used as input data. The three zones resulted in NDVI values of 0.56±0.02, 0.50±0.01, and 0.45±0.02 in zones A, B, and C, respectively, whereas TWI showed values of 10.3±1.21, 7.4±0.59, and 5.7±0.59 in the same zones. Vegetative and reproductive parameters were monitored in each zone (three plots for each zone, six trees for each plot) by assessing the annual trunk cross-sectional area (TCSA) increment and the fruit yield for each experimental tree. The highest and lowest values of TCSA increment were measured in zone A (0.43±0.11 cm^2) and C (0.36±0.07cm^2), respectively, with intermediate values in zone B (0.31 ± 0.07 cm^2). Similarly, fruit yield was 1.72±0.58 and 0.83±0.41 kg per tree in zones A and C, respectively. Despite being preliminary, these results show how remote-sensed data can be effective in orchard zone delineations. Further investigations are planned to integrate soil maps and plant sensors to better understand the physiological and agronomic meaning of the spatial variability within the olive orchard.

Keywords

Yield, normalized difference vegetation index, Olea europaea L., remote sensing, topographic wetness index

S7 - P08

Pollinator Diversity and flower Glucosinolate dynamics in *Eruca sativa* and *Reseda lutea*

Matteo Carloni[1,2], Gherardo Bogo[4], Laura Bortolotti[4], Eleonora Pagnotta[2], Luisa Ugolini[2], Lorena Malaguti[2], Nicola Pecchioni[1,3], Manuela Bagatta[2]

[1]Department of Life Sciences, University of Modena and Reggio Emilia, Modena, Italy -Padiglione Besta - Via Amendola 2, 242122 Reggio Emilia – Italy;
[2]CREA, Research Centre for Cereal and Industrial Crops (CREA-CI), Via di Corticella 133, 40128, Bologna, Italy ;
[3]CREA, Research Centre for Cereal and Industrial Crops (CREA-CI), S.S. 673 Km 25, 200, 71122 Foggia , Italy ;
[4]CREA, Research Centre for Agriculture and Environment (CREA-AA), Via di Corticella 133, 40128 Bologna, Italy.
*E-mail: matteo.carloni@unimore.it

Abstract

Eruca sativa and *Reseda lutea*, belonging respectively to the Brassicaceae and Resedaceae families, are characterized by the presence in their tissues of the glucosinolates (GLS), secondary metabolites involved in the plant defense system. Both species, originating from the Mediterranean basin and adapted to warm climates, are also considered pollinator-attractive species. Aims of the research are: a) to evaluate the diversity and abundance of pollinators visiting plants; b) to characterize their flower GLS profile and content during the flowering time; c) to investigate the activity in flower tissues of the myrosinase enzyme, involved in the GLS degradation process, and in the bioactivation of GLS. Data of flower visitor abundance and diversity were collected once a week from the end of march through the first week of may, 2023 for *E.sativa*, and from the last ten days of june to the first week of september, 2023, for *R. lutea*. Preliminary results showed *E. sativa* as more attractive for wild bees than for honeybees, when compared to the neighbouring co-flowering plants. *R. lutea*, instead, was visited by a larger number of both honeybees and wild pollinators. In addition, a significant difference in diversity of pollinator species visiting *R. lutea* was found, compared to the co-flowering plants. Three major GLS were identified throughout the flowering time in *E. sativa* flowers, with glucoraphanin being the most abundant; in *R. lutea* flowers four major GLS were found, the main being 2-(α-L-rhamnopyranosyloxy) benzyl GLS. Myrosinase is the enzyme that catalyzed hydrolysis of GLS; its activity was higher in *R. lutea* than in *E. sativa* flower tissue. Further investigations will be conducted to better evaluate both the pollinator attractive potential of these plants and the role of GLS in pollinator nutrition and health.

Keywords

Brassicaceae; Resedaceae; secondary metabolites; Apis mellifera; wild bees

S7 - P09

Sulphur supplementation: a promising fertilization strategy in camelina

Alessandro Rossi[1]*, Silvia Tavarini[1], Cristiano Nicolella[2], Incoronata Galasso[3], Luciana G. Angelini[1], Clarissa Clemente[1]

[1]Dipartimento di Scienze Agrarie, Alimentari e Agro-ambientali - Università di Pisa, via del Borghetto 80, 56124, Pisa, Italy
[2]Dipartimento di Ingegneria Civile e Industriale - Università di Pisa, largo Lucio Lazzarino 2, 56122, Pisa, Italy
[3]Istituto di Biologia e Biotecnologia Agraria (IBBA) – Consiglio Nazionale delle Ricerche (CNR), via E. Bassini 15, 20133, Milano, Italy
*E-mail: alessandro.rossi@phd.unipi.it

Abstract

Inaccurate fertilization strategies, mainly nitrogen (N), can lead to nutrient imbalances, groundwater contamination, and greenhouse emissions, contributing to the environmental impact of agriculture. In soil fertility management, sulphur (S) often receives less attention compared to other macronutrients, despite S deficiencies in crops have become more common in recent years. Moreover, suboptimal S availability is known to reduce plant N use efficiency and thereby increase N loss potential.
Therefore, improving fertilization efficiency is of primary importance for environmental and economical sustainability of cropping systems, and the inclusion of S in fertilization strategies can be a key factor in enhancing crop performances.
In this preliminary study, the use of low-cost industrial gypsum, as S supplement, has been evaluated in *Camelina sativa* (L.) Crantz, a minor oilseed crop with promising perspectives in food, feed sectors, and in bio-based industry, providing feedstock with low Indirect Land Use Change risk. Despite the wide interest on this crop due to several agronomic advantages and seed compositional peculiarities, camelina still presents some bottlenecks such as not well-defined agronomic management, low seed yield, and productive stability, especially in marginal lands.
So, in order to evaluate the effect of S addition on camelina yield and quality, a field study was set up comparing an ordinary fertilization strategy for camelina with one based on the addition of sulphur. Samplings were performed both at flowering and seeds maturity, assessing biomass production, yield components, N uptake and seeds quality traits.
The achieved results suggest that sulphur had a positive impact on camelina vigour, especially at flowering, when biomass and LAI were significantly increased. At the same time, plants receiving S showed the highest seed yield and seeds quality traits, in terms of oil, protein and glucosinolates. The study, although preliminary, demonstrated the possibility to improve yield and quality of camelina under Mediterranean conditions.

Keywords

Gypsum, Circular Economy, Camelina sativa (L.) Crantz, Fertilization Efficiency

S7 - P10

Agroecological, processing and socio-economic aspects of *Opuntia ficus indica* cultivation in Mediterranean areas: Systematic map study and MOOC

Francesco G. S. Angeletti[1]*, Sergio Saia[2], Laura Righetti[1], Daniela Pacifico[1], Guido Lingua[3] and Irma Terracciano[1]

[1]Council for Agricultural Research and Economics (CREA), Research Centre for Cereal and Industrial Crops, via di Corticella 133, 40128, Bologna, Italy
[2]Department of Veterinary Sciences (DSV), University of Pisa, Viale delle Piagge 2, 5612 Pisa, Italy
[3]Department of Sciences and Technologic Innovation (DISIT), University of Piemonte Orientale, Via Teresa Michel 11, 15121, Alessandria, Italy.
*E-mail: francescogiovannisalvo.angeletti@crea.gov.it

Abstract

Cactus pear (*Opuntia ficus indica*) is a perennial plant with high-water use efficiency, providing supplies for human or animal consumption and a wealth of industrial uses, and can thus contribute to the maintenance of food, and feed security, in arid and semi-arid areas. PROSMALLAGRIMED is a PRIMA project aimed at improving small farmers' agronomic practices and therefore sustainability in Mediterranean areas through beneficial soil microbiota, intercropping between cactus pear and annual short-term species and conservation agriculture techniques. Within the project a systematic map study was carried out on agroecological, product processing and socio-economic aspects of cactus pear cultivation at a global scale to provide an assessment of the state of the existing knowledge. Articles research was performed in Scopus and Web of Science database using 16 keywords. A total of 36033 repeated and non-repeated records was obtained, of which 6962 unique records were classified directly by abstracts reading. Of these, 5261 relevant articles were retained as dealing with at least one of 14 different topics: soil management, organic fertilization, mineral fertilization, beneficial bacteria, beneficial fungi, pest and pathogens, intercrop, forage yield or traits or animal feeding or biomass production, fruit yield or characteristics, genotypes or landraces or cultivar, processing of the products, health or nutrition studies on plate or tissues or animals or humans by using opuntia or extracts from opuntia, economic and social aspect and other agronomic aspects linked to the project. Currently, due to the lack of information on the good agricultural practices for this species, the contribution of cactus pear to sustainable development is limited. The present results are being used to produce relevant systematic reviews and metanalyses and to develop a massive open online course (MOOC) available in English, French and Arabic languages to improve knowledge and accessibility to stakeholders.

Keywords

Opuntia ficus indica, Sustainability, Mediterranean areas Systematic map, MOOC

S7 - P11

Grapevine photosynthetic dynamics under water stress conditions - a case study in cv. Glera

Monica Canton[1]*, Luca Tezza[1], Franco Meggio[1,2], Andrea Pitacco[1,2]

[1]Università di Padova, Dipartimento di Agronomia, Alimenti, Risorse naturali, Animali e Ambiente
[2]Università di Padova, Centro Interdipartimentale per la Ricerca in Viticoltura ed Enologia
*e-mail: monica.canton@unipdi.it

Abstract

Gas exchange measurements are widely used to noninvasively study photosynthetic parameters. Photosynthetic CO_2 responses (A/Ci curves, where Ci is intercellular [CO_2]) are used to understand how photosynthesis responds to changing environmental conditions, to predict the responses of plant carbon uptake to future climatic conditions. The open field experiment focused on *Vitis vinifera* cv. 'Glera' and applied two treatments: irrigated and not irrigated. A/Ci curves were measured using a Li-6400XT portable photosynthesis system. A/Ci measurements were conducted at 30°C and 400 ppm CO_2, followed by 300, 200, 100, 50, 400, 600, and 800 ppm CO_2 under 1500 µmol m^2 s^{-1} of photosynthetic photon flux density (PPFD). The Farquhar, von Caemmerer, and Berry photosynthesis model ('FvCB model') was used to estimate the maximum carboxylation (Vcmax) and maximum electron transport (*Jmax*) rates. Plant water status was assessed by stem and leaf water potential (Ψleaf, MPa) using a PMS-600 pressure chamber. A parallel measure of leaf dark respiration was done at different temperatures. Despite regular precipitation during fruit growth, some differences in photosynthetic capacity highlighted variations between irrigated and not irrigated plants. For irrigated plants, A/Ci curves were grouped together compared to not irrigated ones and presented higher photosynthetic rates. Leaf water potential showed similarity between treatments, differing for some specific days but not causing excessive stress to the plants. Irrigated plants exhibited higher correlation between *Vcmax* and *Jmax* rates. Both parameters are vital for assessing the photosynthesis capability under varying conditions and environmental changes. Leaf dark respiration increased exponentially with rising temperatures.

Keywords

Grapevine, Gas exchange, Water deficit, A/Ci curve analysis

S7 - P12

Mitigating dismantling costs by repurposing recovered asphalt in desealed soil

G.Fantoni[1], B.Rompato[1], G.Mastrolonardo[1], R. Paradelo Núñez[2], G. Certini[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence (UniFi), Piazzale delle Cascine, 18, 50144 , Firenze, Italy
[2]Departamento de Edafoloxía e Química Agrícola, Universidade de Santiago de Compostela, Avaliación da Calidade do Solo
*E-mail: gregorio.fantoni@unifi.it

Abstract

The practice of permanently covering soil with impervious material such asphalt and concrete (soil sealing) increased exponentially since the industrial revolution, crippling soil ecosystem services. As a result, soil sealing represents a compelling danger on sustainability, at both local and global scale. At the dawn of the new millennium, efforts to convert this trend are due and are actually being carried out, although on a still too limited surface. Desealing (or depaving) has shown enormous potential for recovering new surfaces to plant growth and other soil ecosystem services. However, soil desealing is not as simple as it may appear. In addition to technical and legal issues, high practice costs and material disposal refrain the attempters, who usually are public administrations. To individuate a cheaper alternative to landfill disposal and favouring the reuse of anthropic wastes, we studied the effects of incorporating the removed asphalt, once suitably crumbled, into the desealed soil to be used as a green area.The experiment is underway, in situ, in a former parking lot in Prato, Italy, which has been dismantled and transformed into a public park. In a fenced part of the meadow, the performances of four different blends of urban soil, compost (5% everywhere) and asphalt in different proportions (up to 50%) to the soil, are going to be monitored for at least one year in terms of physical, chemical and biochemical properties evolution, as well as supported microbial, animal and plant biomass, activity and diversity. Here, we present some preliminary results.

Keywords

Desealing; Depeving; Smart city; Soil Ecosystem Services; Soil Sealing

S7 - P13

Comparative study of fertilizers in Tomato-Grown Soils: Soil quality, sustainability, and Carbon/Water Footprints

Angela Maffia[1]*, Giuseppe Celano[2], Adele Muscolo[1]

[1]Department of AGRARIA, 'Mediterranea' University of Reggio Calabria, Feo di Vito, 89122 Reggio Calabria
[2]Department of FARMACIA, University of Salerno, Via Giovanni Paolo II.
*E-mail: angela.maffia@unirc.it

Abstract

The research work conducted aims to identify the crucial role of sustainable agriculture in 'addressing environmental challenges and meeting the nutritional needs of a rapidly growing global population.
The primary objective is to assess the impact of a recently developed eco-friendly fertilizer, denoted as SBO, which arises from the blend of organic and mineral components derived from agricultural waste, sulfur, and residual orange materials. These elements are bound together with bentonite.
This study compares SBO with distinct fertilizer treatments, including horse manure (HM) and nitrogen–phosphorous–potassium (NPK), on two diverse tomato-growing soils, each characterized by unique chemical and biological properties. Furthermore, the research extends to evaluate the environmental implications of these fertilizers, with a specific focus on their carbon and water footprints. Soils have been chemically and biochemically analysed, and carbon and water footprints (CF and WF, respectively) have been assessed.
The results reveal substantial enhancements in soil quality with the application of SBO fertilizer. Both soils undergo a transition towards near-neutral pH levels, an increase in organic matter content, and heightened microbial biomass.
SBO-treated soils exhibit notably superior enzyme activities. The Life Cycle Assessment (LCA) results affirm the sustainability of the SBO-based system, boasting the lowest CF, while NPK demonstrates the highest environmental impact. Consistently, the WF analysis aligns with these findings, indicating that SBO necessitates the least water for tomato production. In summary, this study underscores the critical importance of adopting sustainable fertilization practices for enhancing soil quality and reducing environmental footprints in agriculture. The promising results offer potential benefits for both food production and environmental conservation.

Keywords

Carbon footprint ; soil fertility ; sustainability ; water footprint ; bio-fertilizers

S7 - P14

EFFECTS OF WOOD DISTILLATE CONCENTRATIONS ON WHEAT (*Triticum durum* Desf.) SEED GERMINATION AND DEVELOPMENT UNDER SALINITY STRESS: A PRELIMINARY PETRI DISH TEST

Mortadha Ben Hassine[1]*, Valentina Quintarelli[1], Emanuele Radicetti[1], Paola Tedeschi[1], Stefano Civolani[1], Giovanni Bernacchia[2], Daniele Borgatti[1]

[1]Department of Chemical, Pharmaceutical and Agricultural Sciences (DOCPAS), University of Ferrara, Via Luigi Borsari, 46, 44121 Ferrara Italy
[2]Department of Life Sciences and Biotechnology (SVEB), University of Ferrara, Via Luigi Borsari, 46, 44121 Ferrara Italy
*E-mail: mortadha.benhassine@unife.it

Abstract

Salinity is increasingly found in the Mediterranean areas due to climate change and excessive mineral fertilization practices. Salt accumulation in soils negatively affects the yield of crops, such as durum wheat (*Triticum durum* Desf.). Innovative technologies must therefore be developed to protect plants. Wood distillate (WD) is a by-product of pyrolysis that might have a plant biostimulant behaviour. In this study, a preliminary Petri dish test was performed to verify the action of WD as a biostimulant in combination with different levels of salinity. The trial consisted of 5 WD concentrations: control (H_2O), diluted 1:10 (D10), 1:100 (D100), 1:500 (D500) and 1:1000 (D1000). Wheat seeds were kept for two hours under the different concentrations of WD then placed in the Petri dishes. At the beginning of the trial, three salinity levels of water [no stress (0 mM), moderate (40 mM) and high (80 mM)] were applied to seeds. The Petri dishes were kept at 23°C for 9 days. All WD concentrations were replicated six times (12 seeds/Petri dish) and, in total, there were 90 Petri dishes. The germination rate of seeds was determined at 2, 5, 7 and 9 days after WD application. Measurements of radicle length (RL), number (RN) and seeds weight (SW) were determined at the end of the trial. For the three salinity levels, seeds under the D10 concentration showed the lowest germination rate during the whole period of the trial. Furthermore, under 80 mM and D10 concentration, seeds showed the lowest germination rate, compared to the other two levels of salinity. Seeds under D1000 and D500 concentrations showed similar RLs as the salinity levels increased (40 and 80 mM). Also, a significantly low RN was registered for the highest salinity level and the D10 dilution. No significant differences were observed for SW.

Keywords

Wood distillate, salinity stress, wheat, seed germination, Petri dish

S7 - P15

Effects of Cu-contaminated soil on *Robinia pseudoacacia* L.: a controlled environment experiment

Flora Giulia Simonelli[1]*, Silvia Traversari[2], Irene Rosellini[2], Tommaso Sitzia[1]

[1]Department of Land, Environment, Agriculture and Forestry (TESAF), Università degli Studi di Padova, Viale dell'Università 16, 35020 Legnaro (Padua), Italy
[2]Research Institute on Terrestrial Ecosystems (IRET), National Research Council (CNR), Via Giuseppe Moruzzi 1, 56124 Pisa (PI), Italy
*E-mail:floragiulia.simonelli@phd.unipd.it

Abstract

The long generation times of trees are a challenge for research, yet trees are exceptionally well-characterized in adaptive quantitative variations and their responses to different environmental variables. Nevertheless, there is a lack of knowledge concerning important early fitness components of germination and establishment, and how different environmental parameters affect ecophysiological traits. Meanwhile the crucial role of soil temperature on plant metabolism, even under stress condition, is underrated in research.
Heavy metal contamination in soil affects plants inducing several morphological, physiological, and biochemical dysfunctions. Copper (Cu), while is an essential micronutrient for plants, may cause the cited dysfunctions affecting plant growth when exceed a certain threshold, primarily due to human activities.
This research aims to explore how Cu affects the early stage of tree growth, focusing on black locust (*Robinia pseudoacacia* L.), in controlled environment, with a special attention to soil and air temperature. This is of interest as in the north-eastern Po plain black locust commonly grows along the embankments of railway lines, where we have found that soils are frequently Cu-contaminated.
In this research, we are testing black locust seedlings growing under Cutoxic levels in a controlled environment using a new-concept Microcosm device (European patent no. 3236741). Microcosm setup allows for autonomous control of the environmental conditions of both hypogeal and epigeal portion of the tree.
The experiments last 3 months and compare the growth of 2-months old seedlings growing in CuSO4 contaminated soil and in control media (non-contaminated soil). Biomass allocation patterns, allometric relationships, and photosynthetic activity are measured to investigate tree responses at morphological and ecophysiological levels. Cu content is determined in tree samples from each organ using ICP-OES to assess plant potential for phytoremediation purposes. Preliminary results suggest a significant impact on tree growth despite the high tolerance of black locust to highly Cu-contaminated soil.

Keywords

Ecotoxicology, Copper, black locust, growth chamber, Microcosm

S7 - P16

A critical analysis of the use of the concept of Food Security in the UN Security Council sessions on the Grand Ethiopian Renaissance Dam (GERD)

Giulio Castelli[1,2,3]*, Elisa Savelli[4], Jampel Dell'Angelo[5], Elena Bresci[1], Christian Bréthaut[2,3,6]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Firenze, Italy
[2]UNESCO Chair in Hydropolitics, University of Geneva, Genève, Switzerland
[3]Institute for Environmental Sciences (ISE), University of Geneva, Genève, Switzerland
[4]Mercy Corps, Amman, Jordan
[5]Institute for Environmental Studies (IVM), Vrije Universiteit Amsterdam, Amsterdam, the Netherlands
[6]Geneva Water Hub, University of Geneva, Genève, Switzerland
*E-mail: giulio.castelli@unifi.it)

Abstract

After the food crisis of 2007 - 2008, the World Summit on Food Security led to the following definition for the concept of Food Security: *"Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. The four pillars of food security are availability, access, utilization and stability. The nutritional dimension is integral to the concept of food security"*. Such a definition is intrinsically multidimensional, and different actors can build narratives by focusing on specific pillars to frame hydropolitical issues in different ways. This research therefore investigates the instrumentalization of food security discourse as a political tool in hydropolitical negotiations and conflict dynamics. The analysis will be developed on the river Nile case study, particularly on the political process generated by the construction of the Grand Ethiopian Renaissance Dam (GERD). A consistent database made of the letters submitted by Egypt, Ethiopia, and Sudan before and after the two UN Security Council sessions on the GERD, and the statements made during these two sessions (on 29th June 2020 and 8th July 2021), will be used. Drawing from socio-political and interdisciplinary methodologies (such as discourse analysis), the database will be analyzed to identify the quotes relative to food security or to factors that could influence food security according to the definition. Highlighting its inherently political nature, this study seeks to unravel the complex narratives 3embedded within Food Security's multifaceted dimensions, thereby exposing the strategic maneuvers and powerful interests of the actors involved in the GERD controversy. By uncovering its hidden interests, we can forge pathways toward more just and sustainable food security.
The research was funded by grant IZSEZ0_214526 "Beyond Water: the role of food security on hydropolitical disputes and water conflict and cooperation", funded by the Swiss National Science Foundation.

Keywords

Hydropolitics, sociohydrology, water conflicts and cooperation, food security, environmental politics

S7 - P17

Improvement of agroecological cropping systems for the enhancement of fertility and production of organic rice

Edoardo Visentin[1], Carolina Girometta[1], Valentina Vaglia[1]*

[1]Department of Earth and Environmental Sciences, University of Pavia, Via Adolfo Ferrata, 7, 27100 Pavia (PV)
*E-mail: valentina.vaglia@unipv.it

Abstract

Currently, the agri-food sector is called to support challenges for balancing both the need for food production to feed the population of the planet and, the maintenance of soil fertility and the general good state of health of the territory. In this scenario, the agricultural sector needs to develop a new "green revolution" that aims to produce ecosystem services by opposing the disservices of agri-food business (e.g. food waste, GHG emissions). That study, throught three years of a PhD project, aims to deepen agroecological solutions in the scenario of the organic rice sector, where Northern Italy producers are leaders in Europe in terms of surface. Due to the actual lack of information on practices and scientific research focusing on organic rice cropping systems (ORCS), it could be an innovative and most suitable solution according to the European Green Deal actions, the EU Biodiversity Strategy for 2030 principles and the UN objectives of Agenda 2030.
This project is based on the Participatory research approach to directly involve farmers with a horizontal knowledge exchange on field practices nowadays unexplored aiming at :

- evaluating rotational scheme, considering cover crop termination strategy using innovative mechanical tools and timing, to understand the most suitable solutions to improve soil fertility and yield;

- evaluate the results of the application of *Trichoderma* and consortia known as Plant Growth Promoter (PGP) on agri-waste that could act both as fertilizers and as a defence against pathogens, limiting the use of synthetic products and favouring the protection of the environment and human health.

The results would enrich current agronomic knowledge on ORCS in temperate climates, provide technical-practical insights on the agronomic strategies needed for successful management, and facilitate the sharing of guidelines amongst rice producers in the area.

S7 - P18

ASSESSING THE EFFECTS OF ROTATIONAL GRAZING ADOPTION IN SILVOPASTORAL SYSTEMS UNDER MEDITERRANEAN CONDITIONS

Antonio Pulina* , Alberto Tanda, Antonio Frongia, Pier Paolo Roggero, Giovanna Seddaiu

Department of Agricultural Sciences and Desertification Research Centre, University of Sassari, Viale Italia 39/a 07100 Sassari IT
*E-mail: anpulina@uniss.it

Abstract

Mediterranean silvopastoral systems provide a wide range of ecosystem services, including feed production for grazing animals. Conventional (CG) grazing methods effectively sustain the provisioning services, but it is necessary to incorporate the spatial and temporal heterogeneity of supply and demand of forage into dynamic schemes. Rotational grazing systems such as the Adaptive Multi-Paddock (AMP) have proved to be an effective scheme to improve forage resource exploitation, but their effectiveness in enhancing grassland productivity is debated. The aim of this study was to assess the mid-term effects of AMP on grassland production, phenology, and herbage utilization rates by grazing animals in a Mediterranean silvopastoral farm.
The study site was a silvopastoral farm in central-western Sardinia, Italy (40°8'N, 8°35'E). The principal livestock activities are breeding beef cattle and milking goats. The farm is located in two main areas, 850 m (Elighes
Uttiosos, EU) and 400 m a.s.l. (Sas Bogadas, SB), respectively. The effect of the grazing system (AMP vs CG) on the grassland biomass production, utilization rate, and land surface phenology parameters deriving from the analysis of NDVI time-series was assessed over four growing seasons (from August 2018 to June 2022).
Enhanced biomass production under AMP was observed under non-limiting water conditions in autumn but also for unpalatable and invasive species in the valley grassland. Introducing the AMP in extensive management enhanced the efficiency of forage resource exploitation, highlighting the potential of the AMP in contrasting the loss of pasture quality associated with undergrazing. The NDVI time-series analysis revealed the AMP significant effect on grassland phenology, even if a positive effect emerged only for a subset of parameters. The introduction of the AMP schemes hasalready started to show higher NDVI values at the beginning, peak, and end of the season, suggesting this may imply a higher forage availability for grazing animals.

Keywords

rotational grazing, silvopastoral systems, beef cattle, Mediterranean grassland, remote sensing

S7 - P19

Contrasting urban soil degradation: the benefits of compost in soil compaction restoration

Bianca Rompato[1,2]*, Giovanni Mastrolonardo[2], Giacomo Certini[2], María Teresa Barral[1], Remigio Paradelo[1]

[1]CRETUS, Departamento de Edafoloxía e Química Agrícola, Universidade de Santiago de Compostela, Facultade de Farmacia, 15782 Santiago de Compostela, Spain
[2]Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali (DAGRI), Università degli Studi di Firenze. Piazzale delle Cascine 18, 50144 Firenze, Italy
*E-mail: bianca.rompato@unifi.it

Abstract

Urban waste management and recycling are important issues for the sustainability of cities. Although current uses of composted urban wastes are mostly oriented towards rural land applications, they can also be used successfully within the cities for the restoration of degraded soils. In this work, urban waste composts were assessed as amendments for the reconstruction of urban soils degraded by compaction, where plant growth is hindered. Three soil-like materials –excavated subsoil, construction sand, and crushed construction/demolition waste– were blended alternately with each of three types of composts –green waste compost, food waste compost and municipal solid waste compost– at 20% weight. Imported topsoil, currently used for the remediation of compacted areas by the University of Santiago garden service, was employed as a control. The mixtures were characterized for their main physicochemical properties, and the influence of compost on susceptibility to compaction was assessed preparing compaction curves by the Proctor standard test. The results show that the addition of each of the composts increased the fertility and water retention of all the earthy materials, and reduced their susceptibility to compaction, in some cases even improving the properties of the control soil. The mix of excavated subsoil and green waste compost presented the least susceptibility to compaction, whereas the mixtures with sand presented the poorest properties. Testing the performance of the materials with the best properties under field conditions will be the next step necessary to assess the use of compost for remediation of compacted urban soils.

Keywords

Proctor standard test, Soil remediation, Urban waste

S7 - P20

Decline and restoration of a typical silvo-pastoral mountain landscape in the Italian Apennines. The case of Moscheta in Tuscany

Beatrice Fiore*, Francesco Piras, Antonio Santoro

Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence
*E-mail: beatrice.fiore@unifi.it

Abstract

Mountain cultural landscapes of southern Europe have been affected during the 20th century by significant land use changes, due to depopulation and abandonment of traditional agro-silvo-pastoral practices. In addition, the cessation of traditional forest management led to a homogenization of forest structures and to the loss of habitats. Italy is one of the European countries most affected by the consequences of depopulation of mountain areas. Moscheta is located in the Italian Apennines, in Tuscany, and its economy has been based for centuries on forests (for timber, firewood, charcoal, and chestnuts to produce flour) and livestock. The aim of the paper is to analyze the land use changes occurred in a typical forest mountain landscape of southern Europe in the last 191 years, and to describe the characteristics and the results of the Forest Landscape Restoration project recently implemented. The methodology is based on GIS-based spatial analyses comparing the landscape of 1832, 2013 and 2023. In the period 1832–2013, 45% of the total surface was affected by forestation (average rate of 1.9 ha/year) mainly due to the abandonment of pastures and wooded pastures, but also to direct conifer afforestation. Chestnut groves were abandoned as they were no more economically interesting. From the 2010s, a Forest Landscape Restoration (FLR) project was implemented considering the economical, technical and future management feasibility. It focused on recovering the monumental chestnut groves and the wooded pastures, but also on interventions to increase the touristic attractiveness (paths management, Historical Landscape Museum creation, traditional buildings for chestnut drying restoration). The area was also inscribed in 2016 in the National list of Historical Rural Landscape established by the Italian Ministry of Agriculture. The analyses of the 2013–2023 landscape changes demonstrated that 4 ha of historical chestnut groves and 6.5 ha of wooded pastures have been recently restored, bringing their total surface to 17 ha and to 67 ha, respectively. In addition, results demonstrate that forestation completely stopped in the last 10 years. Other interventions are planned for the future: maintenance of chestnut groves, rehabilitation of other wooded pastures, re-introduction of the traditional practice of pollarding on ten beech trees. This study represents the first assessment of the FLR carried out in Moscheta,and demonstrates that the restoration of open spaces and of cultural forests is possible and could have a big impact on mountain cultural landscapes, contributing to the preservation and enhancement of ecosystem services and of touristic attractiveness, with potential direct benefits on the local economy.

Keywords

Forest landscape restoration, Mountain landscape, Cultural landscape, Chestnut, Agricultural heritage, Rural landscape, Open areas, Wooded pastures

S8 - P01

AGRONOMIC RESPONSE OF 13 VARIETIES OF COTTON GROWN UNDER ORGANIC CONDITIONS IN A HOT ARID ENVIRONMENT

Federica Alaimo[1], Davide Farruggia[1], Nicolò Iacuzzi[1]*, Noemi Tortorici[1], Teresa Tuttolomondo[1]

[1]Department of Agricultural, Food and Forest Sciences, University of Palermo, Viale delle Scienze 13, Building 4, 90128 Palermo, Italy.
*E-mail: nicolo.iacuzzi@unipa.it

Abstract

Cotton (*Gossypium* spp.), belonging to the *Malvaceae* family, is a semi-xerophytic species native to central-northern America and Mexico. It is one of the most relevant species for the production of natural fiber. Unlike most agricultural raw materials, cotton fiber is not produced from one but from 39 species of *Gossypium*. In the last few years, the growing interest in natural fibers around the world has led to a revival of cotton cultivation in the Mediterranean area as well. With the aim of its possible re-establishment in Sicilian environment, this work has set the objective of evaluating the agronomic response of 13 different genotypes, belonging to the species of *Gossypium hirsutum* L., *Gossypium barbadense* L. and hybrids of *G. hirsutum* × *G. barbadense*, grown under organic regime.
The test was carried out in 2023 in Sicily (Italy), adopting an experimental design with randomized blocks with three replicates. Regarding to production data, the raw fiber yield, the fluff fiber % and the seed % showed highly significant differences ($p \leq 0.001$). The highest raw fiber yield was obtained in the variety PRG 9811 (5.99 t ha^{-1}), while the lowest yield in Olivia C1 (2.0 t ha^{-1}). Both varieties belong to the species of *G. hirsutum* and come from Greece. The highest percentage of fluff fiber was found in the variety Concha (48,45 %) of *G. hirsutum*, that comes from Spain; while the lowest was found in the variety HA1432 (37,37 %), a hybrid of *G. hirsutum* and *G. barbadense* that comes from the US.
The results of this study are promising, revealing the possible reintroduction of cotton in the cultivation systems of the semi-arid areas of Sicily. All the 13 varieties have shown a specific capacity to adapt to Sicilian climatic conditions and some of them stand out in terms of productivity.

Keywords

cotton, yield, genotypes, Gossypium, semi-arid areas

S8 - P02

Strigolactones as possible elicitors in sunburn defense mechanisms in grapes: preliminary results

Stefania Savoi[1]*, Alba Garritano[1], Alice Varaldo[1], Ivan Visentin[1], Giovanna Giacalone[1], Andrea Schubert[1], Paolo Sabbatini[1]

[1]Department of Agricultural, Forestry and Food Science, University of Turin, Largo Paolo Braccini 2, 10095 Grugliasco (TO)
*E-mail: stefania.savoi@unito.it

Abstract

Due to altered climatic conditions, grape berry sunburn has become one of the main challenges in contemporary viticulture. This disorder results from a combination of excessive direct exposure to sunlight and high temperatures, leading to brown and necrotic patches on the fruit skin, potentially reducing vineyard yield and grape commercial value. Despite its prevalence, winegrowers lack effective and economically viable strategies, in line with sustainable agriculture principles to mitigate sunburn beyond the use of shade nets, temporary protection with kaolin and zeolite, or the avoidance of defoliation practices.
We investigated the potential agronomic tools of using phytohormones, such as strigolactones, in eliciting plant stress responses. We evaluated the impact of the rac-GR24 solution (a synthetic analog of natural strigolactone) on veraison 'Moscato bianco' grape berries subjected to artificial sunburn in a laboratory setting, utilizing a thermostatic stove and a UV Test BOX. Analyses included berry color assessment using a colorimeter (CIEL*a*b system), spectrophotometric measurements of total polyphenols, and the skin's and pulp's antioxidant capacity, both pre- and post-artificial sunburn treatments. racGR24 application through immersion and direct nebulization revealed significant differences in total polyphenols, indicating a protective effect against degradation. Results also highlighted the potential of strigolactones in preserving antioxidant capacity, particularly in the pulp. Further research is needed to decipher the molecular role of strigolactone applications in grape berry metabolism, including field trials.

Keywords

Climate change, abiotic stress, plant adaptation, strigolactone, sustainability in viticulture

S8 - P03

A geomorphological approach to evaluate post-fire emergency rehabilitation works through a special index

Silvia Calvani[1]*, Cristiano Foderi[1], Giulio Castelli[1], Federico Preti[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Via San Bonaventura 13, Florence, 50145, Italy
*E-mail: silvia.calvani@unifi.it

Abstract

Frequent wildfires and geo-hydrological instability are in a close relationship of cause and effect. They both have a historical importance in most of the Mediterranean basin, especially in Italy, due to climate conditions and to the lack of structural interventions and proper management. When a wildfire is extinguished, the first operations to do are to contain erosion, restore the hydrological network, control the debris flows, etc. Often the interventions are built in a very short period, causing sometimes problems in terms of efficiency. This paper focuses on the monitoring of post wildfire rehabilitation interventions executed immediately after the last fire event in the Monte Pisano area, Tuscany, Italy. The study area is focused on the Rio Grande sub-basin. Post-fire interventions were modeled in a GIS environment thanks to a drone-flight survey and the processing of a DTM. Flow accumulation maps were generated in two scenarios, with and without interventions, thus compared. For the comparison, the morphological RPII index was applied. Areas with a major drainage alteration were highlighted, to be analyzed. This methodology proved the efficiency of the works, their need, and where weak points are. Furthermore, an additional drainage ditch was simulated and tested through RPII, useful as a litmus test. The present study revealed the usefulness of a ready-to-run geomorphological model for post-fire rehabilitation measures. The application of the RPII index in a post-fire analysis also represents a novel.

Keywords

post-wildfire rehabilitation works; monitoring; geomorphological index; RPII

S8 - P04

The effect of heat stress on three ancient Tuscan potato (*Solanum tuberosum* L.) varieties

Sara Anichini [1,2]*, Sara Parri[1], Giulia Curatola[3], Veronica Conti[4], Agata Di Noi[1], Chiara Piccini[5], Marco Romi[1], Giampiero Cai[1]

[1]Department of Life Sciences, University of Siena, Via Mattioli, 5
[2]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Piazzale delle Cascine, 18
[3]Department of Physical Sciences, Earth and Environment (DSFTA), University of Siena, Strada Laterina, 8
[4]Department of Biological, Geological and Environmental Sciences, University of Bologna, Via Zamboni, 33
[5]Department of Biology, Agriculture and Food Sciences, Istitute of Bioeconomy, National Research Council of Italy (IBE-CNR)
*E-mail: sara.anichini@unifi.it

Abstract

Potato (*Solanum tuberosum* L.) is the most important non-cereal crop and the third most important crop after maize, wheat and rice. Because of its high nutritional value, based on starch, vitamins and fibre, potato could play a vital role in global food security, reducing poverty and improving human nutrition. However, potato production is threatened by climate change and rising global temperatures. It has been shown that the critical temperature threshold is around 38°C, above which PSII is rapidly and irreversibly damaged. Instead, night-time temperatures above 22°C significantly reduce tuber formation. In a context of rising temperatures due to climate change, ancient varieties that have adapted locally to climate variations over time could be a resource of genetic traits useful for coping with harsher climatic conditions and can be used in breeding programmes.
In this work, three ancient Tuscan potato varieties (Biancona del Faggeto, Rossa delle Macchie, Quarantina delle Macchie) were grown in an innovative growth chamber, Microcosmo (Piano Green, Bolzano, https://pianogreen.com/en/microcosmo/), which allows complete control of light, temperature and humidity in the epigeal and hypogeal chambers. The three varieties were characterised using a double approach. The analysis of starch, antioxidant power and total polyphenol content established the nutraceutical profile of the tuber of each variety. Therefore, gas exchange measurements and chlorophyll fluorescence related parameters provided information on the integrity and functionality of the photosynthetic machinery and the rate of water loss through the stomata. The same physiological parameters were recorded under control conditions and under heat stress (35°C).
The results identified the cultivar with the highest nutritive value, as well as the most suitable for cultivation in the face of climate change, supporting the use of ancient, locally adapted varieties as tolerant trait pools to cope with higher temperatures.

Keywords

Potato, climate change, ancient varieties, microcosm, nutraceutical profile

S8 - P05

Enhancing Urban Forestry Management: Precision Analysis of Monumental Treesv through Mobile Laser Scanning

Serena Sofia[1]*, Antonio Motisi[1], Donato Salvatore La Mela Veca[1], Alessio Santosuosso[2], Marco Perrrino[2], Giovanna Sala[1]

[1]Department of Agricultural, Food and Forest Sciences, University of Palermo, Viale delle Scienze - Ed. 4, 90128 Palermo, Italy
[2]D.R.E.Am Italia
*E-mail: serena.sofia@unipa.it

Abstract

The essence of 'Urban Precision Forestry' lies in the strategic application of modern tools and technologies to enhance the acquisition of precise information for informed decision-making in urban forest management. Over the past few decades, rapid advancements in remote sensing technology have significantly improved the accuracy of measurements. This has led to notable enhancements in the quality of technical analyses that support planning decisions. Urban forestry research often relies on traditional methods such as inventories, interviews, and surveys, which often lack comprehensive coverage of areas with detailed information on individual trees (Pérez-Martín et al., 2021).

In this study, twelve monumental trees of Ficus macrophylla subsp. *columnaris*, located in different historical gardens of Palermo city (Sicily, Italy), were chosen. This species develops aerial roots from its branches, thickening into additional trunks upon reaching the ground to support its canopy. Field measurements were carried out using a handheld mobile laser scanner, ensuring detailed and precise surveys of the trees without causing damage. Thanks to the application of different automatic algorithms on 3D tree models, we can extrapolate information about tree metric variables such as diameter at breast height, total height, crown basal area, and crown volume.

The objective of this study is to improve decision-making in urban forestry through innovative precision technologies like LiDAR, while highlighting the high value of monumental trees in urban contexts. Its findings significantly contribute to the feasibility and productivity of implementing advanced technologies to observe and manage urban forest ecosystems effectively. Leveraging LIDAR technology allows for precise decisions on pruning, preservation, and risk assessment, thereby refining management and conservation strategies for monumental trees.

Pérez-Martín, E., López-Cuervo Medina, S., Herrero-Tejedor, T., Pérez-Souza, M. A., Aguirre de Mata, J., Ezquerra-Canalejo, A. (2021). Assessment of Tree Diameter Estimation Methods from Mobile Laser Scanning in a Historic Garden. Forests, 12(8), 1013.

Keywords

Urban Precision Forestry, Handheld Mobile Laser scanner, Ficus macrophylla subsp. columnaris, biometric data, biomass estimation

S8 - P06

DROUGHT STRESS RESPONSE IN LENTIL GENETIC RESOURCES UNDER SPEED BREEDING CONDITIONS

Stefania Marzario[1]*, Rocco Sabato[2], Valeria Morante[1], Carmen Verrastro[1], Michele Prestera[1], Mario A. Galante[1], Giuseppina Logozzo[1], Tania Gioia[1]

[1]Scuola di Scienze Agrarie, Forestali, Alimentari ed Ambientali, Università degli Studi della Basilicata, Via dell’Ateneo Lucano 10, 85100 Potenza, Italia
[2]PhD School in Agricultural, Forest and Food Sciences, Università degli Studi della Basilicata, Via dell'Ateneo Lucano 10, 85100 Potenza, Italia
*E-mail: stefania.marzario@unibas.it

Abstract

Lentil (*Lens culinaris* Medik.), both as food legume and crop rotation component, contributes to global food and nutritional security. Climate change increasing the frequency and intensity of abiotic stresses, leads to considerable reduction in biomass production and severe yield losses. Lentil is not spared from these environmental constraints since it shows high susceptibility to drought stress during the flowering and seed filling stages. Therefore, breeding for drought tolerance may contribute to the enhancement of lentil performances in water-stressed environments. Such a task could be achieved through an efficient exploration of the genetic resources for drought tolerance. Besides, traditional genetic improvement practices could be associated to modern breeding strategies in order to accelerate the development of drought-smart and high-productive lentil cultivars. Speed breeding technology, which primally depends on photoperiod extension, temperature control, and early seed harvest, has the potential to accelerate the rate of plant breeding improvement. In this study 35 lentil genotypes, including a line tolerant to drought conditions and a genotype sensitive to drought stress, were grown under speed breeding controlled conditions at SAFE-UNIBAS laboratories. Pot grown plants were exposed to drought stress after flowering and at pod formation stage by withholding irrigation for 15 days, while no stressed plants were regularly irrigated to total available moisture. Morpho-phenological traits and stress indices were recorded in order to assess the genetic variation for response to drought stress.
The obtained results may unravel the potential of unexplored lentil genotypes to address climate change and the challenge for global food security.
This study was carried out within the Agritech National Research Center and received funding from the European Union Next-GenerationEU (PIANO NAZIONALE DI RIPRESA E RESILIENZA (PNRR) – MISSIONE 4 COMPONENTE 2, INVESTIMENTO 1.4 – D.D. 1032 17/06/2022, CN00000022).

Keywords

lentil, drought stress, speed breeding, tolerance, food security

S8 - P07

Light conversion films application on blackberry plants promotes plant photosynthetic performance, fruit production and quality

Hafsa El Horri[1]*, Federico Forestieri[1], Costanza Ceccanti[1], Ermes Lo Piccolo[2], Giulia Lauria[1], Lucia Guidi[1], Damiano Remorini[1], Marco Landi[1]

[1]Department of Agriculture, Food and Environment, University of Pisa, Pisa, Italy
[2]Department of Agriculture, Food, Environment and Forestry, University of Florence, Florence, Italy
*E-mail: elhorri.hafsa@phd.unipi.it

Abstract

Fruit growers are seeking new alternatives for high energy consuming artificial light employed in controlled environments. As an outdoor application, light conversion technology is raising interest for its dependence solely on sunlight without external energy usage. In our study, colored light conversion films were applied as covering on *Rubus fruticosus* L. plants var. Lochness to improve plant productivity without compromising the fruit quality. Floricane blackberry plants were grown in four tunnels covered with Blue, Red and Pink conversion films while a transparent polyethylene film was used as control (Cnt). At plant level, leaf area was improved with all conversion films (+24.8% Red, +21% Pink, +36% Blue) compared to Cnt. The aerial plant fresh weight was higher in plants grown under Red (+16.48%) and Blue films (+23.3%) and lower under Pink film (-17.5%) compared to the Cnt. During the vegetative and flowering stages, plants grown under Blue and Red films showed higher net photosynthesis (P_n) and stomatal conductance (g_s) compared to Pink and Cnt films. Interestingly, during the fruit production, the Blue film induced the highest (P_n) and (g_s) values in comparison to the rest of the treatments. When compared to Cnt, the total fruit yield increased with Red and Blue films (+132%, +113.3%, respectively). Furthermore, the Red film enhanced fruit dry matter and soluble solid content in comparison to the Cnt while the highest titratable acidity was registered in fruit grown under the Pink film. Therefore, the use of tunnel covered with Red or Blue light conversion films demonstrated to be efficient in the enhancement of physiological features of plants and fruit production and quality of *Rubus fruticosus.*

Keywords

conversion films – Rubus fruticosus L. –photosynthetic performance - fruit quality - fruit production

S8 - P08

ASSESSING THE IMPACT OF EXTREME WEATHER EVENTS ON WHEAT YIELD: A CASE STUDY IN TUSCANY

Anna Rita Balingit[1]*, Giovanni Argenti[1], Gloria Padovan[1], Riccardo Rossi[1], Marco Moriondo[2], Sergi Costafreda-Aumedes[2], Roberto Ferrise[1], Giacomo Trombi[1], Camilla Dibari[1]

[1]Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence (UNIFI), Piazzale delle Cascine 18, 50144 Florence, Italy
[2]Institute of BioEconomy, National Research Council of Italy (CNR-IBE), Via Madonna del Piano 10, 50019 Sesto Fiorentino, Italy
*E-mail: annarita.balingit@unifi.it

Abstract

The agricultural sector is facing unprecedented challenges from escalating extreme weather events due to climate change. These events, impacting critical phenological stages like Grain-Filling (GF) in wheat, pose significant threats to production stability and farmers' economic resilience. Current risk management employs insurance policies utilising climate indicators to assess extreme event occurrence and production damage [1]. However, a critical aspect is the lack of an exact correspondence between the extreme event, as defined by the indicator, and the actual damage to production.
This study aims to compute climate indicators, identify high-frequency occurrence years, and assess the impact of extreme events, like heat stress and drought, on wheat yields. Furthermore, it investigates the effectiveness of implementing specific adaptation strategies by using the SSM-Wheat crop simulation model [2].
The analyses cover two periods, the baseline (1991-2020) and the near future (2030-2050), by using the bias-corrected EURO-CORDEX data [3] for Tuscany. A total of 85 Regional Climate Models (RCM) with a spatial resolution of 0.11° (about 12.5 km) were used, focusing on non-irrigated arable lands (Corine Land Cover, 2018), under two GHG scenarios, namely RCP 4.5 and 8.5.
Climate indicators include the number of heat days and the Standardised Precipitation Evapotranspiration Index (SPEI). Heat days rely on daily maximum temperatures exceeding 30°C during Grain-Filling (GF) [4], while SPEI considers precipitation and potential evapotranspiration (PET) from flowering to physiological maturity [5].
From preliminary analysis, SSM-Wheat simulations suggest changes of wheat yield due to extreme weather events. The research will also highlight crop management effects (i.e. anticipating sowing dates and/or adopting short-cycle wheat varieties), as feasible adaptation techniques to cope with the projected extreme events.
This analysis will provide guidance for the creation of innovative insurance policies to help farmers becoming more resilient to climate change, reducing the risk of yield loss and profitability.

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Keywords

climate change; extreme events; climate indicators; wheat phenology; adaptation strategies

S8 - P09

Climate Change Impact on Mountain Grasslands: Insights from Monti Sibillini National Park

Marco Bianchini[1]*, Matteo Francioni[1], Simona Colasante 1 , Marco Fiorentini[1], Chiara Rivosecchi[1,2] , Giulio Tesei[1], Demetra Giovagnoli[1], Mattia Camilletti[1], Mohamed Tarhouni[3], Maria Karatassiou[4], Paola Antonia Deligios[1], Luigi Ledda[1], Marina Allegrezza[1], Athanasios Ragkos[5], Paride D'Ottavio[1]

[1]Dipartimento di Scienze Agrarie, Alimentari ed Ambientali, Università Politecnica delle Marche, via Brecce Bianche 10, Ancona 60131, Italy
[2]Department of Civil, Constructional and Environmental Engineering, Sapienza University of Rome, via Eudossiana 18, Rome 00184, Italy
[3]Laboratoire d'Ecologie Pastorale, Institut des Régions Arides, 4119 Médenine, Tunisia
[4]Laboratory of Rangeland Ecology, School of Forestry and Natural Environment, Aristotle University of Thessaloniki, 54124 Thessaloniki, Greece
[5]Hellenic Agriculture Organization - DIMITRA, Agricultural Economics Research Institute, Terma Alkmanos, 11528 Athens, Greece
*E-mail: m.bianchini@pm.univpm.it

Abstract

Grassland ecosystems are providers of a wide array of ecosystem services. Since the 1980s, protected areas have been settled down to preserve mountain biodiversity and ecosystems, including grasslands. However, ongoing climate change could alter areas with favourable edaphic and climatic conditions for habitat key species. The aim of this study is to predict changes in mountain habitat distribution using predictive models.

The analysis was conducted in the Natura 2000 protected areas within the Monti Sibillini National Park by MaxEnt predictive model. A total of 33 environmental variables (19 bioclimatic, 3 topographic, 11 soil parameters) was pre-processed in QGIS. A total of 778 randomly displaced occurrence points was used to sample 6 habitats (i.e., 6170[1] , 6210*[2] , 6230*[3] , 8120[4] , 8210[5]) and other grassland types without any habitat code assignment (ND[6]). For the analysis were selected the CMCC-CSM2 climate model and 2 Shared Socio-economic Pathways, the 'optimistic' SSP245, and the 'pessimistic' SSP585. Model performance achieved on average an Area Under Curve of 0.92.

In a 50-year perspective, Habitat 8120 is forecasted to have the highest increases with positive trend in optimistic scenario and negative trend in the pessimistic one. Not defined habitat (*Cynosurus cristatus* grasslands) is expected to undergo the highest decrease in both scenarios. Habitats 6170, 6210* and 8210 are projected to remain almost stable, while 6230* are expected to decrease in the optimistic scenario but slightly increase in the pessimistic one. Mountain ranges serve as refuges for grassland communities. If the trends are confirmed, the primary impacts of climate change would affect rocky grasslands, which are expected to increase due to their drier conditions. In contrast, mesophilic grasslands such as *Cynosurus*- and *Nardus*-dominated grasslands are expected to decrease.

Keywords

Protected areas, predictive models, ecosystem services, MaxEnt, rangelands

S8 - P10

PRIN UNDER-VINE: new approaches to vineyard soil management

Tommaso Frioni[1]*, Pier Giorgio Bonicelli[1], Harsh Tiwari[1]

[1]Department of Sustainable Crops Production, Università Cattolica del Sacro Cuore, Piacenza.
*E-mail: tommaso.frioni@unicatt.it

Abstract

Cover crops gained popularity among growers in the last decades thanks to the multiple beneficial effects on vineyard agroecosystem. However, recent studies highlight that sowing cover crops for a use of biomass like mulching or green manure implies a certain use of water and nutrients by the floor vegetation that exerts a significant competition for developing vines.
The PRIN project UNDER-VINE aims at identifying the best options for rainfed vineyards in terms of cover crops management and termination. The following three mix have been sown in autumn 2023: CC1 having a mix of *Graminaceae*, CC2 consisting in a mix dominated by Legumes, and CC3 a balanced mix of *Brassica, Phacelia, Graminaceae* and *Leguminosae*. Cover crops will be terminated to obtain a inter-row green mulching, an under-row green mulching, or a green manure. Vine water status and physiological performances will be monitored through the season and yield and fruit composition will be determined.

Keywords

Viticulture, soil management, water potential, drought, cover crop