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Pest categorisation of Beet curly top virus (non-EU isolates)

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Abstract

The EFSA Panel on Plant Health performed a pest categorisation of non-EU isolates of Beet curly top virus (BCTV) for the European Union territory. The virus causes severe diseases in beet, tomatoes and pepper crops, occurs predominantly in warm and dry zones and is reported from many countries outside the EU in particular from western USA and Mexico. New data from complete virus genomes make BCTV a well characterised virus species of which currently 11 strains are known and for which diagnostic methods are available. BCTV has a very broad host range of more than 300 species some of which may remain symptomless. Aside from vegetative propagation of infected plants, the only mode of BCTV transmission and spread is by the leafhopper *Circulifer tenellus* which efficiently transmits the virus in a persistent mode and which is present in several southern EU Member States. No current reports of BCTV presence in the EU exist and because of doubts about the accuracy of older reports, BCTV likely is absent from the EU territory. BCTV can enter into the EU with viruliferous insects and with imports of plants not subject to specific EU regulation. Because both the virus and its vector have a wide host range, BCTV is expected to establish and spread in the Member States where its vector is present and to cause severe diseases in sugar beet and tomato as well as in other crops. Overall, BCTV non-EU isolates meet all the criteria evaluated by EFSA to qualify as a Union quarantine pest and do not meet the criterion of presence in the EU to qualify as a Union regulated non-quarantine pest (RNQP). The main uncertainties concern (1) the presence of BCTV in the EU, (2) the distribution of *C. tenellus* and (3) the main commodities for virus entry.

Keywords: Beet curly top virus, BCTV, sugar beet, *Circulifer tenellus*, pest categorisation

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1. Introduction

1.1. Background and Terms of Reference as provided by the requestor

1.1.1. Background

Council Directive 2000/29/EC[1] on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community establishes the present European Union plant health regime. The Directive lays down the phytosanitary provisions and the control checks to be carried out at the place of origin on plants and plant products destined for the Union or to be moved within the Union. In the Directive's 2000/29/EC annexes, the list of harmful organisms (pests) whose introduction into or spread within the Union is prohibited, is detailed together with specific requirements for import or internal movement.

Following the evaluation of the plant health regime, the new basic plant health law, Regulation (EU) 2016/2031[2] on protective measures against pests of plants, was adopted on 26 October 2016 and will apply from 14 December 2019 onwards, repealing Directive 2000/29/EC. In line with the principles of the above mentioned legislation and the follow-up work of the secondary legislation for the listing of EU regulated pests, EFSA is requested to provide pest categorizations of the harmful organisms included in the annexes of Directive 2000/29/EC, in the cases where recent pest risk assessment/pest categorisation is not available.

1.1.2. Terms of Reference

EFSA is requested, pursuant to Article 22(5.b) and Article 29(1) of Regulation (EC) No 178/2002[3], to provide scientific opinion in the field of plant health.

EFSA is requested to prepare and deliver a pest categorisation (step 1 analysis) for each of the regulated pests included in the appendices of the annex to this mandate. The methodology and template of pest categorisation have already been developed in past mandates for the organisms listed in Annex II Part A Section II of Directive 2000/29/EC. The same methodology and outcome is expected for this work as well.

The list of the harmful organisms included in the annex to this mandate comprises 133 harmful organisms or groups. A pest categorisation is expected for these 133 pests or groups and the delivery of the work would be stepwise at regular intervals through the year as detailed below. First priority covers the harmful organisms included in Appendix 1, comprising pests from Annex II Part A Section I and Annex II Part B of Directive 2000/29/EC. The delivery of all pest categorisations for the pests included in Appendix 1 is June 2018. The second priority is the pests included in Appendix 2, comprising the group of Cicadellidae (non-EU) known to be vector of Pierce's disease (caused by *Xylella fastidiosa*), the group of Tephritidae (non-EU), the group of potato viruses and virus-like organisms, the group of viruses and virus-like organisms of *Cydonia* Mill., *Fragaria* L., *Malus* Mill., *Prunus* L., *Pyrus* L., *Ribes* L., *Rubus* L. and *Vitis* L. and the group of Margarodes (non-EU species). The delivery of all pest categorisations for the pests included in Appendix 2 is end 2019. The pests included in Appendix 3 cover pests of Annex I part A section I and all pests categorisations should be delivered by end 2020.

For the above mentioned groups, each covering a large number of pests, the pest categorisation will be performed for the group and not the individual harmful organisms listed under 'such as' notation in the Annexes of the Directive 2000/29/EC. The criteria to be taken particularly under consideration for these cases, is the analysis of host pest combination, investigation of pathways, the damages occurring and the relevant impact.

Finally, as indicated in the text above, all references to 'non-European' should be avoided and replaced by 'non-EU' and refer to all territories with exception of the Union territories as defined in Article 1 point 3 of Regulation (EU) 2016/2031.

[1] Council Directive 2000/29/EC of 8 May 2000 on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community. OJ L 169/1, 10.7.2000, p. 1–112.

[2] Regulation (EU) 2016/2031 of the European Parliament of the Council of 26 October 2016 on protective measures against pests of plants. OJ L 317, 23.11.2016, p. 4–104.

[3] Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. OJ L 31/1, 1.2.2002, p. 1–24.

1.1.2.1. Terms of Reference: Appendix 1

List of harmful organisms for which pest categorisation is requested. The list below follows the annexes of Directive 2000/29/EC.

Annex IIAI

(a) Insects, mites and nematodes, at all stages of their development

Aleurocantus spp.
Anthonomus bisignifer (Schenkling)
Anthonomus signatus (Say)
Aschistonyx eppoi Inouye
Carposina niponensis Walsingham
Enarmonia packardi (Zeller)
Enarmonia prunivora Walsh
Grapholita inopinata Heinrich
Hishomonus phycitis
Leucaspis japonica Ckll.
Listronotus bonariensis (Kuschel)
Numonia pyrivorella (Matsumura)
Oligonychus perditus Pritchard and Baker
Pissodes spp. (non-EU)
Scirtothrips aurantii Faure
Scirtothrips citri (Moultex)
Scolytidae spp. (non-EU)
Scrobipalpopsis solanivora Povolny
Tachypterellus quadrigibbus Say
Toxoptera citricida Kirk.
Unaspis citri Comstock

(b) Bacteria

Citrus variegated chlorosis
Erwinia stewartii (Smith) Dye
Xanthomonas campestris pv. *oryzae* (Ishiyama) Dye and pv. *oryzicola* (Fang. et al.) Dye

(c) Fungi

Alternaria alternata (Fr.) Keissler (non-EU pathogenic isolates)
Anisogramma anomala (Peck) E. Müller
Apiosporina morbosa (Schwein.) v. Arx
Ceratocystis virescens (Davidson) Moreau
Cercoseptoria pini-densiflorae (Hori and Nambu) Deighton
Cercospora angolensis Carv. and Mendes
Elsinoe spp. Bitanc. and Jenk. Mendes
Fusarium oxysporum f. sp. *albedinis* (Kilian and Maire) Gordon
Guignardia piricola (Nosa) Yamamoto
Puccinia pittieriana Hennings
Stegophora ulmea (Schweinitz: Fries) Sydow & Sydow
Venturia nashicola Tanaka and Yamamoto

(d) Virus and virus-like organisms

Beet curly top virus (non-EU isolates)
Black raspberry latent virus
Blight and blight-like
Cadang-Cadang viroid
Citrus tristeza virus (non-EU isolates)
Leprosis
Little cherry pathogen (non-EU isolates)
Naturally spreading psorosis
Palm lethal yellowing mycoplasm
Satsuma dwarf virus
Tatter leaf virus
Witches' broom (MLO)

Annex IIB

(a) Insect mites and nematodes, at all stages of their development

Anthonomus grandis (Boh.)
Cephalcia lariciphila (Klug)
Dendroctonus micans Kugelan
Gilphinia hercyniae (Hartig)
Gonipterus scutellatus Gyll.
Sternochetus mangiferae Fabricius
Ips amitinus Eichhof
Ips cembrae Heer
Ips duplicatus Sahlberg
Ips sexdentatus Börner
Ips typographus Heer

(b) Bacteria

Curtobacterium flaccumfaciens pv. flaccumfaciens (Hedges) Collins and Jones

(c) Fungi

Glomerella gossypii Edgerton
Gremmeniella abietina (Lag.) Morelet
Hypoxylon mammatum (Wahl.) J. Miller

1.1.2.2. Terms of Reference: Appendix 2

List of harmful organisms for which pest categorisation is requested per group. The list below follows the categorisation included in the annexes of Directive 2000/29/EC.

Annex IAI

(a) Insects, mites and nematodes, at all stages of their development

Group of Cicadellidae (non-EU) known to be vector of Pierce's disease (caused by *Xylella fastidiosa*), such as:

1) *Carneocephala fulgida* Nottingham
2) *Draeculacephala minerva* Ball
3) *Graphocephala atropunctata* (Signoret)

Group of Tephritidae (non-EU) such as:

1) *Anastrepha fraterculus* (Wiedemann)
2) *Anastrepha ludens* (Loew)
3) *Anastrepha obliqua* Macquart
4) *Anastrepha suspensa* (Loew)
5) *Dacus ciliatus* Loew
6) *Dacus curcurbitae* Coquillet
7) *Dacus dorsalis* Hendel
8) *Dacus tryoni* (Froggatt)
9) *Dacus tsuneonis* Miyake
10) *Dacus zonatus* Saund.
11) *Epochra canadensis* (Loew)
12) *Pardalaspis cyanescens* Bezzi
13) *Pardalaspis quinaria* Bezzi
14) *Pterandrus rosa* (Karsch)
15) *Rhacochlaena japonica* Ito
16) *Rhagoletis completa* Cresson
17) *Rhagoletis fausta* (Osten-Sacken)
18) *Rhagoletis indifferens* Curran
19) *Rhagoletis mendax* Curran
20) *Rhagoletis pomonella* Walsh
21) *Rhagoletis suavis* (Loew)

(c) Viruses and virus-like organisms

Group of potato viruses and virus-like organisms such as:

1) Andean potato latent virus
2) Andean potato mottle virus
3) Arracacha virus B, oca strain
4) Potato black ringspot virus
5) Potato virus T
6) non-EU isolates of potato viruses A, M, S, V, X and Y (including Yo, Yn and Yc) and Potato leafroll virus

Group of viruses and virus-like organisms of Cydonia Mill., Fragaria L., Malus Mill., Prunus L., Pyrus L., Ribes L.,Rubus L. and Vitis L., such as:

1) Blueberry leaf mottle virus
2) Cherry rasp leaf virus (American)
3) Peach mosaic virus (American)
4) Peach phony rickettsia
5) Peach rosette mosaic virus
6) Peach rosette mycoplasm
7) Peach X-disease mycoplasm
8) Peach yellows mycoplasm
9) Plum line pattern virus (American)
10) Raspberry leaf curl virus (American)
11) Strawberry witches' broom mycoplasma
12) Non-EU viruses and virus-like organisms of *Cydonia Mill., Fragaria L., Malus Mill., Prunus L., Pyrus L., Ribes L., Rubus L.* and *Vitis L.*

Annex IIAI

(a) Insects, mites and nematodes, at all stages of their development

Group of *Margarodes* (non-EU species) such as:

1) *Margarodes vitis* (Phillipi)
2) *Margarodes vredendalensis* de Klerk
3) *Margarodes prieskaensis* Jakubski

1.1.2.3. Terms of Reference: Appendix 3

List of harmful organisms for which pest categorisation is requested. The list below follows the annexes of Directive 2000/29/EC.

Annex IAI

(a) Insects, mites and nematodes, at all stages of their development

Acleris spp. (non-EU)
Amauromyza maculosa (Malloch)
Anomala orientalis Waterhouse
Arrhenodes minutus Drury
Choristoneura spp. (non-EU)
Conotrachelus nenuphar (Herbst)
Dendrolimus sibiricus Tschetverikov
Diabrotica barberi Smith and Lawrence
Diabrotica undecimpunctata howardi Barber
Diabrotica undecimpunctata undecimpunctata Mannerheim
Diabrotica virgifera zeae Krysan & Smith
Diaphorina citri Kuway
Heliothis zea (Boddie)
Hirschmanniella spp., other than *Hirschmanniella gracilis* (de Man) Luc and Goodey
Liriomyza sativae Blanchard
Longidorus diadecturus Eveleigh and Allen
Monochamus spp. (non-EU)
Myndus crudus Van Duzee
Nacobbus aberrans (Thorne) Thorne and Allen
Naupactus leucoloma Boheman
Premnotrypes spp. (non-EU)
Pseudopityophthorus minutissimus (Zimmermann)
Pseudopityophthorus pruinosus (Eichhoff)
Scaphoideus luteolus (Van Duzee)
Spodoptera eridania (Cramer)
Spodoptera frugiperda (Smith)
Spodoptera litura (Fabricus)
Thrips palmi Karny
Xiphinema americanum Cobb sensu lato (non-EU populations)
Xiphinema californicum Lamberti and Bleve-Zacheo

(b) Fungi

Ceratocystis fagacearum (Bretz) Hunt
Chrysomyxa arctostaphyli Dietel
Cronartium spp. (non-EU)
Endocronartium spp. (non-EU)
Guignardia laricina (Saw.) Yamamoto and Ito
Gymnosporangium spp. (non-EU)
Inonotus weirii (Murril) Kotlaba and Pouzar
Melampsora farlowii (Arthur) Davis
Mycosphaerella larici-leptolepis Ito et al.
Mycosphaerella populorum G. E. Thompson
Phoma andina Turkensteen
Phyllosticta solitaria Ell. and Ev.
Septoria lycopersici Speg. var. *malagutii* Ciccarone and Boerema
Thecaphora solani Barrus
Trechispora brinkmannii (Bresad.) Rogers

(c) Viruses and virus-like organisms

Tobacco ringspot virus
Tomato ringspot virus
Bean golden mosaic virus
Cowpea mild mottle virus
Lettuce infectious yellows virus
Pepper mild tigré virus
Squash leaf curl virus
Euphorbia mosaic virus
Florida tomato virus

(d) Parasitic plants

Arceuthobium spp. (non-EU)

Annex IAII

(a) Insects, mites and nematodes, at all stages of their development

Meloidogyne fallax Karssen
Popillia japonica Newman
Rhizoecus hibisci Kawai and Takagi

(b) Bacteria

Clavibacter michiganensis (Smith) Davis et al. ssp. *sepedonicus* (Spieckermann and Kotthoff) Davis et al.
Ralstonia solanacearum (Smith) Yabuuchi et al.

(c) Fungi

Melampsora medusae Thümen
Synchytrium endobioticum (Schilbersky) Percival

Annex I B

(a) Insects, mites and nematodes, at all stages of their development

Leptinotarsa decemlineata Say
Liriomyza bryoniae (Kaltenbach)

(b) Viruses and virus-like organisms

Beet necrotic yellow vein virus

1.2. Interpretation of the Terms of Reference

Beet curly top virus (BCTV) is one of a number of pests listed in the Appendices to the Terms of Reference (ToR) to be subject to pest categorisation to determine whether it fulfils the criteria of a quarantine pest or those of a regulated non-quarantine pest (RNQP) for the area of the EU excluding Ceuta, Melilla and the outermost regions of Member States (MSs) referred to in Article 355(1) of the Treaty on the Functioning of the European Union (TFEU), other than Madeira and the Azores.

The present opinion addresses 'non-EU' isolates of BCTV which are defined by their geographical origin outside of the EU. Consequently, a plant originating from a non-EU country infected with a BCTV isolate or a viruliferous insect vector on a non-host plant originating from a non-EU country, are considered infected with a 'non-EU' isolate of BCTV. The pest categorisation considers BCTV, the type species of the genus *Curtovirus* in the family Geminiviridae and its strains. BCTV has a broad host range, and in its main host, sugar beet, it causes a disease with characteristic leaf curl symptoms, the beet curly top disease (BCTD). There were several viruses formerly described as separate virus species related to BCTV and for which distinct virus names were given. With new data on complete virus genomes available, the genomes of the curtoviruses were compared which lead to a revision of the taxonomic status of viruses and strains within the genus. Consequently, a number of formerly distinct virus species have now been reassigned as strains of BCTV (Varsani et al., 2014). Therefore, this pest categorisation encompasses both BCTV in its previous restricted sense and its newly assigned strains.

2. Data and methodologies

2.1. Data

2.1.1. Literature search

A literature search on BCTV was conducted at the beginning of the categorisation. Further references and information were obtained from citations within the references and grey literature.

2.1.2. Database search

Pest information, on host(s) and distribution, was retrieved from the EPPO Global Database (EPPO, 2017).

Data about import of commodity types that could potentially provide a pathway for the pest to enter the EU and about the area of hosts grown in the EU were obtained from EUROSTAT.

The Europhyt database was consulted for pest-specific notifications on interceptions and outbreaks. Europhyt is a web-based network launched by the Directorate General for Health and Consumers (DG SANCO), and is a subproject of PHYSAN (Phyto-Sanitary Controls) specifically concerned with plant health information. The Europhyt database manages notifications of interceptions of plants or plant products that do not comply with EU legislation, as well as notifications of plant pests detected in the territory of the MSs and the phytosanitary measures taken to eradicate or avoid their spread.

2.2. Methodologies

The Panel performed the pest categorisation for Beet curly top virus (BCTV), following guiding principles and steps presented in the EFSA guidance on the harmonised framework for pest risk assessment (EFSA PLH Panel, 2010) and as defined in the International Standard for Phytosanitary Measures No 11 (FAO, 2013) and No 21 (FAO, 2004).

In accordance with the guidance on a harmonised framework for pest risk assessment in the EU (EFSA PLH Panel, 2010), this work was initiated following an evaluation of the EU's plant health regime. Therefore, to facilitate the decision-making process, in the conclusions of the pest categorisation, the Panel addresses explicitly each criterion for a Union quarantine pest and for a Union RNQP in accordance with Regulation (EU) 2016/2031 on protective measures against pests of plants, and includes additional information required as per the specific terms of reference received by the European Commission. In addition, for each conclusion, the Panel provides a short description of its associated uncertainty.

Table 1 presents the Regulation (EU) 2016/2031 pest categorisation criteria on which the Panel bases its conclusions. All relevant criteria have to be met for the pest to potentially qualify either as a quarantine pest or as a RNQP. If one of the criteria is not met, the pest will not qualify. Note that a pest that does not qualify as a quarantine pest may still qualify as a RNQP which needs to be addressed in the opinion. For the pests regulated in the protected zones only, the scope of the categorisation is the territory of the protected zone, thus the criteria refer to the protected zone instead of the EU territory.

It should be noted that the Panel's conclusions are formulated respecting its remit and particularly with regards to the principle of separation between risk assessment and risk management (EFSA founding regulation (EU) No 178/2002); therefore, instead of determining whether the pest is likely to have an unacceptable impact, the Panel will present a summary of the observed pest impacts. Economic impacts are expressed in terms of yield and quality losses and not in monetary terms, while addressing social impacts is outside the remit of the Panel, in agreement with EFSA guidance on a harmonised framework for pest risk assessment (EFSA PLH Panel, 2010).

Table 1: Pest categorisation criteria under evaluation, as defined in Regulation (EU) 2016/2031 on protective measures against pests of plants (the number of the relevant sections of the pest categorisation is shown in brackets in the first column)

Criterion of pest categorisation	Criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Criterion in Regulation (EU) 2016/2031 regarding protected zone quarantine pest (articles 32-35)	Criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest
Identity of the pest (Section 3.1)	Is the identity of the pest established, or has it been shown to produce consistent symptoms and to be transmissible?	Is the identity of the pest established, or has it been shown to produce consistent symptoms and to be transmissible?	Is the identity of the pest established, or has it been shown to produce consistent symptoms and to be transmissible?

Criterion of pest categorisation	Criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Criterion in Regulation (EU) 2016/2031 regarding protected zone quarantine pest (articles 32-35)	Criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest
Absence/presence of the pest in the EU territory (Section 3.2)	Is the pest present in the EU territory? If present, is the pest widely distributed within the EU? Describe the pest distribution briefly!	Is the pest present in the EU territory? If not, it cannot be a protected zone quarantine organism.	Is the pest present in the EU territory? If not, it cannot be a regulated non-quarantine pest. (A regulated non-quarantine pest must be present in the risk assessment area.)
Regulatory status (Section 3.3)	If the pest is present in the EU but not widely distributed in the risk assessment area, it should be under official control or expected to be under official control in the near future.	The protected zone system aligns with the pest free area system under the International Plant Protection Convention (IPPC) The pest satisfies the IPPC definition of a quarantine pest that is not present in the risk assessment area (i.e. protected zone)	Is the pest regulated as a quarantine pest? If currently regulated as a quarantine pest, are there grounds to consider its status could be revoked?
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Is the pest able to enter into, become established in, and spread within, the EU territory? If yes, briefly list the pathways!	Is the pest able to enter into, become established in, and spread within, the protected zone areas? Is entry by natural spread from EU areas where the pest is present possible?	Is spread mainly via specific plants for planting, rather than via natural spread or via movement of plant products or other objects? Clearly state if plants for planting is the main pathway!
Potential for consequences in the EU territory (Section 3.5)	Would the pests' introduction have an economic or environmental impact on the EU territory?	Would the pests' introduction have an economic or environmental impact on the protected zone areas?	Does the presence of the pest on plants for planting have an economic impact, as regards the intended use of those plants for planting?
Available measures (Section 3.6)	Are there measures available to prevent the entry into, establishment within or spread of the pest within the EU such that the risk becomes mitigated?	Are there measures available to prevent the entry into, establishment within or spread of the pest within the protected zone areas such that the risk becomes mitigated? Is it possible to eradicate the pest in a restricted area within 24 months (or a period longer than 24 months where the biology of the organism so justifies) after the presence of the pest was confirmed in the protected zone?	Are there measures available to prevent pest presence on plants for planting such that the risk becomes mitigated?
Conclusion of pest categorisation (Section 4)	A statement as to whether (1) all criteria assessed by EFSA above for consideration as a potential quarantine pest were met and (2) if not, which one(s) were not met	A statement as to whether (1) all criteria assessed by EFSA above for consideration as potential protected zone quarantine pest were met, and (2) if not, which one(s) were not met	A statement as to whether (1) all criteria assessed by EFSA above for consideration as a potential regulated non-quarantine pest were met, and (2) if not, which one(s) were not met

The Panel will not indicate in its conclusions of the pest categorisation whether to continue the risk assessment process, but, following the agreed 2-step approach, will continue only if requested by the risk managers. However, during the categorisation process, experts may identify key elements and knowledge gaps that could contribute significant uncertainty to a future assessment of risk. It would be useful to identify and highlight such gaps so that potential future requests can specifically target the major elements of uncertainty, perhaps suggesting specific scenarios to examine.

3. Pest categorisation

3.1. Identity and biology of the pest

3.1.1. Identity and taxonomy

Is the identity of the pest established? **Yes**

BCTV has a monopartite single-stranded DNA (ssDNA) genome of about 2.9–3.0 kilobases and is the type species of the genus *Curtovirus* a member of the Geminiviridae, a family of viruses with circular ssDNA monopartite or bipartite genomes. The taxonomy of this virus family is undergoing constant revisions with new viruses continuously discovered having genome features that are substantially different from those of existing ones. Taxonomy and demarcation of genera in the family Geminiviridae are based on insect vector (leafhoppers, treehoppers, whiteflies and aphids), host range, genome organisation and genome sequence (Virus Taxonomy: 2016 Release EC 48, Budapest, Hungary, August 2016). The analysis of complete ssDNA genome sequences (DNA-A of bipartite viruses) is the basis for species and strain assignment. The phylogenetic relationships of viruses within the genus *Curtovirus* was recently revised using a pairwise comparison of complete DNA genome sequences (Varsani et al., 2014). This led to a reconsideration of the taxonomic status of virus species, and clear species as well as strain demarcation thresholds were set. A genome-wide pairwise nucleotide identity of < 77% discriminates virus species, while a nucleotide identity threshold of 94% assigns a genome sequence to a strain (Varsani et al., 2014). Based on this revision, a number of formerly distinct virus species were re-assigned as strains of BCTV. The names of the newly assigned strains retain in their name their previous denomination, allowing for a link between the current and the previous taxonomy (Table 2).

Table 2: List of former virus species newly assigned as strains of BCTV and their original host plants according to Varsani et al. (2014) and new strains identified by Strausbaugh et al. (2017)

BCTV	Former species name	Original host plant	Acronym - strain
Beet curly top virus	Beet mild curly top virus	*Capsicum annuum, Phaseolus vulgaris*	BCTV-Mld
Beet curly top virus	Beet mild curly top virus	*Beta vulgaris*	BCTV-Wor
Beet curly top virus	Beet curly top virus	*Beta vulgaris*	BCTV-CO
Beet curly top virus	Beet curly top virus	*Beta vulgaris*	BCTV-CA/Logan
Beet curly top virus	Beet severe curly top virus	*Beta vulgaris*	BCTV-Svr
Beet curly top virus	Beet severe curly top virus	*Capsicum annuum*	BCTV-SvrPep
Beet curly top virus	Pepper curly top virus	*Capsicum annuum, Solanum lycopersicum*	BCTV-PeCT
Beet curly top virus	New strain (Strausbaugh et al., 2017)	*Beta vulgaris*	BCTV-Kimberly1
Beet curly top virus	New strain (Strausbaugh et al., 2017)	*Solanum lycopersicum, Capsicum annuum*	BCTV-leafhopper 71

Strain denominations: Mld, mild; Svr, severe; Wor, Worland; CO, Columbia; Ca/Logan, Californian Logan; SvrPep, severe pepper; Pect, pepper leaf curl; SpCT, spinach leaf curl; PeYDV, pepper yellow dwarf. BCTV strains in the last two lines are from Strausbaugh et al. (2017).

Recently, BCTV genome sequences from US virus collections of sugar beet and other crops were evaluated to elucidate the current prevalence of particular strains, to identify strain shifts and to discover the emergence of new virus variants (Strausbaugh et al., 2017). Following the recently accepted BCTV nomenclature, two additional BCTV sequence clades (Strausbaugh et al., 2017) were identified, demonstrating the existence of two additional strains of BCTV (BCTV-Kimberly and BCTV-Leafhopper71). There are now altogether 11 BCTV strains identified (Table 2).

The *Beet curly top Iran virus* (BCTIV) causes a serious leaf curl disease of sugar beet in Iran. This disease is very similar to the disease caused by BCTV but the virus belongs to a different genus, *Becurtovirus* within the family Geminiviridae and has genome features clearly distinct from BCTV (Kamali et al., 2017). BCTIV is transmitted by a different leafhopper vector, *Circulifer haematoceps*, and can clearly be discriminated from BCTV. Overall, BCTV is a well characterised virus.

3.1.2. Biology of the pest

The only mode of BCTV natural spread is through transmission by the beet leafhopper, *Circulifer tenellus* (Baker). No other modes of transmission, through seed, pollen or by mechanical inoculation are known. Thus, incidence and spread of BCTV are tightly linked to the occurrence and density of insect vector populations.

Once acquired by its vector BCTV persists in the insect. *C. tenellus* is very effective in acquiring the virus during its feeding on infected plants. After short acquisition access periods (minutes to hours) and after a latent period of several hours in its vector, the virus is efficiently transmitted to other host plants. Prolonged feeding increases the persistence of the virus in its vector. *C. tenellus* can carry the virus for up to 30 days during which the insect is able to transmit and spread the virus, although the transmission efficiency declines over time (Soto and Gilbertson, 2003). There is neither replication of the virus in its vector nor transovarial transmission to the progeny and this characterises a persistent circulative but non-propagative mode of transmission.

BCTV has a wide host range comprising more than 300 species in 44 families (Thomas and Mink, 1979). The main host for this virus is beet (*Beta vulgaris*) but other important crops, bean (*Phaseolus vulgaris*), pepper (*Capsicum annuum*), tomato (*Solanum lycopersicum*), potato (*Solanum tuberosum*), cucurbits (e.g. squash, melon, cucumber) as well as many weed species (e.g. *Chenopodium* sp., *Amaranthus* sp.) are also host plants (Wisler and Duffus, 2000; Soto and Gilbertson, 2003; Golenberg et al., 2009; Lam et al., 2009).

3.1.3. Intraspecific diversity

3.1.3.1. Genome diversity

Recombination has contributed significantly to shaping the evolution of all viruses in the family Geminiviridae. Many curtoviruses have chimeric genomes comprising sequences derived from either other BCTV strains or from other viral species (Varsani et al., 2014).

3.1.3.2. Biological diversity

Because of the wide host range of BCTV, its strains can be found on many hosts other than sugar beet, causing either mild or severe leaf curl symptoms. BCTV strains can be particularly adapted to the specific host(s) in which they predominantly circulate while still being able to infect (sugar) beet. Over a 10-year period a shift of virus populations occurred in the western USA. In sugar beet, the BCTV-Svr was found in almost 90% of infected samples either single or frequently also as mixed virus infections. This was replaced with mild strains of BCTV, the BCTV-Wor and BCTV-CO strains becoming the dominant viruses in the major sugar beet regions of the US, Idaho and Oregon (Rondon et al., 2016; Strausbaugh et al., 2016a, 2017). Similarly, a BCTV population shift was also recorded in tomato in California. In contrast to BCTV-Svr and BCTV-Wor dominating in earlier surveys, the BCTV isolates collected during an outbreak in California in 2013 resembled BCTV-CO (Strausbaugh et al., 2017) suggesting another strain replacement event.

Symptoms caused by genetically diverse BCTV strains in each crop are variable, and therefore, symptom descriptors, mild or severe, for particular strains are generally not very informative because they are influenced by age of the plant at insect transmission, crop management (neonicotinoid seed drenching) and climate.

While curly top disease symptoms in crops are particularly prominent, disease symptoms of BCTV in weed hosts are mostly either very mild or absent. Weed plants however play a significant role in the survival of the virus and as sources of inoculum. Weed infections with BCTV and the virus titres reached in these hosts are decisive for the extent of crop infections and can also explain strain shifts over time.

Overall, there is biological variability between BCTV strains in their adaptation to particular hosts and severity of symptoms.

3.1.4. Detection and identification of the pest

Are detection and identification methods available for the pest?

YES

3.2. Pest distribution

3.2.1. Pest distribution outside the EU

The known geographical range of BCTV includes the Mediterranean region, the Middle East, the Indian subcontinent, and North, Central and South America. BCTV is widely present in the USA and in the eastern Mediterranean region, including Egypt and Turkey and the virus has also been reported from Iran, Iraq and Japan (Figure 1, Tables 3 and 4).

Table 3: Global distribution of Beet curly top virus outside of the EU (extracted from EPPO Global Database, accessed June 30 2017)

Continent	Country	Status
Africa	Ivory Coast	Present, no details
Africa	Egypt	Present, no details
America	Argentina	Present, no details
America	Bolivia	Present, no details
America	Brazil	Absent, unreliable record
America	Canada	Present, restricted distribution
America	Canada (British Columbia)	Present, no details
America	Costa Rica	Present, no details
America	Mexico	Present, restricted distribution
America	Puerto Rico	Absent, unreliable record
America	United States of America	Present, restricted distribution Present, widespread Present, no details
America	Uruguay	Present, widespread
Asia	India	Present, few occurrences
Asia	Iran	Present, no details
Asia	Israel	Absent, invalid record
Asia	Japan	Present, restricted distribution
Asia	Korean Republic	Absent, invalid record
Europe (non-EU)	Turkey	Present, restricted distribution

Last updated: 2017-04-19

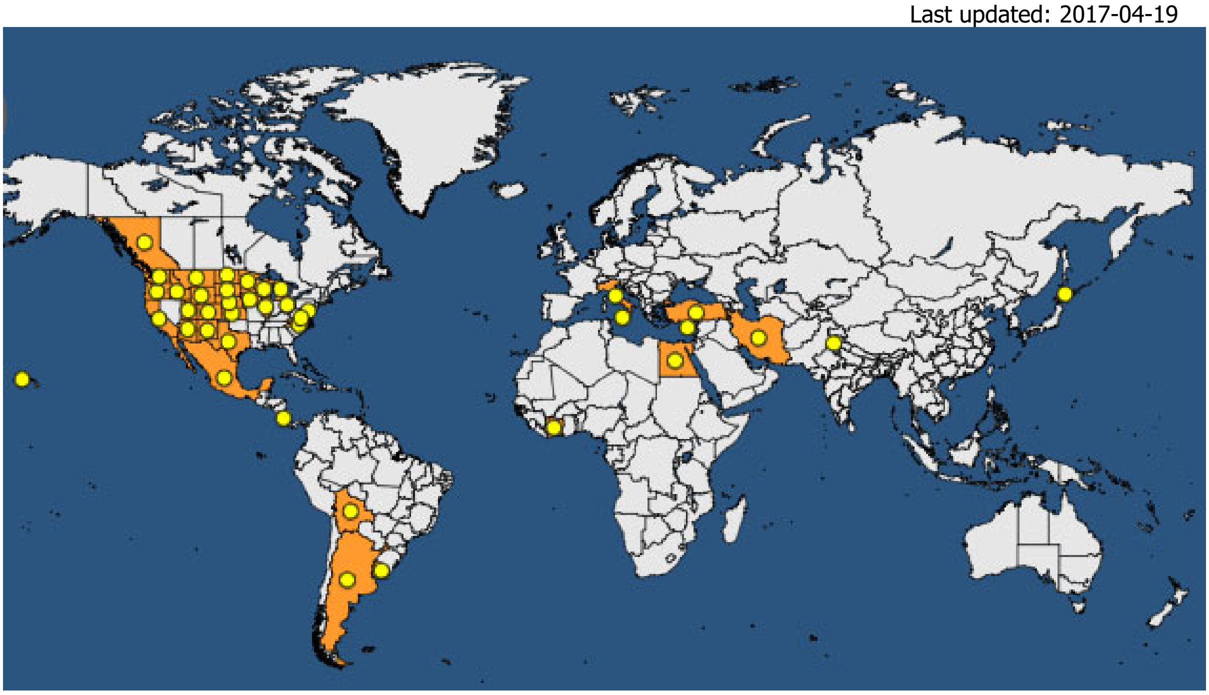

Figure 1: Global distribution of Beet curly top virus (extracted from EPPO Global Database, accessed June 30 2017)

3.2.2. Pest distribution in the EU

Is the pest present in the EU territory?
NO, however with some uncertainty

The EPPO Global Database states that BCTV was found in Italy and Cyprus while for all other EU MS countries, the virus is currently marked as absent. The BCTV records for these two countries correspond to records dating back to more than 20 years. The Panel was not able to trace back to the origins of the detection reports and the country reports (EPPO Global Database), do not provide any information on the infected host, the method used for identification, or whether the findings were from interceptions.

The Panel stresses that given the diversity of viruses in the Geminiviridae family and the limited availability of appropriate identification methods, it was difficult at that time to realise an unambiguous diagnostics for BCTV. BCTV has a wide host range and it is possible that it exists in natural hosts that remain mostly without any symptoms. However, given the pronounced symptoms BCTV causes in crops such as sugar beet, tomato and pepper, it is unlikely that BCTV infections would remain unnoticed.

The Panel therefore considers that the lack of recent reports on BCTV outbreaks in the EU can be taken as a good indication that BCTV is not present in EU crops, with some uncertainty. As a consequence, BCTV is not considered by the Panel as meeting the criterion on being present in the EU to qualify as a Union RNQP.

Table 4: Current distribution of Beet curly top virus in the 28 EU MS based on information extracted from the EPPO Global Database (accessed 30 June 2017)

Country	EPPO GD
Austria	Absent, pest no longer present (1998)
Belgium	–
Bulgaria	Absent, unreliable record (1977)
Croatia	–

Country	EPPO GD
Cyprus	Present, restricted distribution
Czech Republic	–
Denmark	–
Estonia	–
Finland	–
France	–
Germany	–
Greece	–
Hungary	–
Ireland	–
Italy	Present, restricted distribution (1993) Present, no details (1993)
Latvia	–
Lithuania	–
Luxembourg	–
Malta	–
Poland	–
Portugal	–
Romania	–
Slovak Republic	–
Slovenia	–
Spain	Absent, invalid record (1996)
Sweden	–
Netherlands	–
United Kingdom	–

–: no information available.

3.2.3. Insect vectors for BCTV and their distribution in the EU

C. tenellus is the only known vector of BCTV and is reported from Spain, France, Italy and Greece (Figure 2).

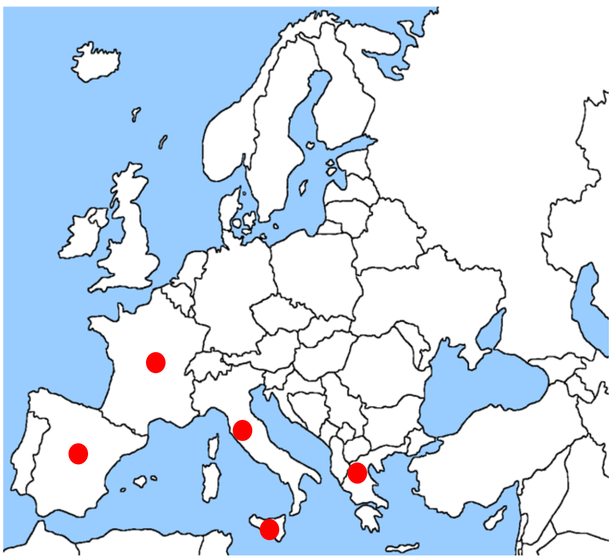

Figure 2: European distribution of *C. tenellus* extracted from EFSA PLH Panel (2015)

While *C. tenellus* has been reported from few Mediterranean countries, it is possible that it is also present (but not reported) in other southern EU countries, such as Slovenia and Croatia. Due to the small size of the insect, it is easily overlooked but if still absent, similar climates and environments make it conceivable that range expansion into these areas could occur. *C. tenellus* is a highly polyphagous insect that feeds on many herbaceous plants and shrubs. The most common host plants belong to the Chenopodiaceae (*Salsola kali*, *Salsola pestifer*, *Chenopodium album*), Brassicaceae (*Matthiola incana*, *Matthiola sinuata*), Amaranthaceae (*Atriplex* sp.) and Fabaceae (*Alhagi mannifera*) families (Frazier, 1953). Plant species from other families can also host immature stages, thus broadening the host range.

Given the availability of many common host plant species, it is very likely that the actual distribution of this leafhopper is wider than reported. However, it has to be noted that the current area of distribution reflects its ecological preferences/requirements. From its current distribution worldwide, *C. tenellus* appears to have preferences for warm and dry environments and this might limit its spread into areas characterised by high levels of precipitation. Still uncertainty exists on the potential distribution of the leafhopper because of the lack of information on climatic and ecological requirements.

The dispersal and migration capabilities of *C. tenellus* are the cause of BCTV spread and responsible for recurrent outbreaks of curly top diseases in tomato, pepper and sugar beet in the USA and Mexico. It has been well documented for the recent outbreaks of BCTV in tomato (2013) in California with dispersal of insects from the uncultivated plains and foothills where they overwinter into the cultivated areas to return to the uncultivated plains and foothills in the fall (Chen et al., 2010). Seasonal dispersals can occur over relatively long distances. In the USA reports have shown that *C. tenellus* can migrate from the desert in Utah were it breeds, to invade distant sugar beet crops that are up to 300 km away (EFSA PLH Panel, 2015). Similar migration patterns and distances have been described for *C. tenellus* in the southwestern part of the USA or from northern Mexico to Miami, Florida (Severin, 1933; Dorst and Davis, 1937). DeLong (1971) describes mass migrations, presumably wind-borne, with 'piling up' at weather fronts and usually associated with large populations (EFSA PLH Panel, 2015).

3.3. Regulatory status

3.3.1. Council Directive 2000/29/EC

BCTV (non-EU isolates) is listed in Council Directive 2000/29/EC. Details are presented in Tables 5 and 6.

3.3.2. Legislation addressing plants and plant parts on which Beet curly top virus (non-EU isolates) is regulated

Table 5: Beet curly top virus (non-EU isolates) in Council Directive 2000/29/EC

Annex II, Part A	Harmful organisms whose introduction into, and spread within, all member states shall be banned if they are present on certain plants or plant products	
Section I	Harmful organisms not known to occur in the community and relevant for the entire community	
(d)	Virus and virus-like organisms	
	Species	**Subject of contamination**
1.	Beet curly top virus (non-European isolates)	Plants of *Beta vulgaris* L., intended for planting, other than seeds

3.3.3. Legislation addressing plants and plant parts on which Beet curly top (non-EU isolates) virus is regulated

Table 6: Regulated hosts and commodities that may involve Beet curly top virus (non-EU isolates) in Annexes III, IV and V of Council Directive 2000/29/EC

Annex III, Part A	Plants, plant products and other objects the introduction of which shall be prohibited in all Member States	
	Description	**Country of origin**
16.	Plants of *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf., and their hybrids, other than fruit and seeds	Third countries
Annex IV, Part A	Special requirements which must be laid down by all member states for the introduction and movement of plants, plant products and other objects into and within all member states	
Section I	Plants, plant products and other objects originating outside the community	
	Plants, plant products and other objects	**Special requirements**
35.1	Plants of *Beta vulgaris* L. intended for planting, other than seeds	Official statement that no symptoms of Beet curly top virus (non-European isolates) have been observed at the place of production since the beginning of the last complete cycle of vegetation.
Annex V	Plants, plant products and other objects which must be subject to a plant health inspection (at the place of production if originating in the community, before being moved within the community — in the country of origin or the consignor country, if originating outside the community) before being permitted to enter the community	
Part A	Plants, plant products and other objects originating in the Community	
I.	Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for the entire Community and which must be accompanied by a plant passport	
1.4	Plants of *Fortunella* Swingle, *Poncirus* Raf. and their hybrids and of *Citrus* L., other than fruit and seeds	
1.5	Plants of *Citrus* L. and their hybrids other than fruit and seeds	

3.3.4. Legislation addressing the vectors of Beet curly top virus (non-EU isolates) (Directive 2000/29/EC) (Table 7)

Table 7: *C. tenellus* in Council Directive 2000/29/EC

Annex II, Part A	**Harmful organisms whose introduction into, and whose spread within, all Member States shall be banned if they are present on certain plants or plant products**	
Section II	**Harmful organisms known to occur in the Community and relevant for the entire Community**	
(a)	**Insects, mites and nematodes, at all stages of their development**	
	Species	**Subject of contamination**
6.	*C. tenellus*	Plants of *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf., and their hybrids, other than fruit and seeds

3.4. Entry, establishment and spread in the EU

3.4.1. Host range

BCTV has a wide host range comprising more than 300 natural hosts (Wisler and Duffus, 2000; Soto and Gilbertson, 2003; Golenberg et al., 2009; Lam et al., 2009) (see Section 3.1.2). The major hosts of BCTV are sugar beet, tomato and pepper in which the virus causes the most serious damage and high economic impact (Gordon, 2014; http://www.growingproduce.com/crop-protection/disease-control/beet-curly-top-virus-is-an-unpredictable-disease).

BCTV has also been found in common weed hosts (Chenopodiaceae, Amaranthaceae, etc.) that are often found associated with sugar beet cultivation. Because of its wide host range and the activity of the polyphagous insect vectors, many plant species can become infected, in particular when vector populations are high. While many of the wild hosts often are not showing symptoms, those plants function as hosts for overwintering and as virus reservoirs they play a significant role in disease outbreaks.

3.4.2. Entry

Is the pest able to enter into the EU territory?
YES

Given its very wide host range, BCTV can enter into the EU territory with either consignments of infected plants for planting or plant products of anyone of its numerous hosts or with viruliferous *C. tenellus* present in consignments of host or non-host plants.

Although Annexes III, IV and V restrictions of some BCTV host plants exist on the introduction to and movement within the EU most of the more than 300 host species are unregulated, leaving at least partially open the pathway associated with plants and plant products.

Similarly, while *C. tenellus* is listed in Directive 2000/29/EC on citrus plants, there are no specific restrictions to its presence on other plants and plant products, therefore leaving open the pathway associated with these viruliferous insects. In addition, *C. tenellus* present in neighbouring countries could fly or hitchhike into the EU.

Between 1995 and 8 of June, 2017 there were no records of interception of *Beet curly top* (non-EU isolates) in the Europhyt database.

3.4.3. Establishment

3.4.3.1. EU distribution of main host plants

Is the pest able to become established in the EU territory?
YES, numerous host plants are present and the insect vector is endemic in at least some EU regions with suitable climate

Many of the more than 300 known wild and cultivated host plants for BCTV are widely distributed in the EU. The broad host range suggests that BCTV has hosts throughout the EU.

Sugar beet and tomato are the most affected crops and outbreaks of BCTV in these crops have high economic impact. The main producers for sugar beet in Europe are France, Germany and the UK. In Italy, Spain and Greece, acreage of sugar beet cultivation is comparatively small (Table 8).

Table 8: Area (cultivation/harvested/production) (1,000 ha) of sugar beet (excluding seed) in selected countries of the EU (2011–2015). Extracted from EUROSTAT on the 7th of June 2017

GEO/TIME	2011	2012	2013	2014	2015
France	393.13	389.79	393.63	406.74	385.05
Germany	398.10	402.10	357.40	372.50	312.80
United Kingdom	113.00	120.00	117.00	116.00	90.00
Italy	62.24	45.55	40.71	51.99	38.12
Spain	44.93	38.95	32.05	38.41	37.61
Greece	5.51	8.05	5.81	7.87	5.18
Portugal	0.32	0.37	0.38	0.35	0.10
SUM	**1,017.23**	**1,004.81**	**946.98**	**993.86**	**868.86**

In the EU, almost 18 million tonnes of tomatoes are produced and the biggest portion, 11 million tonnes, is cultivated in Italy and Spain either in open field horticulture or under protected cultivation. Even in other areas of the EU host species such as tomato and peppers are widely grown, under protected cultivation for the northern regions.

3.4.3.2. Climatic conditions affecting establishment

In a perennial host systemically infected with BCTV, the virus is maintained as long as its living host exists. Although BCTV is found mostly in warm and dry climates, the climatic condition affecting the establishment of the virus are those of the host plant it systemically infects.

Overall, ecoclimatic conditions are not expected to significantly affect BCTV establishment wherever its hosts are able to grow.

3.4.4. Spread

3.4.4.1. Vectors and their distribution in the EU (if applicable)

Is the pest able to spread within the EU territory following establishment?
YES, but plants for planting do not represent the main pathway for spread

Dissemination of BCTV is with infected plants and with viruliferous insects that can passively (wind, hitchhiking) or actively migrate over long distances. Natural spread of BCTV, its transmission from host plant to host plant, is ONLY possible by transmission by the beet leafhopper *C. tenellus.* Consequently, outside the natural range of the vector, BCTV infected plants may occur but without further spread of the virus from its source. As explained in the 'Scientific Opinion on pest categorisation of *C. haematoceps* and *C. tenellus*' (EFSA PLH Panel, 2015), it is possible that *C. tenellus* is already present (but not reported) in few EU countries, such as Portugal, Slovenia and Croatia, and if still absent from these countries, it could spread into presently uncolonised areas where ecoclimatic conditions are suitable for its development.

Overall, *C. tenellus* vector populations have the potential to establish in the most southern MS from which they are still absent.

3.5. Impacts

Would the pests' introduction have an economic or environmental impact on the EU territory?
YES

Most impact from BCTV is reported from outbreaks in sugar beet and tomato and from a range of other crops, including pepper and basil (Wisler and Duffus, 2000; Strausbaugh et al., 2008, 2017; Chen et al., 2010, 2014). BCTV is most prevalent in the USA where already in 1890, the curly top disease was recognised as a serious threat to the sugar beet production and almost destroyed the California sugar beet industry (Wisler and Duffus, 2000). When young sugar beet seedlings become infected, they can readily die, while plant infections at later stages are characterised by dwarfing, crinkling, rolling and vein chlorosis with blistering and swelling of veins at the underside of the leaves. In tomato, BCTV infections result in severely stunted growth, leaf distortion, curling and yellowing. In particular, when inoculation is at early stages plants fail to flower and to produce fruits. In California, a BCTV outbreak in 2013 caused economic losses of more than 100 million dollars, which was far beyond losses recorded from an outbreak in 2003 which ranged between 5 and 10 million dollars.

Curly top diseases have serious impact for chilli pepper production and in 2001 and 2003 losses between 20% and 50% were recorded in New Mexico, USA; in 2005, outbreaks of curly top disease were reported in pepper fields in central Mexico. In 2014 a severe disease of basil (*Ocimum basilicum*) with stunted growth, leaf epinasty, crumpling and yellowing, was observed in the Imperial Valley of California. The disease was caused by BCTV and the severe outbreak associated with high populations of *C. tenellus* vectors carrying the virus (Chen et al., 2014).

Overall, BCTV is able to cause important damage and losses in a number of crops.

C. tenellus populations in native environments drive epidemics of BCTV in crops. Vector control using insecticides is important for disease management. Insecticide programmes to treat natural habitats of the insect vector and to limit the migrating *C. tenellus* populations are common practice for tomato, sugar beet and other crops (Zhou et al., 2008; Chen et al., 2010, 2011; Strausbaugh et al., 2014, 2016b).

There are no records of BCTV occurrence in Europe. However, if introduced, BCTV epidemics could develop in those member states where the vector is present and cause severe losses in susceptible crops.

3.6. Availability and limits of mitigation measures

Are there measures available to prevent the entry into, establishment within or spread of the pest within the EU such that the risk becomes mitigated?

YES, for entry. The current regulation could be expanded to comprise other host species for BCTV in addition to sugar beet

3.6.1. Biological or technical factors limiting the feasibility and effectiveness of measures to prevent the entry, establishment and spread of the pest

- BCTV entry with viruliferous *C. tenellus* insects hitchhiking on non-regulated host;
- Very wide host range;
- Asymptomatic infection in many wild hosts;
- Distribution of virus and vector in the EU not fully known;
- Presence of the vector in several southern EU member states;
- BCTV is currently only regulated for sugar beet.

3.6.2. Control methods

- Host resistance in sugar beet (Strausbaugh et al., 2008);
- Monitoring programmes for insect populations in natural environments and BCTV viruliferous insects combined with insecticide application to reduce inoculum built up with high populations of insects and to prevent crop invasion;
- Removal of natural reservoirs in close vicinity to crop production sites.

3.7. Uncertainty

The Panel identified the following knowledge gaps and uncertainties:

- Uncertainty on the absence of BCTV in the EU. It is highly unlikely that BCTV could be present but unreported in susceptible crops, in particular sugar beet, but it could potentially still be present in asymptomatically infected wild species;
- Incomplete information on the geographical range of *C. tenellus* in the EU;
- Lack of information on the efficiency of vector spread under EU climatic conditions;
- Distribution of BCTV in Turkey and possibility of transfer to the EU by natural spread of *C. tenellus*.

4. Conclusions

Overall, BCTV non-EU isolates meet all the criteria evaluated by EFSA to qualify as a Union quarantine pest and do not meet the criterion of presence in the EU to qualify as a Union RNQP (Table 9).

Table 9: The Panel's conclusions on the pest categorisation criteria defined in Regulation (EU) 2016/2031 on protective measures against pests of plants (the number of the relevant sections of the pest categorisation is shown in brackets in the first column

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	Is the identity of the pest established? **YES, BCTV is a well-characterised virus**	Is the identity of the pest established? **YES, BCTV is a well-characterised virus**	None
Absence/presence of the pest in the EU territory (Section 3.2)	Is the pest present in the EU territory? **NO**	Is the pest present in the EU territory? **NO, therefore it does not satisfy this criterion for being a RNQP**	Uncertainty on the absence of BCTV in the EU
Regulatory status (Section 3.3)	BCTV non-EU isolates are currently regulated under Directive 2000/29/EU but not in many of hosts	BCTV non-EU isolates are currently regulated under Directive 2000/29/EU but not in tomato and pepper or the very numerous wild hosts	No uncertainty
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Is the pest able to enter into, become established in, and spread within, the EU territory? **YES, entry** with viruliferous *C. tenellus* vector insects or on non-regulated host plants **YES**, establishment and spread likely in southern Member States where the vector is present	Is spread mainly via specific plants for planting, rather than via natural spread or via movement of plant products or other objects? **NO**	Uncertainty on geographic range of the vector
Potential for consequences in the EU territory (Section 3.5)	Would the pests' introduction have an economic or environmental impact on the EU territory? **YES**, BCTV has the potential to cause significant impact on major crops in at least some EU Member States where *C. tenellus* is established	Because of the negative impact of BCTV, its presence on plants for planting would have a negative impact of their intended use	Uncertainty limited, affecting more the extent of the impact than its existence
Available measures (Section 3.6)	Are there measures available to prevent the entry into, establishment within or spread of the pest within the EU such that the risk becomes mitigated? **YES**, for entry through an extension of current regulations to other host species than sugar beet	**YES,** vector control in nurseries	Uncertainty on the effectiveness of the available measures
Conclusion on pest categorisation (Section 4)	BCTV non EU isolates meet all the criteria evaluated by EFSA to qualify as Union quarantine pest	BCTV non EU isolates do not meet the presence on the territory criterion therefore they do not qualify as a Union RNQP	
Aspects of assessment to focus on/scenarios to address in future if appropriate	BCTV has the potential to cause significant damage to important crops if it were to be introduced in member states in which its vector is present. Overall, limited uncertainties affect this assessment but the pathways through BCTV could enter the EU are incompletely characterised		

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Abbreviations

BCTD	beet curly top disease
BCTIV	Beet curly top Iran virus
BCTV	Beet curly top virus
EPPO	European and Mediterranean Plant Protection Organization
EU MS	European Union Member State
FAO	Food and Agriculture Organization
IPPC	International Plant Protection Convention
PLH	EFSA Panel on Plant Health
RNQP	regulated non-quarantine pest
ssDNA	single-stranded DNA
TFEU	Treaty on the Functioning of the European Union
ToR	Terms of Reference