## SCIENTIFIC OPINION

# Scientific Opinion on the pest categorisation of *Strawberry vein banding virus*[1]

**EFSA Panel on Plant Health (PLH)**[2,3]

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## ABSTRACT

The Panel on Plant Health performed a pest categorisation of *Strawberry vein banding virus* (SVBV) for the European Union (EU) territory. *SVBV* is a well-defined virus species of the genus *Caulimovirus* for which the entire genome sequence is known and molecular detection assays are available. *SVBV* is transmitted by vegetative multiplication of infected hosts and through the activity of aphid vectors, the most efficient being *Chaetosiphon* spp. The virus is reported from all continents and is present in three EU Member States: the Czech Republic, Italy and Slovakia. The host range of *SVBV* is restricted to cultivated and wild strawberries. It is listed in Annex IAI of Directive 2000/29/EC. *SVBV* is not expected to be affected by ecoclimatic conditions wherever its hosts are present and has the potential to establish in large parts of the EU territory, and to subsequently spread through the action of its *Chaetosiphon fragaefolii* vector, which is present in many Member States. *SVBV* does not cause severe symptoms, and modern cultivars are mostly symptomless if infected with *SVBV* alone. *SVBV* can, however, contribute to more severe symptoms when it occurs in mixed infections with other strawberry viruses. Despite this, *SVBV* is considered a minor problem in strawberry production as a consequence of modern practices including the systematic use of certified planting materials and the use of short crop cycles, which have greatly reduced the impact of strawberry viruses. Overall, *SVBV* does not have the potential to be a quarantine pest as, given current agricultural practices, it does not fulfil the pest categorisation criteria defined in the International Standards for Phytosanitary Measures No 11 of having a severe impact. However, *SVBV* has the potential to be a regulated non-quarantine pest because it fulfils all pest categorisation criteria defined in the International Standards for Phytosanitary Measures No 21.



## KEY WORDS

*Strawberry vein banding virus*, *Caulimovirus*, *Chaetosiphon fragaefolii*, pest categorisation, quarantine pest, regulated non-quarantine pest

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[1] On request from the European Commission, Question No EFSA-Q-2014-00286, adopted on 2 July 2014.

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## BACKGROUND AS PROVIDED BY THE EUROPEAN COMMISSION

The current European Union plant health regime is established by Council Directive 2000/29/EC 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, 10.7.2000, p. 1).
The Directive lays down, amongst others, the technical phytosanitary provisions to be met by plants and plant products 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, the list of harmful organisms whose introduction into or spread within the Union is prohibited and the control measures to be carried out at the outer border of the Union on arrival of plants and plant products.
The Commission is currently carrying out a revision of the regulatory status of organisms listed in the Annexes of Directive 2000/29/EC. This revision targets mainly organisms which are already locally present in the EU territory and that in many cases are regulated in the EU since a long time. Therefore it is considered to be appropriate to evaluate whether these organisms still deserve to remain regulated under Council Directive 2000/29/EC, or whether, if appropriate, they should be regulated in the context of the marketing of plant propagation material, or be deregulated. The revision of the regulatory status of these organisms is also in line with the outcome of the recent evaluation of the EU Plant Health Regime, which called for a modernisation of the system through more focus on prevention and better risk targeting (prioritisation).

In order to carry out this evaluation, a recent pest risk analysis is needed which takes into account the latest scientific and technical knowledge on these organisms, including data on their agronomic and environmental impact, as well as their present distribution in the EU territory. In this context, EFSA has already been asked to prepare risk assessments for some organisms listed in Annex IIAII. The current request concerns 23 additional organisms listed in Annex II, Part A, Section II as well as five organisms listed in Annex I, Part A, Section I, one listed in Annex I, Part A, Section II and nine organisms listed in Annex II, Part A, Section I of Council Directive 2000/29/EC. The organisms in question are the following:

Organisms listed in Annex II, Part A, Section II:

- *Ditylenchus destructor* Thome
- *Circulifer haematoceps*
- *Circulifer tenellus*
- *Helicoverpa armigera* (Hübner)
- *Radopholus similis* (Cobb) Thome (could be addressed together with the HAI
- organism *Radopholus citrophilus* Huettel Dickson and Kaplan)
- *Paysandisia archon* (Burmeister)
- *Clavibacter michiganensis* spp. *insidiosus* (McCulloch) Davis *et al.*
- *Erwinia amylovora* (Burr.) Winsl. *et al.* (also listed in Annex IIB)
- *Pseudomonas syringae* pv. *persicae* (Prunier *et al.*) Young *et al.*
- *Xanthomonas campestris* pv. *phaseoli* (Smith) Dye
- *Xanthomonas campestris* pv. *pruni* (Smith) Dye
- *Xylophilus ampelinus* (Panagopoulos) Willems *et al.*
- *Ceratocystis fimbriata* f. sp. *platani* Walter (also listed in Annex IIB)
- *Cryphonectria parasitica* (Murrill) Barr (also listed in Annex IIB)
- *Phoma tracheiphila* (Petri) Kanchaveli and Gikashvili
- *Verticillium albo-atrum* Reinke and Berthold
- *Verticillium dahliae* Klebahn
- *Beet leaf curl virus*
- *Citrus tristeza virus* (European isolates) (also listed in Annex IIB)
- Grapevine flavescence dorée MLO (also listed in Annex IIB)
- Potato stolbur mycoplasma
- *Spiroplasma citri* Saglio *et al.*
- *Tomato yellow leaf curl virus*

Organisms listed in Annex I, Part A, Section I:

- *Rhagoletis cingulata* (Loew)
- *Rhagoletis ribicola* Doane
- *Strawberry vein banding virus*
- Strawberry latent C virus
- Elm phloem necrosis mycoplasm

Organisms listed in Annex I, Part A, Section II:

- *Spodoptera littoralis* (Boisd.)

Organisms listed in Annex II, Part A, Section I:

- *Aculops fuchsiae* Keifer
- *Aonidiella citrina* Coquillet
- *Prunus necrotic ringspot virus*
- *Cherry leafroll virus*
- *Radopholus citrophilus* Huettel Dickson and Kaplan (could be addressed together with IIAII organism *Radopholus similis* (Cobb) Thome)
- *Scirtothrips dorsalis* Hendel
- *Atropellis* spp.
- *Eotetranychus lewisi* McGregor
- *Diaporthe vaccinii* Shaer.

## TERMS OF REFERENCE AS PROVIDED BY THE EUROPEAN COMMISSION

EFSA is requested, pursuant to Article 29(1) and Article 22(5) of Regulation (EC) No 178/2002, to provide a pest risk assessment of *Ditylenchus destructor* Thome, *Circulifer haematoceps, Circulifer tenellus, Helicoverpa armigera* (Hübner), *Radopholus similis* (Cobb) Thome, *Paysandisia archon* (Burmeister), *Clavibacter michiganensis* spp. *insidiosus* (McCulloch) Davis *et al, Erwinia amylovora* (Burr.) Winsl. *et al, Pseudomonas syringae pv. persicae* (Prunier *et al.)* Young *et al. Xanthomonas campestris* pv. *phaseoli* (Smith) Dye, *Xanthomonas campestris* pv. *pruni* (Smith) Dye, *Xyîophilus ampelinus* (Panagopoulos) Willems *et al, Ceratocystis fimbriata* f. sp. *platani* Walter, *Cryphonectria parasitica* (Murrill) Barr, *Phoma tracheiphila* (Petri) Kanchaveli and Gikashvili, *Verticillium alboatrum* Reinke and Berthold, *Verticillium dahliae* Klebahn, *Beet leaf curl virus, Citrus tristeza virus* (European isolates), Grapevine flavescence dorée MLO, Potato stolbur mycoplasma, *Spiroplasma citri* Saglio *et al, Tomato yellow leaf curl virus, Rhagoletis cingulata* (Loew), *Rhagoletis ribicola* Doane, *Strawberry vein banding virus*, Strawberry latent C virus, Elm phloem necrosis mycoplasma, *Spodoptera littoralis* (Boisd.), *Aculops fuchsiae* Keifer, *Aonidiella citrina* Coquillet, *Prunus necrotic ringspot virus, Cherry leafroll virus, Radopholus citrophilus* Huettel Dickson and Kaplan (to address with the IIAII *Radopholus similis* (Cobb) Thome), *Scirtothrips dorsalis* Hendel, *Atropellis* spp., *Eotetranychus lewisi* McGregor *md Diaporthe vaccinii* Shaer., for the EU territory.

In line with the experience gained with the previous two batches of pest risk assessments of organisms listed in Annex II, Part A, Section II, requested to EFSA, and in order to further streamline the preparation of risk assessments for regulated pests, the work should be split in two stages, each with a specific output. EFSA is requested to prepare and deliver first a pest categorisation for each of these 38 regulated pests (step 1). Upon receipt and analysis of this output, the Commission will inform EFSA for which organisms it is necessary to complete the pest risk assessment, to identify risk reduction options and to provide an assessment of the effectiveness of current EU phytosanitary requirements (step 2). *Clavibacter michiganensis* spp. *michiganensis* (Smith) Davis *et al.* and *Xanthomonas campestris* pv. *vesicatoria* (Doidge) Dye, from the second batch of risk assessment requests for Annex IIAII organisms requested to EFSA (ARES(2012)880155), could be used as pilot cases for this approach, given that the working group for the preparation of their pest risk assessments has been constituted and it is currently dealing with the step 1 "pest categorisation". This proposed modification of previous request would allow a rapid delivery by EFSA by May 2014 of the first two outputs for step 1 "pest categorisation", that could be used as pilot case for this request and obtain a prompt feedback on its fitness for purpose from the risk manager's point of view.

As indicated in previous requests of risk assessments for regulated pests, in order to target its level of detail to the needs of the risk manager, and thereby to rationalise the resources used for their preparation and to speed up their delivery, for the preparation of the pest categorisations EFSA is requested, in order to define the potential for establishment, spread and impact in the risk assessment area, to concentrate in particular on the analysis of the present distribution of the organism in comparison with the distribution of the main hosts and on the analysis of the observed impacts of the organism in the risk assessment area.

# ASSESSMENT

## 1. Introduction

### 1.1. Purpose

This document presents a pest categorisation prepared by the EFSA Scientific Panel on Plant Health (hereinafter referred to as the Panel) for the species *Strawberry vein banding virus* (SVBV) in response to a request from the European Commission.

### 1.2. Scope

The pest risk assessment area is the territory of the European Union (hereinafter referred to as the EU) with 28 Member States (hereinafter referred to as EU MSs), restricted to the area of application of Council Directive 2000/29/EC, which excludes Ceuta and Melilla, the Canary Islands and the French overseas departments.

## 2. Methodology and data

### 2.1. Methodology

The Panel performed the pest categorisation for SVBV following guiding principles and steps presented in the EFSA Guidance on a harmonised framework for pest risk assessment (EFSA PLH Panel, 2010) and as defined in the International Standard for Phytosanitary Measures (ISPM) No 11 (FAO, 2013) and ISPM No 21 (FAO, 2004).

In accordance with the harmonised framework for pest risk assessment in the EU (EFSA PLH Panel, 2010), this work was initiated as result of the review or revision of phytosanitary policies and priorities. As explained in the background of the European Commission request, the objective of this mandate is to provide updated scientific advice to European risk managers to take into consideration when evaluating whether those organisms listed in the Annexes of Council Directive 2000/29/EC deserve to remain regulated under Council Directive 2000/29/EC, or whether they should be regulated in the context of the marketing of plant propagation material, or should be deregulated. Therefore, to facilitate the decision-making process, in the conclusions of the pest categorisation, the Panel addresses explicitly each criterion for a quarantine pest in accordance with ISPM 11 (FAO, 2013) but also for a regulated non-quarantine pest (RNQP) in accordance with ISPM 21 (FAO, 2004) 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.

The table 1 below presents the ISPM 11 (FAO, 2013) and ISPM 21 (FAO, 2004) pest categorisation criteria on which the Panel bases its conclusions. 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[4]); 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, in agreement with EFSA guidance on a harmonised framework for pest risk assessment (EFSA PLH Panel, 2010).

[4] 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.

**Table 1:** ISPM 11 (FAO, 2013) and ISPM 21 (FAO, 2004) pest categorisation criteria under evaluation.

| Pest categorisation criteria | ISPM 11 for being a potential quarantine pest | ISPM 21 for being a potential regulated non-quarantine pest |
|---|---|---|
| **Identity of the pest** | The identity of the pest should be clearly defined to ensure that the assessment is being performed on a distinct organism, and that biological and other information used in the assessment is relevant to the organism in question. If this is not possible because the causal agent of particular symptoms has not yet been fully identified, then it should have been shown to produce consistent symptoms and to be transmissible | The identity of the pest is clearly defined |
| **Presence (ISPM 11) or absence (ISPM 21) in the PRA area** | The pest should be **absent from all or a defined part of the PRA area** | The pest is **present** in the PRA area |
| **Regulatory status** | If the pest is present but not widely distributed in the PRA area, it should be under official control or expected to be under official control in the near future | The pest is under official control (or being considered for official control) in the PRA area with respect to the specified plants for planting |
| **Potential for establishment and spread in the PRA area** | The PRA area should have ecological/climatic conditions including those in protected conditions suitable for the establishment and spread of the pest and, where relevant, host species (or near relatives), alternate hosts and vectors should be present in the PRA area | – |
| **Association of the pest with the plants for planting and the effect on their intended use** | – | Plants for planting are a pathway for introduction and spread of this pest |
| **Potential for consequences (including environmental consequences) in the PRA area** | There should be clear indications that the pest is likely to have an unacceptable economic impact (including environmental impact) in the PRA area | – |
| **Indication of impact(s) of the pest on the intended use of the plants for planting** | – | The pest may cause severe economic impact on the intended use of the plants for planting |
| **Conclusion** | If it has been determined that the pest has the potential to be a quarantine pest, the PRA process should continue. If a pest does not fulfil all of the criteria for a quarantine pest, the PRA process for that pest may stop. In the absence of sufficient information, the uncertainties should be identified and the PRA process should continue | If a pest does not fulfil all the criteria for an regulated non-quarantine pest, the PRA process may stop |

In addition, in order to reply to the specific questions listed in the terms of reference, three issues are specifically discussed only for pests already present in the EU: the analysis of the present EU distribution of the organism in comparison with the EU distribution of the main hosts; the analysis of the observed impacts of the organism in the EU; and the pest control and cultural measures currently implemented in the EU.

The Panel will not indicate in its conclusions of the pest categorisation whether the pest risk assessment process should be continued, as it is clearly stated in the terms of reference that, at the end of the pest categorisation, the European Commission will indicate EFSA if further risk assessment work is required for the pest under scrutiny following its analysis of the Panel's scientific opinion.

## 2.2. Data

### 2.2.1. Literature search

A literature search on SVBV was conducted at the beginning of the mandate. The search was conducted for the scientific name of the pest together with the most frequently used common names on the ISI Web of Knowledge database. Further references and information were obtained from experts, from citations within the references as well as from grey literature.

### 2.2.2. Data collection

To complement the information concerning the current situation of the pest provided by the literature and online databases on pest distribution, damage and management, the PLH Panel sent a short questionnaire, on the current situation at country level based on the information available in the European and Mediterranean Plant Protection Organization Plant Quarantine Retrieval System (EPPO PQR), to the National Plant Protection Organisation (NPPO) contacts of all the EU MSs. A summary of the pest status based on EPPO PQR and MSs replies is presented in Table 2.

Information on the distribution of the main host plants was obtained from the EUROSTAT database.

## 3. Pest categorisation

## 3.1. Identity and biology of *Strawberry vein banding virus*

### 3.1.1. Taxonomy

SVBV is a well-characterised virus and a member of the genus *Caulimovirus* within the family *Caulimovridae* (EPPO, 1997; Geering and Hull, 2012). Caulimoviruses have double-stranded DNA genomes of approximately 8 kbp which are encapsidated in icosahedral particles of 45 nm diameter. The genome of SVBV is 7.8 kbp in size and comprises six open reading frames (ORFs) and large and small intergenic regions in a genome arrangement typical of members of the genus (Petrzik et al., 1998). Virus replication occurs in the nucleus: the dsDNA genome is shuttled into the nucleus and transcribed into RNA, which then serves as template for reverse transcription into progeny DNA molecules. The same RNA also serves as a polycistronic mRNA for expression of the viral genes. In *Caulimovirus*-infected plants, typical electron-dense cytoplasmic inclusion bodies are found. Such inclusions have been observed in vascular parenchyma and mesophyll cells of SVBV-infected strawberry plants (Kitajima et al., 1973). By using infectious virus DNA clones of SVBV, symptoms of the vein banding disease have been reproduced in strawberry, demonstrating that the strawberry vein banding disease is caused by this single virus (Mahmoudpour, 2003).

### 3.1.2. Biology of *Strawberry vein banding virus*

SVBV causes systemic infections in strawberry and is thus transmitted through vegetative multiplication of infected host plants. In addition, SVBV is transmitted by *Chaetosiphon* spp. aphids, (Frazier, 1955), which transmit the virus in a semipersistent manner. Other aphid species, e.g. *C. jacobi*, *Macrosiphum pelargonii*, *Aphis rubifolii* (Thomas) and *Myzus persicae*, can also transmit the virus (Converse, 1987) but with a much lower transmission efficiency and may therefore only play

a significant role in virus spread when high population numbers are reached. The most significant vector for SVBV transmission and spread in the field is *C. fragaefolii* (Converse, 1987). Thus in the absence of insect vectors, notably of *Chaetosiphon* spp. virus-free planting materials can provide excellent control of SVBV (Martin and Tzanetakis, 2006).

SVBV can be transmitted by grafting to indicator plants, but the virus is not transmitted by mechanical inoculation (Converse, 1987).

### 3.1.3. Intraspecific diversity

The early literature indicated some variability in SVBV symptomatology, with three main types of symptoms recognised: (i) vein banding, (ii) leaf curl and (iii) necrosis (summarised in Converse, 1987). It is, however, unclear whether this phenotypic diversity reflects virus isolate variability or the presence of other viruses in mixed infection. A low molecular diversity of geographically distant isolates from North America and Europe has been found (Mraz et al., 1998; Vaskova et al., 2006), indicating that the European isolates probably originated from a common source and may have been introduced from North America. However, a more distant sequence relationship was found in the coat protein of a Chinese isolate of the virus (Chang et al., 2007).

### 3.1.4. Detection and identification of *Strawberry vein banding virus*

Modern cultivated strawberry varieties do not show prominent symptoms when infected by SVBV. More pronounced symptoms are expressed only if other viruses, such as strawberry crinkle virus (SCV) or strawberry mottle virus (SMoV), are present (Converse, 1987). Biological indexing by grafting on *Fragaria vesca* (clones 'UC4 and UC5') and *F. virginiana* (clones 'UC10' and 'UC11') (Frazier, 1974) is generally used as a sensitive method to analyse the presence of viruses in strawberry, however, symptom development in general does not provide information on the identity of the virus(es) present or able to resolve mixed virus infections. SVBV can be detected by molecular tests based on PCR or NASBA (Thompson et al., 2003; Vaskova et al., 2004, 2006; Chang et al., 2007). SVBV tests are included in PCR assays that are targeting all known viruses of strawberry, with the exception of Strawberry latent C virus (SLCV) (Martin and Tzanetakis, 2013). SVBV can be unequivocally identified in such tests.

## 3.2. Current distribution of *Strawberry vein banding virus*

### 3.2.1. Global distribution of *Strawberry vein banding virus*

SVBV is reported on cultivated strawberries from all five continents (Figure 1). It is known from North and South America, Australia, Japan and China, and is reported from three EU MSs (Table 2; the EPPO PQR report from Hungary is not considered reliable by the Hungarian NPPO). In the USA, SVBV was detected in all production areas (Martin and Tzanetakis, 2013; Tzanetakis and Martin, 2013) in declining strawberries and in non-symptomatic plants, although it is not considered to be one of the high-risk strawberry viruses identified by Martin and Tzanetakis in their 2013 study.

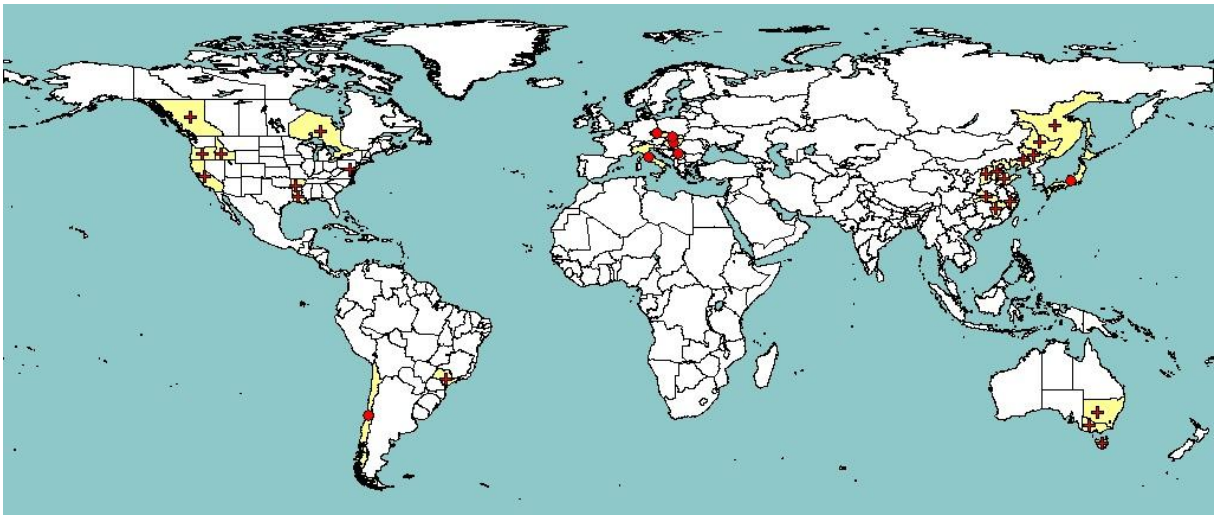

**Figure 1:** Global distribution map for *Strawberry vein banding virus* (extracted from EPPO PQR, version 5.3.1, accessed in June 2014). Red circles represent pest presence as national records and red crosses represent pest presence as subnational records (note that this figure combines information from different dates, some of which could be out of date)

### 3.2.2. Distribution in the EU of *Strawberry vein banding virus*

Owing to the absence of recent systematic surveys, data for virus presence/absence in many European countries are out of date and anecdotal. Recent findings are, however, reported from the Czech Republic, Slovakia (Mraz et al., 1997, 1998) and, most recently, Italy (Ratti et al., 2009).

There are no interception records for SVBV in the EUROPHYT database.

**Table 2:** Current distribution of Strawberry latent C virus in the risk assessment area, based on answers received from the 28 Member States, Iceland and Norway.

| **Member State** | ***Strawberry vein banding virus*** |
|---|---|
| Austria | **Absent**, no pest records |
| Belgium | **Absent**, no pest records |
| Bulgaria | **Absent** |
| Croatia | **Absent**, no pest records |
| Cyprus | – |
| Czech Republic | **Present**, few occurrences |
| Denmark | **Absent**, known not to occur |
| Estonia | No information is available |
| Finland | **Absent**, no pest records |
| France [(a)] | – |
| Germany | **Absent**, invalid record |
| Greece [(a)] | – |
| Hungary | **Absent**, pest records unreliable and now no pest records |
| Ireland | **Absent**, no pest records |
| Italy | **Present,** restricted distribution; widespread on old varieties |
| Latvia [(a)] | – |

| Member State | *Strawberry vein banding virus* |
|---|---|
| Lithuania [(a)] | – |
| Luxembourg [(a)] | – |
| Malta | **Absent**, no pest records |
| Netherlands | **Absent**, no pest records |
| Poland | **Absent** |
| Portugal | **Absent**, no pest records |
| Romania [(a)] | – |
| Slovakia | **Present**, at low prevalence |
| Slovenia | **Absent**, no pest records |
| Spain | **Absent** |
| Sweden | **Absent**, not known to occur |
| United Kingdom | **Absent** |
| Iceland [(a)] | – |
| Norway [(a)] | – |

(a): When no information was made available to EFSA, the pest status in the EPPO PQR (2012) was used.
–, No information available; EPPO PQR, European and Mediterranean Plant Protection Organization Plant Quarantine Data Retrieval system; NPPO, National Plant Protection Organisation.

### 3.2.3. Vectors and their distribution in the EU

*C. fragaefolii* is presumably of North American origin, but now occurs almost everywhere in the world where strawberries are cultivated (Blackman and Eastop, 2000). This wide distribution is confirmed, with some discrepancies, by several sources. According to CABI Crop Protection Compendium (CPC), it is present in Asia (Israel, Japan, the Philippines), North America (Canada, the USA), South America (Argentina, Bolivia), non-EU Europe (Macedonia, Serbia and Montenegro, Switzerland) and Oceania (Australia, New Zealand).

According to *Fauna Europaea*, it is present in the following non-EU European countries: Macedonia, Yugoslavia (Serbia, Kosovo, Voivodina, Montenegro). Outside Europe it is present in the Afro-tropical, the Australian, the East Palearctic, the Nearctic and the Neotropical regions, as well as in North Africa and the Near East. In addition, *C. fragaefolii* is reported to be present in 15 EU MSs (Table 3).

**Table 3:** Current distribution of the strawberry aphid *Chaetosiphon fragaefolii* in the risk assessment area, based on the Plantwise database, the CABI Crop Protection Compendium (CPC), *Fauna Europaea* (data retrieved in January 2014) and Holman (2009)

| Member State | Plantwise | CABI CPC | *Fauna Europaea* | Holman (2009) |
|---|---|---|---|---|
| Austria | | | Present | Present |
| Belgium | Present | Present, no further details | Present | |
| Bulgaria | Present | Widespread | Present | Present |
| Croatia | | | | |
| Cyprus | | | | |
| Czech Republic | | | | Present |
| Denmark | | | | |

| Member State | Plantwise | CABI CPC | *Fauna Europaea* | Holman (2009) |
|---|---|---|---|---|
| Estonia | | | | |
| Finland | | | | |
| France | Present | Present, no further details | Present | Present |
| Germany | Present | Widespread | Present | Present |
| Greece | | | | |
| Hungary | | | Present | Present |
| Ireland | | | Present | Present |
| Italy | Present | Present, no further details | Present | Present |
| Latvia | | | Present | |
| Lithuania | | | | |
| Luxembourg | | | | |
| Malta | | | | |
| Netherlands | | | Present | |
| Poland | | | | |
| Portugal | Present | Restricted distribution | Present | Present |
| Romania | | | Present | |
| Slovakia | | | | |
| Slovenia | | | | |
| Spain | Present | Restricted distribution | Present | Present |
| Sweden | | | | |
| United Kingdom | Present | Widespread | Present | Present |
| Iceland | | | | |
| Norway | | | Present | Present |

Much less information is available for the other potential vector species. *C. jacobi* is present in western USA (Blackman and Eastop, 2000), while *C. minor* is present in eastern North America, Venezuela, Japan, Korea and the Philippines (Blackman and Eastop, 2000).

### 3.3. Regulatory status

#### 3.3.1. Legislation addressing *Strawberry vein banding virus* (Directive 2000/29/EC)

SVBV is a regulated harmful organism in the EU and is listed in Council Directive 2000/29/EC in the following sections:

**Table 4:** *Strawberry vein banding virus* in Council Directive 2000/29/EC.

| | |
|---|---|
| **Annex I, Part A** | Harmful organisms whose introduction into, and spread within, all Member States shall be banned |
| **Section I** | Harmful organisms not known to occur in any part of the Community and relevant for the entire Community |
| **(d)** | Viruses and virus-like organisms |
| **5.** | Viruses and virus-like organisms of … *Fragaria*…, such as: |
| **(1)** | Strawberry vein banding virus |

### 3.3.2. Legislation addressing hosts of *Strawberry vein banding virus* (Directive 2000/29/EC)

**Table 5:** *Strawberry vein banding virus* host plants in 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 | |
| **18** | Plants of [...] *Fragaria* L., intended for planting, other than seeds | Without prejudice to the prohibitions applicable to the plants listed in Annex III A (9), where appropriate, non-European countries, other than Mediterranean countries, Australia, New Zealand, Canada, the continental states of the USA |
| **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 | |
| **21.1** | Plants of *Fragaria* L. intended for planting, other than seeds, originating in countries where the relevant harmful organisms are known to occur<br>The relevant harmful organisms are:<br>Strawberry vein banding virus | Without prejudice to the provisions applicable to the plants listed in Annex III(A)(18), and Annex IV(A)(I)(19.2), official statement that:<br>(a) the plants, other than those raised from seed, have been:<br>— either officially certified under a certification scheme requiring them to be derived in direct line from material which has been maintained under appropriate conditions and subjected to official testing for at least the relevant harmful organisms using appropriate indicators or equivalent methods and has been found free, in these tests, from those harmful organisms,<br>or<br>— derived in direct line from material which is maintained under appropriate conditions and has been subjected, within the last three complete cycles of vegetation, at least once, to official testing for at least the relevant harmful organisms using appropriate indicators or equivalent methods and has been found free, in these tests, from those harmful organisms,<br>(b) no symptoms of diseases caused by the relevant harmful organisms have been observed on plants at the place of production, or on susceptible plants in its immediate vicinity, 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 before being permitted to enter the Community | |
| **Part A** | Plants, plant products and other objects originating in the Community | |
| **Section 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 | |
| **2** | Plants, plant products and other objects produced by producers whose production and sale is authorised to persons professionally engaged in plant production, other than those plants, plant products and other objects which are prepared and ready for sale to the final consumer, and for which it is ensured by the responsible official bodies of the Member States, that the production | |

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| | thereof is clearly separate from that of other products. |
| **2.1** | Plants intended for planting other than seeds of the genera [...] *Fragaria* L.,…; |

### 3.3.3. Legislation addressing the hosts in the Marketing directives

*Fragaria*, the host of SVBV, is regulated also under Marketing directives of the EU.

**Table 6:** *Strawberry vein banding virus* host plants in EU Marketing Directives.

| Plant propagation material | Marketing directive | Comment |
|---|---|---|
| *Fragaria L.;* | COUNCIL DIRECTIVE 2008/90/EC of 29 September 2008 on the marketing of fruit plant propagating material and fruit plants intended for fruit production (OJ L 267, 08/10/2008, p. 8–22) | Official inspections check if the material meets criteria for:<br>Identity;<br>Quality;<br>Plant health;<br>The rules also cover batch separation & marking, identification of varieties and labelling. |

## 3.4. Elements to assess the potential for establishment and spread in the EU

### 3.4.1. Host range

SVBV has a restricted host range, and strawberries (*Fragaria* spp.) are the only known natural host. This includes wild *Fragaria* species such as *F. cuneifolia*, *F. chiloensis* and *F. vesca* (Frazier, 1955).

### 3.4.2. EU distribution of main host plants

Strawberry plants are widely grown both in the field and under protected cultivation in a wide range of EU MSs (Table 7). In addition, the wild strawberry (*Fragaria vesca*), which is susceptible, has a widespread distribution in the EU (Table 7).

**Table 7:** Area of strawberry production in EU-28 in 2012 according to the Eurostat database (crops products—annual data [apro_cpp_crop] extracted on 23 January 2014), and the distribution of *Fragaria vesca* in the EU-28 according to *Flora Europaea*

| Member State | Area of strawberry production (ha) | Strawberries under glass or high accessible cover (ha) | Presence of *Fragaria vesca* |
|---|---|---|---|
| Austria | 1 300 | 0 | + |
| Belgium | 1 600 | – | + |
| Bulgaria | 700 | 0 | + |
| Croatia | 200 | 100 | + [(a)] |
| Cyprus | 0 | – | |
| Czech Republic | 500 | – | + |
| Denmark | 1 100 | – | + |
| Estonia | 400 | 0 | + |
| Finland | 3 400 | 0 | + |
| France | 3 200 | 1 600 | + |
| Germany | 15 000 | 400 | + |
| Greece | 1 100 | 1 100 | + |
| Hungary | 600 | – | + |
| Ireland | 500 | 0 | + |
| Italy | 2 000[(b)] | 2 700[(b)] | + |
| Latvia | 300 | 0 | + |
| Lithuania | 1 000 | 0 | + |

| Member State | Area of strawberry production (ha) | Strawberries under glass or high accessible cover (ha) | Presence of *Fragaria vesca* |
|---|---|---|---|
| Luxembourg | 0 | – | |
| Malta | 0 | – | + |
| Netherlands | 1 800 | 300 | + |
| Poland | 50 600 | 100 | + |
| Portugal | 500 | 100 | + |
| Romania | 2 300 | 0 | + |
| Slovakia | 200 | – | + |
| Slovenia | 0 | 0 | + (a) |
| Spain | 7 600 | 7 400 | + |
| Sweden | 2 200 | 0 | + |
| United Kingdom | 5 000 | 0 | + |
| EU-28 | 103 000 | – | |

(a): Presence interpreted from the presence in Yugoslavia.
(b): Inconsistent figures as total strawberry area is lower than glasshouse area
–, No data available in Eurostat.

### 3.4.3. Analysis of the potential distribution of *Strawberry vein banding virus* in the EU

As for other viruses, SVBV requirements are expected to be similar to those of its host plants, and hence SVBV is not considered to be affected by local ecoclimatic conditions as long as these are suitable for the development of its strawberry host plants. Given the wide distribution of strawberry crops and of wild strawberry (*F. vesca*) populations in Europe, it can be considered that SVBV can establish over large parts of the EU territory.

### 3.4.4. Spread capacity

SVBV is spread by its aphid vectors and through the movement of strawberry plants for planting. The most efficient aphid vector, *C. fragaefolii*, is present in the EU, and vector-mediated spread is unlikely to be affected by climatic conditions.

However, the existence of efficient and widely adopted voluntary certification systems for strawberry constitutes a very strong limitation to the spread of SVBV and of other strawberry viruses through the plants for planting pathway (EFSA PLH Panel, 2013, 2014a, b), limiting opportunities for virus spread in the field by vector aphids. In areas where *Chaetosiphon* spp. are not found, the use of virus-free planting stock usually provides excellent control of this virus (Martin and Tzanetakis, 2013; Tzanetakis and Martin, 2013).

## 3.5. Elements to assess the potential for consequences in the EU

### 3.5.1. Potential effects of *Strawberry vein banding virus*

SVBV is the causal agent of the vein banding disease of strawberry (Frazier, 1955; Kitajima et al., 1973), which is expressed as a mild chlorosis along the leaf veins (vein banding). This has been proven by the use of infectious SVBV DNA clones (Mahmoudpour, 2003). The impact of SVBV is considered low because, in most cultivars grown currently, SVBV infections remain symptomless (Tzanetakis and Martin, 2013). Leaf curl symptoms can also be associated with SVBV infection, but it is unclear whether this second type of symptoms is caused by particular SVBV isolates or by mixed infection(s) with other strawberry viruses (Converse, 1987). SVBV was found in 2007 and 2008 in severely diseased strawberry plants in open production fields in northern Italy (Ratti et al., 2009). Plants exhibited poor growth, leaf chlorosis, decline and reduced fruit production. However, in this work only the presence of SVBV was examined, and the potential presence of additional viruses, which could explain the severe symptoms, was not analysed. SVBV has been reported to reduce runner production, yield and fruit quality in the USA in commercial fields of the strawberry varieties 'Marshall', 'Tioga' and more recently 'Carlsbad'. Symptoms also developed in SVBV-infected 'Gaviota', 'Cuesta', 'Pacifica' and 'Selva' (Converse, 1987). However, SVBV is generally considered

a minor problem in commercial production of strawberry (Converse, 1987), and more severe symptoms are generally observed only in situations of mixed infection.

No environmental impact from SVBV has been identified.

### 3.5.2. Observed impact of *Strawberry vein banding virus* in the EU

Although recent reports have confirmed SVBV presence in three EU Member States, the impact of SVBV can be considered marginal because of its limited distribution and because, in most cultivars grown currently, SVBV infections remain symptomless (Tzanetakis and Martin, 2013).

## 3.6. Currently applied control methods in the EU

The current practices followed in modern strawberry production, including the use of certified planting materials, the use of short cropping cycles, etc., very significantly reduce the risk and impact of SVBV. In addition, modern strawberry varieties generally do not express symptoms in the event of SVBV infection. Overall, these strategies provide an efficient way to control SVBV incidence and impact.

## 3.7. Uncertainty

SVBV is considered a minor problem in strawberry production (Converse, 1987; Martin and Tzanetakis, 2013; Tzanetakis and Martin, 2013). Uncertainties concern, in particular, the contribution of SVBV to more severe strawberry disease phenotypes (Converse, 1987; Ratti et al., 2009). Because of the complexity of the interrelation—symptoms in cultivated strawberry, symptoms on indexing cultivars and molecular assays—some uncertainties on the impact of SVBV remain.

# CONCLUSIONS

The Panel summarises in the table below its conclusions on the key elements addressed in this scientific opinion in consideration of the pest categorisation criteria defined in ISPM 11 and ISPM 21 and of the additional questions formulated in the terms of reference.

**Table 8:** Panel's conclusions on the pest categorisation criteria defined in the International standards for Phytosanitary measures No 11 and No 21 and on the additional questions formulated in the terms of reference.

| Criterion of pest categorisation | Panel's conclusions against ISPM 11 criterion Yes/No | Panel's conclusions against ISPM 21 criterion Yes/No | List of main uncertainties |
|---|---|---|---|
| **Identity of the pest** | *Is the identity of the pest clearly defined? Do clearly discriminative detection methods exist for the pest?*<br>**Yes**, SVBV satisfies this criterion.<br>It is a well-characterised virus and its taxonomy is clear. Reliable detection and identification tests are available. | | Some unncertainties exist on the extent of SVBV variability. |
| **Absence (ISPM 11) or presence (ISPM 21) of the pest in the PRA area** | *Is the pest absent from all or a defined part of the PRA area?*<br>**Yes**, SVBV satisfies this criterion.<br>SVBV is present only in a limited part of the PRA area (three Member States). | *Is the pest present in the PRA area?*<br>**Yes**, SVBV satisfies this criterion.<br>SVBV is present in the PRA area. | There is uncertainty on the extent of SVBV presence in the EU because of the limited number of surveys and frequent lack of conspicuous symptoms. |

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| **Regulatory status** | *In consideration that the pest under scrutiny is already regulated just mention in which annexes of 2000/29/EC and the marketing directives the pest and associated hosts are listed without further analysis. (the RM will have to consider the relevance of the regulation against official control)*<br><br>SVBV is listed in Annex IAI of Directive 2000/29EC. | | – |
| **Potential establishment and spread** | *Does the PRA area have ecological conditions (including climate and those in protected conditions) suitable for the establishment and spread of the pest?*<br><br>*And, where relevant, are host species (or near relatives), alternate hosts and vectors present in the PRA area?*<br><br>**Yes**, SVBV satisfies this criterion. Strawberry and wild strawberry are widely present in the EU and SVBV is unlikely to be affected by EU ecoclimatic conditions.<br>The C. *fragaefolii* vector is widely present in the EU and SVBV can efficiently spread through movement of infected plants for planting. | *Are plants for planting a pathway for introduction and spread of the pest?*<br><br>**Yes**, SVBV satisfies this criterion.<br>SVBV is graft-transmissible and transmitted by vegetative propagation of infected host plants. | Only limited uncertainties because SVBV is already established. |
| **Potential for consequences in the PRA area** | *What are the potential for consequences in the PRA area?*<br><br>*Provide a summary of impact in terms of yield and quality losses and environmental consequences.*<br><br>SVBV is considered a minor problem in strawberry cultivation. It however has the potential to cause symptoms in some strawberry varieties or when in mixed infection with other strawberry viruses. No environmental impact from SVBV is identified. | *If applicable is there indication of impact(s) of the pest as a result of the intended use of the plants for planting?*<br><br>SVBV is considered a minor problem in strawberry cultivation. It however has the potential to cause symptoms in some strawberry varieties or when in mixed infection with other strawberry viruses.<br>No environmental impact from SVBV is identified. | Uncertainties mostly concern the impact of SVBV in modern strawberry varieties. |
| **Conclusion on pest categorisation** | **SVBV does not have the potential to be a quarantine pest** as, given the current agricultural practices, it does not fulfil the ISPM 11 criterion of having a severe impact. | **SVBV has the potential to be a regulated non quarantine pest** as it fulfils all ISPM 21 criteria, including the ability to have impact when associated with plants for planting. | The overall uncertainty is limited. |

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| **Conclusion on specific ToR questions** | *If the pest is already present in the EU, provide a brief summary of*<br><br>*the analysis of the present distribution of the organism in comparison with the distribution of the main hosts, and the distribution of* | Uncertainties mostly concern the distribution of SVBV in the EU because |

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| | *hardiness/climate zones, indicating in particular if in the PRA area, the pest is absent from areas where host plants are present and where the ecological conditions (including climate and those in protected conditions) are suitable for its establishment,*<br><br>*and*<br><br>*the analysis of the observed impacts of the organism in the risk assessment area.*<br><br>SVBV is present in EU, but with a very limited distribution, restricted to certain areas in the Czech Republic, Slovakia and Italy.<br>It has the potential to establish wherever strawberries are grown in the EU and to spread as a consequence of the activity of its widespread vectors.<br>Given the limited distribution of SVBV, the existence of an efficient voluntary strawberry certification system and the mild symptoms caused by SVBV in single infection, its observed impact is considered marginal. | of the absence of specific surveys. |

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## ABBREVIATIONS

| | |
|---|---|
| EFSA: | European Food Safety Authority |
| EPPO: | European and Mediterranean Plant Protection Organization |
| EPPO-PQR: | European and Mediterranean Plant Protection Organization Plant Quarantine Retrieval System |
| EU: | European Union |
| FAO: | Food and Agriculture Organisation |
| ISPM: | International Standard for Phytosanitary Measures |
| MS(s): | Member State(s) |
| NPPO: | National Plant Protection Organisation |
| PLH Panel: | Plant Health Panel |
| RNQP: | Regulated Non Quarantine Pest |
| SVBV: | *Strawberry vein banding virus* |