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Report of a Pest Risk Analysis for

Grapevine red blotch virus



Grapevine red blotch virus (GRBAV0) - <https://gd.eppo.int>
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This summary is based on a scientific opinion prepared by the EFSA Panel on Plant Health published in 2019, and subsequent discussions in the EPPO Panel on Phytosanitary Measures. Additional literature searches have been conducted (also using the EPPO datasheet being drafted) and relevant new information is included in this PRA report. Probability of entry, establishment, spread, and potential impact, with associated uncertainties, have been rated by the Panel on Phytosanitary Measures.

Remark: Given the very limited information available on this very recently described virus, the EFSA Panel on Plant Health considered that the development of a full PRA will not allow to resolve the uncertainties attached to their opinion until more data become available.

- Pest:** *Grapevine red blotch virus* (GRBV)
PRA area: EPPO region
Assessors: EFSA Panel on Plant Health and subsequent discussions in the EPPO Panel on Phytosanitary Measures.
Date: The EFSA opinion was published in 2019. The Panel on Phytosanitary Measures discussed the document in 2021-04 and 2021-10. EPPO Working Party on Phytosanitary Regulations and Council agreed that grapevine red blotch virus should be added to the A1 List of pests recommended for regulation as quarantine pests in 2022.

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Based on this PRA report, grapevine red blotch virus was added to the EPPO A1 List. Measures for *Vitis* plants for planting (other than seeds) are recommended.

STAGE 1: INITIATION

Reason for doing PRA:	<i>Grapevine red blotch virus</i> (GRBV) was added to the EPPO Alert List in 2015 and maintained on this list until the publication of the EFSA pest-categorization for non-EU viruses and viroids of <i>Vitis</i> L. (EFSA PLH, 2019a) which was considered sufficient to make EPPO recommendations.
Taxonomic position of pest:	Virus, <i>Geminiviridae</i> , <i>Graplobivirus</i> Synonyms: grapevine Cabernet Franc-associated virus grapevine red leaf-associated virus.

STAGE 2: PEST RISK ASSESSMENT

PROBABILITY OF INTRODUCTION

Entry

Geographical distribution: **AMERICA:**
(Source: EPPO Global Database Argentina, Canada, Mexico, USA
last consulted 2021-01-25, details **ASIA**
on distribution are available in India, South Korea
Global Database).

Major host plants:
(see EFSA opinions and EPPO
Global Database for references)

Major host: *Vitis* spp. (*Vitis vinifera* and its hybrids, as well as free living¹ plants of *Vitis* sp.)

Remark: Additional natural hosts may exist (EFSA PLH, 2019a), but no other records are currently available in the literature.

Comment on *Rubus armeniacus* host status: *Rubus armeniacus* is noted as a host in EFSA PLH (2019a). However, following a re-analysis of the literature, GRBV was excluded from the opinion on non-EU viruses of *Rubus* (EFSA PLH, 2019b) which concluded that GRBV should not be considered as a *Rubus*-infecting virus. Indeed, while *Vitis* sp. were tested positive in all four seasons for GRBV, the virus was detected only in winter and spring in *R. armeniacus* and not in the new growth in summer and fall. Tests indicated that GRBV did not replicate in *R. armeniacus* and thus the virus did not become systemic in this host (Bahder *et al.*, 2016).

Which pathway(s) is the pest likely to be introduced on:
(see EFSA opinion for references not provided in the reference section)

***Vitis* plants for planting (other than seeds).**

All the viruses considered in the EFSA opinion are efficiently transmitted by vegetative propagation material. *Spissistilus festinus* (Hemiptera, Membracidae), vector of GRBV, is polyphagous and feeds on *Vitis*, although it has not been reported to reproduce on *Vitis* (Preto *et al.*, 2018). *Vitis* plants for planting could host the virus (and/or the vector) and should be considered as being potentially the main entry pathway.

Current legislation in several EPPO countries ban the import of plants of *Vitis* other than fruits from third countries (e.g. in the EU). However, in these countries, GRBV could enter via *Vitis* propagated material through derogation for research or breeding purposes. Some EPPO countries do not prohibit the import of *Vitis* plants for planting: it is the case for Norway (Paulsen, pers. comm.) and Russia (Mironova, pers. comm.). However, Russia mainly imports *Vitis* plants for planting from pest-free countries

¹ Repeatedly, the American authors have referred to free-living vines in their publications and not as wild or escaped vines. They probably result from a cross between wild and cultivated (varieties or rootstocks) grapevine.

from Europe or Asia (e.g. Uzbekistan and Kyrgyzstan) (Mironova, pers. comm.).

Other natural hosts may exist and be unregulated.

The Panel on Phytosanitary Measures concluded that GRBV may enter EPPO territory with infected *Vitis* plants for planting, when this pathway is not prohibited or through derogation for research and breeding purposes.

Plants of non-host plants (other than seeds).

GRBV can be transmitted by vectors that may provide an entry pathway: the treehopper *S. festinus* is polyphagous and can feed and reproduce on a variety of plant species found in and around vineyards (within Asteraceae, Convolvulaceae, Fabaceae [Leguminous plants being the preferred hosts], Poaceae and Polygonaceae; Bick *et al.*, 2020; Kron & Sisteron, 2020). The vector is mainly associated with stems. Recent results suggest that this transmission is in a circulative, non-propagative mode (Flasco *et al.*, 2021). When the pathway of plants of *Vitis* is closed, viruliferous insects could enter if associated via unregulated host plants.

Remark: In addition to *S. festinus*, GRBV has been detected by multiplex PCR in other phloem-sucking insects: *Colladonus reductus* (Cicadellidae), *Osbornellus borealis* (Cicadellidae) and *Melanoliarus* sp. (Cixiidae) but there is to date no proof that these other species might be able to transmit GRBV (Cieniewicz *et al.*, 2018b). A recent unpublished report suggests that the ragweed treehopper (*Entylia carinata*) and the two-marked treehopper (*Enchenopa binotata*) might be able to transmit GRBV (Smith *et al.*, 2020). Transmission by the leafhopper *Erythroneura ziczac* had been reported but not confirmed.

The EFSA Panel on Plant Health considered that entry in association with vectors was an additional pathway, but this is associated with high uncertainty. The Panel on Phytosanitary Measures considered that such plants being traded and hosting viruliferous vectors infected from *Vitis* plants is a very unlikely event. This is therefore considered as a very unlikely pathway.

Other pathways (seeds, fruits, pollen) were considered of minor significance because of the low risk of transfer. GRBV and members of family Geminiviridae are not generally reported to be seed- or pollen-transmitted. Entry of *S. festinus* in association with fruits is considered unlikely.

Overall, GRBV is able to enter EPPO countries where *Vitis* plants for planting is not a prohibited pathway or where *Vitis* propagated material entering through derogation for research or breeding purposes is not appropriately tested for the absence of this virus.

Establishment

Plants at risk in the PRA area:

GRBV is not present in the PRA area.

Grapevine widely occurs in the EPPO region as commercial crops as well as wild plants. Details on the area of grapes production in individual EU countries are provided in the EFSA opinion.

Climatic similarity of present distribution with PRA area (or parts thereof):

Except for those affecting the host, no eco-climatic constraints exist for GRBV. Therefore, it is expected that GRBV is able to establish wherever *Vitis* plants may live.

Characteristics (other than climatic) of the PRA area that would favour establishment:

None.

Which part of the PRA area is the area of potential establishment: GRBV can establish wherever *Vitis* plants are grown.

Spread

Three mechanisms could contribute to GRBV spread.

The most important means of spread is plant for planting (except seeds):

- **Infected host plant for planting (except seed)** is a mean of spread. Unlike in the entry section, the Panel on Phytosanitary Measures considered that if the pest is introduced, outbreaks will occur and consequently the probability of GRBV associated with *Vitis* plant for planting is higher. This pathway would contribute to local and long-distance spread in the EPPO region.

Two other means of spread are insect transmission and mechanical transmission, and may need to be considered although they are most probably less important:

- **Insect transmission:** Natural vector-mediated spread is not expected to occur due to the lack of an appropriate vector (*S. festinus* is native to North America but so far not present in EPPO countries). However, whether other species already present in the EPPO region, might be able to transmit GRBV and contribute to the natural spread of this virus is unknown. This might be the case of the polyphagous species *Stictocephala bisonia* (Membracidae). This species colonized almost the whole European continent during the last 100 years and is reported to cause damage on grapevine (Walczak *et al.*, 2018).
- **mechanical transmission:** All the viruses considered in the EFSA opinion are efficiently transmitted by vegetative propagation techniques. Some of them may possibly be mechanically transmitted by contaminated tools and/or injuries, but this process is generally considered to be at best inefficient in woody hosts, such as *Vitis* species. No specific information is available in the EFSA opinion for GRBV.

POTENTIAL ECONOMIC CONSEQUENCES

How much economic impact does the pest have in its present distribution:

The symptoms of GRBD are dependent on grapevine phenology. Symptom severity varies with the cultivar, the growing season and vineyard location (Cieniewicz *et al.*, 2017). Symptoms occur on leaves and berries. Virus symptoms reported on grapevine red-berried cultivars consist of red blotches appearing early in the growing season, which later coalesce covering most of the leaf blade which turns reddish. In white-berried cultivars, symptoms consist of chlorotic areas that turn necrotic over time (Cieniewicz *et al.*, 2017).

On berries, besides impact on yield, a delay and heterogeneity in ripening are seen. Fruit juice quality and anthocyanin accumulation are negatively affected, what affects the quality of the wine (Bowen *et al.*, 2020; Cieniewicz *et al.*, 2017). Anthocyanin concentration was generally reduced in GRBV positive vines, by between 18% and 30% with yearly variations in Pinot Noir (Levin and Achala, 2020). Total soluble solids are also reduced at harvest, and berries of red varieties exhibited reduced polyphenolic content (Girardello *et al.*, 2020; Martinez-Luscher *et al.*, 2019). Effects of GRBV on vine performance were studied in a Cabernet franc and included lower yields comprising fewer clusters and larger berries with more seeds, deleterious effects on fruit composition for winemaking. Inclusion of low amounts, up to 20%, of diseased fruit in wine reduced red

fruit character in the first year and increased astringency and vegetal character in the second year (Bowen *et al.*, 2020). Impacts of the disease on grape composition and influence on wine chemistry was also confirmed in Chardonnay (Girardello *et al.*, 2020).

The economic impact has been estimated in the grape-growing regions in the United States, on Cabernet-Sauvignon in California and on Merlot in Washington State and New York, reaching between 2 200 - 68 500 USD per hectare over a 25-year production period (Ricketts *et al.*, 2017).

Describe damage to potential hosts in PRA area: GRBV would cause symptoms in *Vitis*, thus impacting fruit yield and/or quality

How much economic impact would the pest have in the PRA area: **The EFSA Panel on Plant Health concluded that GRBV may induce severe disease in *Vitis*.** The Panel on Phytosanitary Measures agreed that this conclusion was also valid for the EPPO region.

CONCLUSIONS OF PEST RISK ASSESSMENT

Summarize the major factors that influence the acceptability of the risk from this pest:

Estimate the probability of entry: Moderate to high with moderate uncertainty for countries where import of *Vitis* plants is possible. Very low to low with a low uncertainty when the import of *Vitis* plants is banned.

The main pathway identified is *Vitis* plants for planting. The uncertainties associated with this evaluation include existence of other natural hosts, *S. festinus* association with consignments of non-host plants, and the probability of association of GRBV with the pathway at origin (due to the limited information available on geographical distribution).

Estimate the probability of establishment: Given the wide availability of *Vitis* and the suitability of the PRA area, GRBV likelihood of establishment is considered to be moderate to high with a low uncertainty.

Estimate the probability of spread: The magnitude of spread is expected to be moderate with a moderate to high uncertainty

Estimate the potential economic impact: The impact of GRBV is expected to be moderate to high on *Vitis* with a moderate uncertainty.

Degree of uncertainty The main knowledge gaps or uncertainties identified by the EFSA Plant Health Panel concern:

- Possible unreported presence in the EPPO region;
- Biology (host range and vector transmission);
- Efficiency of natural spread under EPPO conditions;
- *S. festinus* association with consignments of unregulated plants;
- Magnitude of the impact of GRBV under EPPO conditions.

OVERALL CONCLUSIONS GRBV meets all the criteria to qualify as a quarantine pest. In particular, this virus is absent from the EPPO region and could cause significant damage to *Vitis* if it were to be introduced in the region.

GRBV poses a risk to the EPPO region and risk management options should be considered.

STAGE 3: PEST RISK MANAGEMENT

IDENTIFICATION OF THE PATHWAYS

Evaluation of the need for management measures for the different hosts

- *Vitis*

It is considered that the import ban of *Vitis* plants for planting (other than seeds) by several EPPO countries because of other pests recommended by EPPO for listing as quarantine pests would already cover this risk.

Pathways studied in the pest risk management Plants for planting (except seeds) of *Vitis*

IDENTIFICATION OF POSSIBLE MEASURES

Possible measures for all pathways

Measures related to the crop or to places of production:

Pest free area

Pest free place/site of production established according to EPPO Standard PM 5/8 Guidelines on the phytosanitary measure ‘Plants grown under physical isolation’

Production under a certification scheme that fulfils the requirements for pest free place of production or pest free production site established according to EPPO Standard PM 5/8.

Inspection during the growing period (not as a standalone measure to be combined with measures related to consignment)

Measures related to consignments:

Chemical treatment (spraying/dipping insecticide could be used to remove vectors)

Testing

These two measures should be combined with inspection during the growing period

EVALUATION OF THE MEASURES IDENTIFIED IN RELATION TO THE RISKS PRESENTED BY THE PATHWAYS

Degree of uncertainty Uncertainties in the management part are:
 - Biology (host range and vector transmission);
 - *S. festinus* association with consignments of unregulated plants;

IDENTIFICATION OF POSSIBLE MEASURES

Pathway	Measures
Plants for planting of <i>Vitis</i> spp. (other than seeds).	Pest free area Or Plants should be produced in a pest-free place/site ¹ of production for GRBV established according to EPPO Standard PM 5/8 <i>Guidelines on the phytosanitary measure ‘Plants grown under physical isolation’</i> to prevent both the virus and the vector entering the place/site of production. Or No symptoms of GRBV have been observed during the growing period and Plants in the consignment have been tested. Sampling for testing should be performed to achieve a 99% confidence level to detect an

	infection level of at least 1% (see ISPM 31 and PM 3/72 (EPPO, 2009)). Plants should be found free from GRBV. and The consignment should be treated for the vector. Or Post-entry quarantine (in the framework of a bilateral agreement)
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I: The choice between PFPP and PFPS is a decision to be taken by the NPPO based on the operational capacities of the producers and biological elements.

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