EPPO Datasheet: *Nepovirus myrtilli*

Last updated: 2023-04-25

IDENTITY

Preferred name: *Nepovirus myrtilli*
Taxonomic position: Viruses and viroids: Riboviria: Orthornavirae: Pisuviricota: Pisoniviricetes: Picornavirales: Secoviridae
Other scientific names: *BLMoV, Blueberry leaf mottle nepovirus, Blueberry leaf mottle virus*
view more common names online...
EPPO Categorization: A1 list
view more categorizations online...
EU Categorization: Quarantine pest ((EU) 2019/2072 Annex II A)
EPPO Code: BLMOV0



more photos...

Notes on taxonomy and nomenclature

Blueberry leaf mottle virus (BLMoV) was first identified from symptomatic *Vaccinium corymbosum* cv. Rubel in Michigan, USA (Ramsdell & Stace-Smith, 1979). Partial sequences of the two RNAs of the virus were obtained and placed BLMoV in subgroup C of the genus *Nepovirus* (Bacher *et al.*, 1994; Martin *et al*., 2012). A serologically related virus detected on grapevine in Central Europe, grapevine Bulgarian latent virus (GBLV) was considered by several authors (e. g. Brunt *et al*., 1996) as a strain of BLMoV. However, Elbeaino *et al.* (2011) confirmed the classification of GBLV as a member of a distinct species in subgroup C of the genus *Nepovirus*. The main host plants of BLMoV are *Vaccinium* species, but *Vitis*-infecting strains/isolates of BLMoV have been identified in the USA (Uyemoto *et al.*, 1977) and the Republic of Korea (Kwak *et al*., 2016).

HOSTS

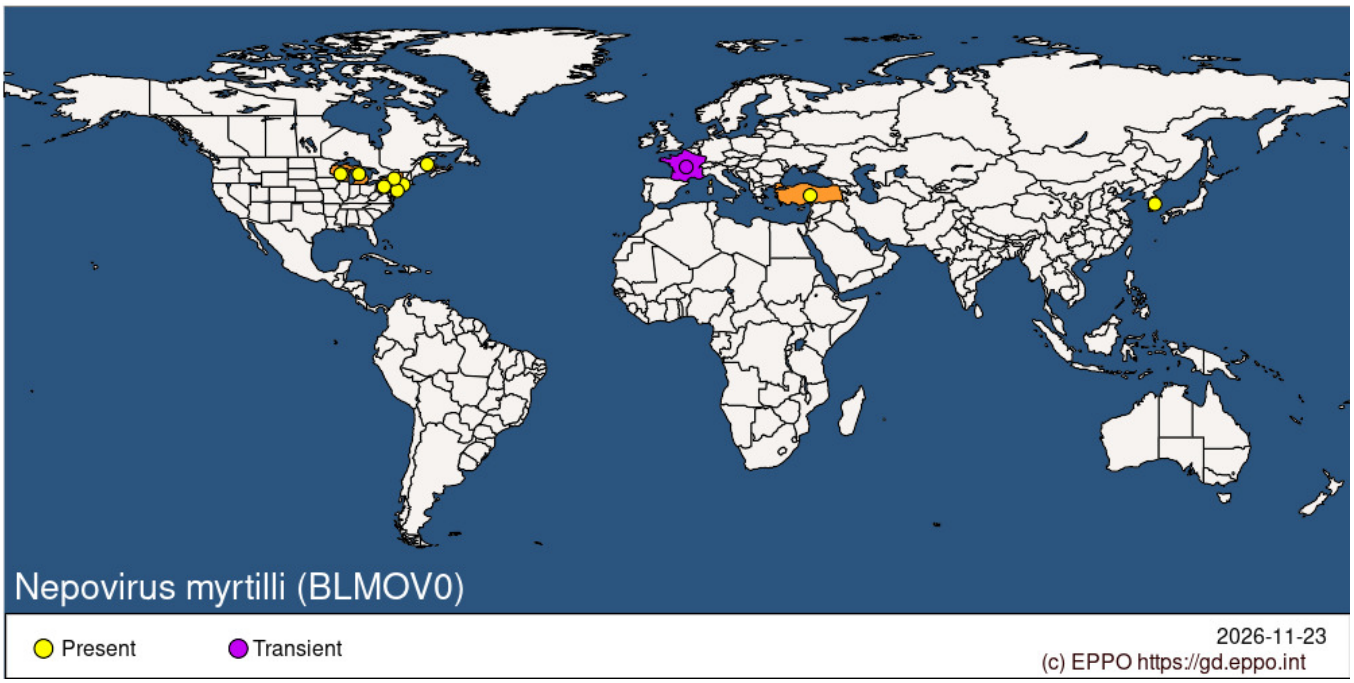
The principal woody host is highbush blueberry (*Vaccinium corymbosum*). Lowbush types (*V. angustifolium* and *V. myrtilloides*), and the highbush x lowbush hybrid (*V. corymbosum* x *V. angustifolium*) have been found to be asymptomatically infected in the wild in Michigan, USA, adjacent to commercial highbush crops (Sandoval Briones, 1992). In addition, some breeding accessions of hybrid blueberry (from Minnesota and Maine, USA) were found to be infected with BLMoV in New Brunswick, Canada (Jaswal, 1990).

The NY strain of BLMoV was found to infect one American grapevine (*Vitis labrusca*) in New York, USA (Uyemoto *et al.*, 1977). Kwak *et al.*, (2016) found BLMoV in four cultivars in grapevine (*V. vinifera*) fields of the Republic of Korea.

Host list: *Vaccinium angustifolium, Vaccinium corymbosum, Vaccinium hybrids, Vaccinium myrtilloides, Vaccinium myrtillus, Vitis labrusca, Vitis vinifera*

GEOGRAPHICAL DISTRIBUTION

The distribution of BLMoV shown on the map below is based on references that used the nucleic acid-based detection technique RT-PCR (Kwak *et al*., 2016) and DAS-ELISA (Martin *et al.*, 2012; Martin & Tzanetakis 2018).



EPPO Region: France (mainland), Türkiye
Asia: Korea, Republic of
North America: Canada (New Brunswick), United States of America (Connecticut, Michigan, New Jersey, New York, Pennsylvania, Wisconsin)

BIOLOGY

BLMoV infects blueberries via infected pollen, spread by honeybees. Although BLMoV is a nepovirus (based upon physical and chemical properties), it does not appear to have a nematode vector, this is also the case for the BLMoV-NY strain (Childress & Ramsdell, 1986b). The virus causes an economically important disease in the highbush blueberry cultivars Jersey and Rubel. There is a latent period of approximately 4-years between initial infection and the onset of symptoms. BLMoV is seedborne in up to 20% of mechanically inoculated *Chenopodium quinoa*. The virus is also seedborne in blueberry infecting 1.5% of blueberry seedlings originating from an infected bush (Childress & Ramsdell, 1986a) and *Vitis labrusca* affecting 5% of seedlings (BLMoV-NY strain) (Uyemoto *et al.*, 1977).

In grapevines, it is not known how the virus is spread (Kwak *et al*., 2016).

DETECTION AND IDENTIFICATION

Symptoms

On highbush blueberry cv. Rubel, the main uprights of the bush are killed; new regrowth occurs from the crown. Leaves are malformed and mottled. If a leaf is held up to the light, translucent spots will be visible. On cv. Jersey, bushes are stunted, but unlike cv. Rubel the main uprights are not killed. New growth exhibits rosetted leaves, which is a result of shortened internodes with leaves appearing to be piled on top of one another. Leaves on infected bushes are smaller than normal and are pale yellow-green. Crop yields are reduced to nil (Ramsdell & Stace-Smith, 1979). BLMoV-NY strain causes leaf malformation and shortening of internodes in *Vitis labrusca*. Kwak *et al*. (2016) detected BLMoV by RT-PCR both in symptomatic leaves showing yellowing and mottling and asymptomatic leaves of grapevine (*V. vinifera*) cultivars (latent infection).

Morphology

BLMoV virions are polyhedral and 28-30 mm in diameter when negatively stained with 2% uranyl acetate or 2% ammonium molybdate and viewed with a transmission electron microscope (Ramsdell & Stace-Smith, 1981). A full description of the virus and its properties is given by Ramsdell & Stace-Smith (1983).

Detection and inspection methods

BLMoV can be detected directly from young, infected leaves of blueberry or grapevine, by use of DAS-ELISA commercial kits (Martin & Tzanetakis, 2018) or RT-PCR (Kwak *et al*., 2016). Alternatively, young symptomatic leaves can be ground in 5 mL 0.05M phosphate buffer, pH 7.2, containing 1% (v/v) nicotine alkaloid, followed by mechanical inoculation to leaves of *Chenopodium quinoa* or *Nicotiana clevelandii*. After 7-14 days, chlorotic lesions will develop on inoculated leaves of *C. quinoa* along with terminal epinasty of the growing tip. *N. clevelandii* will exhibit pin-point necrotic local lesions on the non-inoculated terminal leaves.

Other diagnostic herbaceous hosts which become symptomatic 7-10 days after mechanical inoculation with the virus are *Chenopodium amaranticolor* and *Nicotiana tabacum* cv. Xanthi.

PATHWAYS FOR MOVEMENT

BLMoV is present on the surface of and inside pollen grains from infected blueberry bushes. Honeybees spread infected pollen from bush to bush, causing infection. Bees marked at the hive entrance with coloured dye have been shown to forage in blueberry bushes 1600 m away. Marked honeybees have also been shown to visit other hives in the same apiary and hives in apiaries 600 m away. Honeybees were also shown to spread pollen from bee to bee within hives. BLMoV-infected pollen was shown to survive in hives and to remain infectious for up to 10 days (Childress & Ramsdell, 1987; Boylan-Pett *et al.*, 1991; 1992).

Wild highbush, lowbush and highbush-lowbush hybrids have been found to be infected with BLMoV at distances of 5, 50 and 100 m into wooded areas adjacent to commercial crops of highbush blueberry that contained infected bushes. The means of spread of the virus in grapevine is unknown (Hancock *et al.*, 1993; Kwak *et al*., 2016).

Movement and trade of infected planting material is seen as the most significant mode of long-distance spread of BLMoV.

PEST SIGNIFICANCE

Economic impact

In commercial highbush blueberry crops in Michigan, USA, BLMoV causes virtually 100% crop loss within 4-5 years after infection. Infected blueberry cv. Jersey does not usually die, but growers remove diseased bushes when symptoms are evident. BLMoV had infection levels varying from 16.3 to 70% in studied vineyards (*V. vinifera*) of the Republic of Korea, but caused no major damage (Kwak *et al*., 2016).

Control

Prevention is the best means of control. Only virus-tested plant material from an approved certification scheme should be planted (EPPO, 1998). If the disease is already present in a planted area, all infected plants should be identified by ELISA or RT-PCR tests and destroyed. If plants are only cut back to ground level and allowed to regrow, blossoms will for which will bear infected pollen and be an inoculum source for healthy blueberry plants. Beehives should be placed as far away as possible from any diseased wild or cultivated bushes.

Phytosanitary risk

BLMoV is extremely damaging to *Vaccinium* spp. (Martin & Tzanetakis, 2018) which are currently crops of increasing importance in the EPPO region. The BLMoV isolates/strains reported from the Republic of Korea (Kwak *et al*., 2016) and New York State (US) (Uyemoto *et al.*, 1977) attack *Vitis* spp., but their economic impact on

grapevine cultivation remains to be further studied. The risk BLMoV could present for grapevine seems to be limited, and in principle could be covered by certification of planting material according to a scheme such as the one recommended by EPPO (EPPO, 2008). However, in a risk evaluation carried out for the European Union covering non-EU viruses and viroids of *Vitis*, it was considered that BLMoV met the criteria of a quarantine pest (EFSA, 2019).

PHYTOSANITARY MEASURES

Plants for planting of *Vaccinium corymbosum*, *V. angustifolium* and their hybrids, and of *V. myrtilloides*, should originate from a pest-free area or should have been produced according to an approved certification scheme for virus-tested planting material (EPPO, 1988). For *Vitis*, it can be noted that a number of EPPO countries already ban the import of plants for planting (other than seeds) from third countries and as a consequence, this would also cover the potential risk of introducing BLMoV.

REFERENCES

Bacher JW, Warkentin D, Ramsdell D & Hancock JF (1994) Sequence analysis of the 3' termini of RNA1 and RNA2 of blueberry leaf mottle virus. *Virus Research* **33**, 145–156. https://doi.org/10.1016/0168-1702(94)90051-5

Boylan-Pett W, Ramsdell DC, Hoopingarner RA & Hancock JF (1991) Honeybee foraging behavior, in-hive survival of infectious, pollen-borne blueberry leaf mottle virus and transmission of the virus in highbush blueberry. *Phytopathology* **81**, 1407-1412.

Boylan-Pett W, Ramsdell DC, Hoopingarner RA & Hancock JF (1992) Honeybee foraging behavior and the transmission of the pollen-borne blueberry leaf mottle virus in highbush blueberry. *Acta Horticulturae* No. 308, 99-103.Brunt AA, Crabtree K, Dallwitz MJ, Gibbs AJ & Watson L (editors) (1996) *Viruses of plants*. CABI, Wallingford, UK.

Childress AM & Ramsdell DC (1986a) Detection of blueberry leaf mottle virus in highbush blueberry pollen and seed. *Phytopathology* **76**, 1333-1337.

Childress AM & Ramsdell DC (1986b) Lack of evidence for a nematode vector of blueberry leaf mottle virus (BBLMV). *Acta Horticulturae* No. 186, 87-91.

Childress AM & Ramsdell DC (1987) Bee-mediated transmission of blueberry leaf mottle virus via infected pollen in highbush blueberry. *Phytopathology* **77**, 167-172.

EPPO (2008) Certification schemes. Pathogen-tested material of grapevine varieties and rootstocks. *EPPO Bulletin* **38**, 422–429.

EPPO (1998) Certification schemes. Pathogen-tested material of *Vaccinium spp*. *EPPO Bulletin* **27**, 195-204.

Elbeaino T, Digiaro M, Fallanaj F, Kuzmanovic S & Martelli GP (2011) Complete nucleotide sequence and genome organisation of grapevine Bulgarian latent virus. *Archives of Virology* **156**, 875-879. https://doi.org/10.1007/s00705-010-0908-5

Hancock JF, Sandoval CR, Ramsdell DC, Callow PW, Boylan-Pett W, Hokanson K & Holtsford P (1993) Disease spread between wild and cultivated blueberries. *Acta Horticulturae* No. 346, 240-245.

Jaswal AS (1990) Occurrence of blueberry leaf mottle, blueberry shoestring, tomato ringspot and tobacco ringspot virus in eleven halfhigh blueberry clones grown in New Brunswick, Canada. *Canadian Plant Disease Survey* **70**(2), 113-117.

Martin RR, Polashock JJ & Tzanetakis IE (2012) New and emerging viruses of blueberry and cranberry. *Viruses* **4**, 2831-2852. https://doi.org/10.3390/v4112831

Martin RR & Tzanetakis IE (2018) High risk blueberry viruses by region in North America; implications for certification, nurseries, and fruit production. *Viruses* **10**, 342. https://doi.org/10.3390/v10070342

Kwak HR, Yoon JS, Shin JC, Seo JK, Kim M, Lee JK. Lee KS, Kim CS, Choi HS & Kim JS (2016) First report of Blueberry leaf mottle virus on grapevine in Korea. *Plant Disease* **100**(1), 232-232. https://doi.org/10.1094/PDIS-05-15-0517-PDN

Ramsdell DC & Stace-Smith R (1979) Blueberry leaf mottle, a new disease of highbush blueberry. *Acta Horticulturae* No. 95, 37-45.

Ramsdell DC & Stace-Smith R (1981) Physical and chemical properties of the particles and ribonucleic acid of blueberry leaf mottle virus. *Phytopathology* **71**, 468-472.

Ramsdell DC & Stace-Smith R (1983) Blueberry leaf mottle virus. *CMI/AAB Descriptions of Plant Viruses* No. 267. Association of Applied Biologists, Wellesbourne, UK.

Sandoval Briones CR (1992) Movement of blueberry leaf mottle virus (BBLMV) within and between cultivated and wild *Vaccinium* spp. *Ph.D. Thesis*, Michigan State University, East Lansing, USA.

Uyemoto JK, Taschenberg EF & Hummer DK (1977) Isolation and identification of a strain of grapevine Bulgarian latent virus in concord grapevine in New York State. *Plant Disease Reporter* **61**, 949-953.

CABI and EFSA resources used when preparing this datasheet

CABI Datasheet on blueberry leaf mottle virus. CABI Compendium. https://www.cabidigitallibrary.org/doi/full/10.1079/cabicompendium.9355 (last accessed in March 2023)

CABI Datasheet on grapevine Bulgarian latent virus CABI Compendium. https://doi.org/10.1079/cabicompendium.26181 (last accessed in March 2023)

EFSA Panel on Plant health (2019) Pest categorisation of non?EU viruses and viroids of *Vitis* L. *EFSA Journal* **17** (9), 5669. https://doi.org/10.2903/j.efsa.2019.5669

ACKNOWLEDGEMENTS

This datasheet was extensively revised in 2023 by Josef Špak, Biology Centre, Institute of Plant Molecular Biology supported by the program ´Virology and Antiviral Therapy´ Strategy AV 21 of the Czech Academy of Sciences. His valuable contribution is gratefully acknowledged.

How to cite this datasheet?

EPPO (2026) *Nepovirus myrtilli*. EPPO datasheets on pests recommended for regulation. Available online. https://gd.eppo.int

Datasheet history

This datasheet was first published in 1997 in the second edition of 'Quarantine Pests for Europe', and revised in 2023. It is now maintained in an electronic format in the EPPO Global Database. The sections on 'Identity', ‘Hosts’, and 'Geographical distribution' are automatically updated from the database. For other sections, the date of last revision is indicated on the right.

CABI/EPPO (1997) *Quarantine Pests for Europe (2nd edition).* CABI, Wallingford (GB).



Co-funded by the
European Union