Canadian Food Inspection Agency
Agence canadienne d'inspection des aliments

Pest categorization

Monilinia vaccinii-corymbosi (Reade) Honey

Mummy berry

Canada

Table of contents

Background

The purpose of this categorization is to determine whether *Monilinia vaccinii-corymbosi* (mummy berry) has the potential to satisfy the criteria in the definition for a quarantine pest. The method used by the CFIA to initiate and conduct this categorization is consistent with international guidelines set by the International Plant Protection Convention (IPPC). Definitions follow those listed in the IPPC's *Glossary of phytosanitary terms*.

Initiation point(s): This categorization was identified via a Commodity Risk Assessment on blueberry plants from Canada to the UK for the Jens-Georg Unger Plant Health Fellowship project, funded by the European and Mediterranean Plant Protection Organisation (EPPO). This project was led by a visiting scientist from the UK Department for the Environment, Food and Rural Affairs, utilising the tools and templates of the Canadian Food Inspection Agency and coordinating with experienced Canadian risk assessors.

Identification of the PRA area: The PRA area is all of the UK.

Current regulatory status: *Monilinia vaccinii-corymbosi* is not currently regulated as a pest in the UK. However, it is a regulated quarantine pest in Argentina, Brazil, Chile, Ecuador, Japan, New Zealand and Uruguay (EPPO 2022; MPI 2022). The entire *Monilinia* genus is regulated by the United States (APHIS-USDA 2022).

Identity of organism

Name: *Monilinia vaccinii-corymbosi* (Reade) Honey (Sclerotiniaceae)

Synonyms: *Sclerotinia vaccinii-corymbosi* Reade, *Monilinia vaccinii* (Voronin) Whetzel

English common names: Mummy berry, Monilinia blight

French common names: Brûlure des rameaux de l'airelle, pourriture à sclérotes de l'airelle

1. **Is the organism clearly a single taxonomic entity and can it be adequately distinguished from other entities of the same rank?**

Yes	**Go to 2**
If no	Go to 11

Monilinia vaccinii-corymbosi produces hollow, sphere-shaped mummified fruit (known as pseudosclerotium) that germinate to produce brown, goblet-shaped spore-bearing structures (Batra 1983; Schilder et al. 2008). It also has a wide host range of *Vaccinium* species, wild and cultivated, that distinguishes it from other *Monilinia* species (Batra 1983).

Symptoms include shoot, flower and leaf blight and fruit mummification (where the infected fruit turns whitish gray, shrivels and hardens, and then drops off), all of which result in yield losses (Munda 2011; Polashock et al. 2017).

Presence in the PRA area

2. **Does the organism occur in the PRA area?**

Yes	**Go to 3**
If no	Go to 5

3. **Is the organism widely distributed in the PRA area?**

If yes	Go to 11
No	**Go to 4**

This pathogen has been identified on blueberries in one region of the UK, in Dorset (Storey 2018). Records of this pathogen in other parts of the UK could not be found.

Regulatory status

4. **Is the organism under official control in the PRA area or is it a potential candidate for official control?**

Yes	**Go to 5**
If no	Go to 11

Monilinia vaccinii-corymbosi is not currently regulated as a pest in the UK, but it is a potential candidate for official control in the future.

Potential for establishment and spread in the PRA area

5. **Does the PRA area have climatic conditions suitable for establishment and spread of the organism?**

Yes	**Go to 6**
If no	Go to 11

6. **Does the PRA area have ecological conditions suitable for establishment and spread of the organism?**

Yes	**Go to 7**
If no	Go to 11

This fungus is native to Canada and the United States (AAFC 2019; Batra 1983). In addition to the UK, it has been found in Austria, Finland, Georgia, Germany, Italy, Russia and Slovenia, though the findings in Finland, Sweden, Germany, and Russia were mainly from preserved specimens in the late 1800s (GBIF 2022; Gosch 2003; Munda 2011; Ngugi et al. 2002; Suffert et al. 2015). The spread of this pest to Slovenia was attributed to the import of infected blueberry planting material (Munda 2011). Interestingly, the origin of spread to Austria back in 2001 is not known. No plant material was imported from outside of Europe, leading to the authors at the time suggesting that the distribution of this pest, at the time believed to be solely North America, had spread to Europe. It is possible that *Monilinia vaccinii-corymbosi* has been spreading in Europe undetected for years due to unfavourable

environmental conditions and the low levels of blueberry production (Gosch 2003). This would explain how this pathogen spread to the UK.

This pest is a common pathogen on wild and cultivated blueberry species (including *Vaccinium corymbosum, V. angustifolium, V. myrtilloides*). These *Vaccinium* species are present in urban areas (e.g. gardens) in the UK and/or in cultivated areas such as fields, nurseries, and garden centres, that could enable the establishment and spread of this fungus (GBIF 2022; RHS 2022a; RHS 2022b).

Monilinia vaccinii-corymbosi overwinters on mummified fruit that falls on the ground under infected plants. These mummified fruit require certain moisture and chilling periods between 0-7°C to germinate (Schilder et al. 2008). Then in spring, ascospores (sexual spores) are released from the mummified fruit and cause primary infection in buds (Munda 2011). Insect pollinators, rain and wind then enable the spread of asexual spores to healthy flowers (Batra and Batra 1985; Polashock et al. 2017). Primary infection has been shown to occur between 2-18°C and is optimal at 14°C. Plants that are stressed due to exposure to freezing temperatures also exhibit enhanced susceptibility to initial infection by *M. vaccinii-corymbosi* (Hildebrand and Braun 1991). Finally, the release of ascospores is influenced by changes in relative humidity and wind speed (as well as soil temperature, soil moisture and solar radiation) and may travel significant distances as a result (Harteveld et al. 2017; Ramsdell et al. 1974). Given that the average annual temperature of the UK is between 5-13°C (MetOffice 2022), the dispersal mechanisms of this fungus, and the record of this pest in the UK, it is possible that *M. vaccinii-corymbosi* is or will become well-established in the UK.

Potential for economic and environmental consequences in the PRA area

7. **Is the organism a known pest in its area of current distribution?**

Yes	**Go to 9**
If no	Go to 8

8. **Does the organism have intrinsic attributes that indicate that it could cause significant harm to plants?**

If yes	Go to 9
If no	Go to 11

9. **With specific reference to the plants or habitats which occur in the PRA area, could the organism by itself, or acting as a vector, cause significant damage or loss to plants leading to negative economic, environmental, societal or export market impacts?**

Yes	**Go to 10**
If no	Go to 11

Mummy berry disease has been reported as one of the most important fungal pathogens on blueberry in North America (Gosch 2003) and remains a serious problem in Canada (PMC 2020). It has caused significant yield losses in the past, for example, resulting in the estimated loss of 8.1% of the highbush blueberry crop grown in British Columbia in a single year (Pepin and Toms 1969). More recently, it has spread to countries in Europe; most significantly causing up to 50% damage in certain highbush blueberry varieties in Slovenia (Munda 2011). *Monilinia vaccinii-corymbosi* has also been reported to cause substantial yield losses in Georgia (Ngugi et al. 2002). Because of their hard texture, infected berries are unfit for processing and as a result, affected countries have a low to zero tolerance for mummified fruit (Scherm and Copes 1999; Schilder et al. 2008).

Blueberry species, such as *Vaccinium corymbosum*, are cultivated in the UK and are at risk from this pathogen. The value of the blueberry-growing economy in Great Britain is currently valued at £32 million ex-farm (Jack Evans, British Summer Fruits, pers. comm., Jun. 10, 2022). Ornamental blueberry plants could also be impacted by this pest (RHS 2022a). Finally, native *Vaccinium* species, such as *V. vitis-idaea* and *V. myrtillus* in the wild, could also be affected by this fungus though their host status is unknown.

Conclusion

10. **This organism has the potential to satisfy the definition of a quarantine pest.**
11. This organism does not fulfill all of the criteria for a quarantine pest**.**

Monilinia vaccinii-corymbosi has shown to be capable of spreading to other European countries, including the UK, from its native distribution in North America. Although this fungus has only been found in one region of the UK, it is likely that it could have spread and established across the UK. However, the significant impacts expected on blueberry production have not been reported yet. The reasons for this are unknown. Perhaps the environmental conditions have suppressed the impact of this pest or it has been misidentified, given that the symptoms are similar to pathogens such as *Botrytis cinerea*. Before a Pest Risk Analysis is undertaken, a survey would be beneficial to confirm the presence and delimit the spread of this fungus in the PRA area.

References

AAFC. 2019. Canadian Host-Pathogen Database. [Online] Available: http://hpdb.biodiversity.agr.gc.ca/home [June. 14, 2022].

APHIS-USDA. 2022. U.S. Regulated Plant Pest Table. [Online] Available: https://www.aphis.usda.gov/aphis/ourfocus/planthealth/import-information/rppl/rppl-table [May 12, 2022].

Batra, L. 1983. *Monilinia vaccinii-corymbosi* (Sclerotiniaceae): Its biology on blueberry and comparison with related species. Mycologia 75(1):131-152.

Batra, L. and Batra, S. 1985. Floral mimicry induced by mummy-berry fungus exploits host's pollinators as vectors. Science 228(4702):1011-1013.

EPPO. 2022. EPPO Global Database. EPPO, Paris, France, https://gd.eppo.int/.

GBIF. 2022. Global Biodiversity Information Facility. [Online] Available: https://www.gbif.org/ [May. 31, 2022].

Gosch, C. 2003. *Monilinia vaccinii-corymbosi* on Highbush Blueberries (*Vaccinium corymbosum* L.): Also in Europe! European Journal of Horticultural Science 68(5):238-241.

Harteveld, Dalphy, Michael, Grant, Jay and Tobin. 2017. Predicting Ascospore Release of *Monilinia vaccinii-corymbosi* of Blueberry with Machine Learning. Phytopathology 107(11):1364-1371.

Hildebrand, P. and Braun, P. 1991. Factors affecting infection of lowbush blueberry by ascospores of *Monilinia vaccinii-corymbosi*. Canadian Journal of Plant Pathology 13(3):232-240.

MetOffice. 2022. UK climate averages. [Online] Available: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/u1057171v [July. 27, 2022].

MPI. 2022. Official New Zealand Pest Register. [Online] Available: https://pierpestregister.mpi.govt.nz/PestsRegister/ImportCommodity/ [July, 06, 2022].

Munda, A. 2011. Monilinia pathogens of cultivated and native *Vaccinium* species in Slovenia. Acta Agriculturae Slovenica 97(2):99.

Ngugi, H., Scherm, H. and NeSmith, D. 2002. Distribution of pseudosclerotia of *Monilinia vaccinii-corymbosi* and risk of apothecial emergence following mechanical cultivation. Phytopathology 92(8):877-883.

Pepin, H. and Toms, H. 1969. Economic Loss from Mummy Berry of Highbush Blueberry In Coastal British Columbia, 1969. Canadian Plant Disease Survey 49(4):105-7.

PMC. 2020. Crop profile for highbush blueberry in Canada, 2020. Pages 51 *in* A. a. A.-F. Canada, ed. Pest Management Centre.

Polashock, J., Caruso, F., Averill, A., Schilder, A. and Press, A. 2017. Compendium of blueberry, cranberry, and lingonberry diseases and pests. Am Phytopath Society.

Ramsdell, D., Nelson, J. and Myers, R. 1974. An epidemiological study of mummy berry disease of highbush blueberry. Phytopathology 64(2):222-228.

RHS. 2022a. *Vaccinium angustifolium*. [Online] Available: https://www.rhs.org.uk/plants/18645/vaccinium-angustifolium/details [June. 16, 2022].

RHS. 2022b. *Vaccinium corymbosum* [Online] Available: https://www.rhs.org.uk/plants/18670/vaccinium-corymbosum-(f)/details [June. 21, 2022].

Scherm, H. and Copes, W. 1999. Evaluation of methods to detect fruit infected by *Monilinia vaccinii-corymbosi* in mechanically harvested rabbiteye blueberry. Plant Disease 83(9):799-805.

Schilder, A., Wharton, P. and Miles, T. 2008. Mummy berry. Pages 1-6 *in* M. S. University, ed.

Storey. 2018. *Monilinia vaccinii-corymbosi* 18H11A_1. [Online] Available: https://fungi.myspecies.info/file/14857 [September. 27, 2022].

Suffert, M., Grousset, F., Petter, F., Wilstermann, A., Steffen, K. and Schrader, G. 2015. Work package 1. Pathways of introduction of fruit pests and pathogens Deliverable 1.3. PART 4-REPORT on VACCINIUM-Fruit pathway and Alert List (Dropsa, EU project number 613678).