



Canadian Food  
Inspection Agency

Agence canadienne  
d'inspection des aliments

# Commodity risk assessment

Blueberry plants (*Vaccinium*) from Canada to the United Kingdom



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## Summary

The purpose of this assessment is to evaluate the plant health risk of pests and diseases associated with the importation of blueberry plants (*Vaccinium* spp.) from Canada to the United Kingdom (UK). This document was prepared 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. The method used by the CFIA to initiate and conduct this commodity risk assessment 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](#).

This assessment has considered the pest status of bacteria and phytoplasmas, fungi, viruses, nematodes, insects, mites, and molluscs reported on blueberry plants (*Vaccinium angustifolium*, *V. ashei* (or *V. virgatum*), *V. corymbosum*, *V. darrowii*, *V. elliotii*, *V. myrtilloides*) in Canada. Appendix 1 provides a list of pests potentially associated with blueberry plants from Canada.

From those pests listed in Appendix 1, **39** pests associated with blueberry plants from Canada have been identified as potential Quarantine Pests<sup>1</sup>. Many pests listed in the Appendix are currently regulated in the UK, these pests are summarized in Table 1 and include the following organisms:

### Currently regulated Quarantine Pests (GB QPs) of blueberry plants that occur in Canada include:

- *Blueberry leaf mottle virus* (BLMoV)
- *Blueberry scorch virus* (BIScV)
- *Blueberry shoestring sobemovirus* (BSSV)
- *Choristoneura rosaceana* (Harris) (oblique-banded leaf roller)
- *Conotrachelus nenuphar* (Herbst) (plum curculio)
- *Exomala orientalis* (Waterhouse) (oriental beetle)
- *Grapholita packardi* Zeller (cherry fruitworm)
- *Grapholita prunivora* (Walsh) (plum moth)
- *Peach rosette mosaic virus* (PRMV)
- *Diaporthe vaccinii* Shear (blight of blueberry)

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<sup>1</sup> A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (ISPM 5, [Adopted Standards \(ISPMs\) - International Plant Protection Convention \(ippc.int\)](#)).

- *Popillia japonica* Newman (Japanese beetle)
- *Rhagoletis mendax* Curran (blueberry maggot)
- *Spodoptera frugiperda* (Smith) (fall armyworm)
- *Tobacco virus* (ToRSV)
- *Xiphinema americanum sensu stricto* Cobb (Dagger nematode)
- *Xylella fastidiosa* Wells Raju, Hung, Weisburg, Parl & Beemer (Pierce's disease of grapevine)

Other identified pests meeting the IPPC definition of a quarantine pest put forward for further consideration are listed below:

- *Argyrotaenia franciscana* Borden (orange tortrix)
- *Acalitus vaccinii* (Keifer) (blueberry bud mite).

Potential phytosanitary mitigation practices for reducing the risk presented by the identified pests are listed in Table 2.

# Background

## Description of the commodity

Blueberries are the second most important fruit crop produced in Canada, based on a farm gate value of \$274 million in 2020 (PMC 2021a). Annual blueberry production is around 170,536 metric tonnes, grown on approximately 79,036 hectares of land. Blueberry production in Canada includes highbush and lowbush blueberries. Highbush blueberries are grown primarily (92%) in British Columbia, with some production in Quebec, Ontario and Nova Scotia (PMC 2021a). Lowbush blueberries are produced commercially in eastern Canada, in the provinces of Quebec, Nova Scotia, New Brunswick and Prince Edward Island (PMC 2021b).

Blueberry plants for planting are typically in the form of plug plants, tissue culture plants and potted plants (EFSA 2017). 3.3 million plants for planting were exported to the European Union (EU) from Canada and the U.S. in 2017 (EFSA 2018b), although zero exports from Canada to the UK have been recorded in recent years (pers. comm., Chantal Nyiransengiyumva, Horticulture Export Certification Specialist, Canadian Food Inspection Agency, June 2022). Imported blueberry plants must be free from plant debris, fruits and flowers. They must also be inspected prior to the export, found to be free from signs of harmful nematodes, insects, mites and fungi or subject to appropriate treatment to eliminate such organisms (Defra 2020, EU 2019). Blueberry plants do not have to be free from leaves to be imported as not all blueberry plants are deciduous (Sharon Matthews-Berry, Department for Environment, Food and Rural Affairs, pers. comm., Jun. 10, 2022).

## Identification of the PRA area

The PRA area is the United Kingdom of Great Britain (GB) and Northern Ireland (NI).

The blueberry-growing industry in the UK is rapidly expanding, with GB blueberry production increasing by 73% (from 2,666 to 4,600 tonnes) from 2018-2021, led by a growth in consumer demand. The value of the GB blueberry-growing economy is currently valued at £32 million ex-farm (British Summer Fruits, personal comm.) with over £400m worth of British blueberries sold in the UK from May 2018 to August 2019 (British Summer Fruits). In addition, native *Vaccinium* species such as *Vaccinium vitis-idaea* and *Vaccinium myrtillus* are present in the wild of the UK. Therefore, the introduction of any blueberry pests could cause serious economic and environmental damage to the UK.

## Regulated pests and potential quarantine pests

Blueberry plants from Canada may serve as a pathway for the movement of a number of pests. The table below lists currently regulated quarantine pests that have been reported in, on, or associated with this commodity from Canada. Species that have potentially been identified as Quarantine Pests and for which a categorization will be conducted are also listed. Pests currently regulated in the UK as provisional Quarantine Pests<sup>2</sup> or Regulated Non-Quarantine Pests<sup>3</sup> (RNQPs), that are not present in the UK, are also listed. For a more extensive list of species potentially associated with the commodity, see Appendix 1.

**Table 1: Summary of preliminary risk assessments for currently regulated pests absent from the UK and associated with blueberry plants from Canada. Risk scores taken from the UK Plant Health Risk Register (Defra 2022a)**

Pest organisms	Probability of entry	Probability of establishment	Probability of spread	Potential economic and environmental consequences
<b>Pathology – Quarantine Pests</b>				
<i>Blueberry leaf mottle virus</i>	Low	Medium	High	High
<i>Blueberry scorch virus</i>	High	Medium	High	Medium
<i>Blueberry shoestring sobemovirus</i>	High	High	High	High
<i>Peach rosette mosaic virus</i>	Low	Low	Low	Very low
<i>Diaporthe vaccinii</i> Shear	Low	High	Low	Medium

<sup>2</sup> A pest that provisionally qualify as a Quarantine Pest (see first footnote) requiring temporary measures as referred to in the retained [Regulation \(EU\) 2016/2031](#).

<sup>3</sup> A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (ISPM 5, [Adopted Standards \(ISPMs\) - International Plant Protection Convention \(ippc.int\)](#)).

<i>Tobacco ringspot virus</i>	High	High	Low	Medium
<i>Xiphinema americanum sensu stricto</i> Cobb	Low	Very high	Very low	Medium
<i>Xylella fastidiosa</i> Wells, Raju, Hung, Weisburg, Parl & Beemer	Low	High	Low	Medium
<b>Pest organisms</b>	<b>Probability of entry</b>	<b>Probability of establishment</b>	<b>Probability of spread</b>	<b>Potential economic and environmental consequences</b>
<b>Pathology – Regulated Non-Quarantine Pests</b>				
<i>Blueberry mosaic associated virus</i>	Medium	High	Low	Low
<i>Blueberry red ringspot virus</i>	Medium	High	Very low	Low
<i>Blueberry shock virus</i>	Medium	High	Low	Medium
<b>Pest organisms</b>	<b>Probability of entry</b>	<b>Probability of establishment</b>	<b>Probability of spread</b>	<b>Potential economic and environmental consequences</b>
<b>Entomology – Quarantine Pests</b>				
<i>Choristoneura rosaceana</i> (Harris)	Low	Very high	Medium	Medium
<i>Conotrachelus nenuphar</i> (Herbst)	Low	Very high	Low	Medium
<i>Exomala orientalis</i> (Waterhouse)	Low	Very high	Low	Medium

<i>Grapholita packardi</i> Zeller	Low	Very high	Medium	Medium
<i>Grapholita prunivora</i> (Walsh)	Low	Very high	Medium	Medium
<i>Popillia japonica</i> Newman	High	High	Medium	Low
<i>Rhagoletis mendax</i> Curran	Very low	Low	Medium	Medium
<i>Spodoptera frugiperda</i> (Smith)	Low	Very high	Very high	Medium
<b>Pest organisms</b>	<b>Probability of entry</b>	<b>Probability of establishment</b>	<b>Probability of spread</b>	<b>Potential economic and environmental consequences</b>
<b>Entomology – provisional Quarantine Pests</b>				
<i>Lambdina fiscellaria</i>	High	Very high	Low	High

A number of unregulated pests were reviewed but ultimately not selected for a categorization due to a variety of reasons. These included: a lack of strong association with blueberry plants, a pathway dependence that was already regulated, a leaf pathway dependence where regulation was recommended (see section on potential risk mitigation measures), or sufficient existing risk analysis conducted by the European Plant Protection Organisation or the UK. See Appendix 1 for the details for each pest.

### List of pests selected for a categorization:

#### Pathology

- *Blueberry fruit drop-associated virus*
- *Botryosphaeria corticis* (Demaree & M.S. Wilcox) von Arx & E. Müller
- *Exobasidium maculosum* M. T. Brewer
- *Gibbera vacciniicola* (Dearn. & House) M. E. Barr
- *Gloeosporium minus* Shear
- *Monilinia vaccinii-corymbosi* (Reade) Honey
- *Phyllosticta vaccinii* Earle
- *Sphaerulina vaccinii* Ali, Hildebrand & Abbasi

#### Entomology

- *Acalitus vaccinii* (Keifer)
- *Argyrotaenia franciscana* Borden
- *Clastoptera saintcyri* Provancher
- *Hemadas nubilipennis* (Ashmead)
- *Neochlamisus cribripennis* (LeConte)
- *Operophtera bruceata* (Hulst)
- *Pyrrhalta vaccinii* (Fall)

### Of these, two potential quarantine pests were identified for a Pest Risk Analysis:

- *Acalitus vaccinii* (Keifer) (identified in the Pest categorisation for *Acalitus vaccinii* (2022))
- *Argyrotaenia franciscana* Borden (identified in the Pest categorisation for *Argyrotaenia franciscana* (2022))

## Potential risk mitigation practices

The following risk mitigation practices for the commodity are applied in parts of the UK or elsewhere, and could be useful in mitigating the risk posed by the pests as named:

**Table 2: Potential risk mitigation practices by discipline**

Pests	Potential mitigation practices
All Quarantine Pests	It is prohibited that a quarantine pest shall be introduced into or moved within Great Britain (GB) on all host pathways. If a quarantine pest is identified, action must be taken to prevent the spread of the pest.
All provisional Quarantine Pests	It is prohibited that a provisional quarantine pest shall be introduced into or moved within Great Britain on all host pathways. If a provisional quarantine pest is identified, action must be taken to prevent the spread of the pest.
All Regulated Non-Quarantine Pests	It is prohibited that a regulated non-quarantine pest shall be introduced into or moved within Great Britain on specified host plants for planting. This prohibition can apply above a certain threshold of pest incidence.
<b>Pathology</b>	
<i>Xylella fastidiosa</i> Wells, Raju, Hung, Weisburg, Parl & Beemer	<i>Vaccinium</i> plants for planting must come from a pest free country, area or place of production. Requirements for a pest free place of production in GB include physical protection against <i>X. fastidiosa</i> , at least two official inspections per year, absence of symptoms of <i>X. fastidiosa</i> or its vectors in the site. Northern Ireland (NI) requirements vary, under EU regulations.
<i>Diaporthe vaccinii</i> Shear	<i>Vaccinium</i> plants for planting (other than seeds) must come from a pest free area or place of production, for import into GB, the latter indicated by the absence of

	symptoms of <i>P. vaccinii</i> . This pest is regulated as a Registered Non-Quarantine Pest (RNQP) in NI, under EU regulations.
<i>Agrobacterium tumefaciens</i> (Smith & Townsend) Conn, <i>Exobasidium vaccinii</i> (Fuckel) Woronin, <i>Thekopsora minima</i> (Arthur) Sydow & P.Sydow, <i>Godronia cassandrae</i> Peck, <i>Blueberry mosaic associated virus</i> , <i>Blueberry red ringspot virus</i> , <i>Blueberry shock virus</i> , <i>Candidatus Phytoplasma 'asteris'</i> Lee, Gundersen-Rindal, Davis, Bottner, Marcone & Seemüller	There is a 0% tolerance threshold for the listed pests on <i>Vaccinium</i> plants for planting, therefore action is always taken if the pests are found.
<i>Microsphaera vaccinii</i> (Schweinitz) Cooke & Peck	This pest infects the leaves of <i>Vaccinium</i> plants in their lifecycle and could enter the UK via this pathway. It is recommended in this Commodity Risk Assessment that the UK should consider introducing specific import requirements for evergreen <i>Vaccinium</i> plants if the risk is considered significant enough.
<b>Entomology</b>	
<i>Grapholita packardi</i> Zeller	<i>Vaccinium</i> plants for planting (other than plants in tissue culture and seeds) must come from a pest free area or place of production. Requirements for a pest free place of production include annual site and plant inspections, official surveys, and the application of preventive treatments.
<i>Cingilia catenaria</i> (Drury), <i>Neopareophora litura</i> Klug, <i>Pristiphora idiota</i> , <i>Pseudanthonomus validus</i> Dietz, <i>Anthonomus musculus</i> Say, <i>Melanchna picta</i> (Harris), <i>Sparganothis sulfureana</i> Clemens, <i>Croesia curvalana</i> (Kearfott), <i>Autoserica castanea</i> Arrow, <i>Altica sylvia</i> (Malloch), <i>Graphiphora smithi</i> (Snellen), <i>Graphiphora collaris</i> Grote and Robinson, <i>Eucirrhoedia pampina</i> (Guenee), <i>Lycophotia phyllophora</i> Grote, <i>Polia purpurissata</i> Grote, <i>Syngrapha epigaea</i> Grote, <i>Frankliniella vaccinii</i> Morgan, <i>Catinathrips kainos</i> (O'Neill),	All of these pests utilise the leaves of <i>Vaccinium</i> plants in their lifecycle and could enter the UK via this pathway. It is recommended in this Commodity Risk Assessment that the UK should consider introducing specific import requirements for evergreen <i>Vaccinium</i> plants if the risk is considered significant enough.

<p><i>Catinathrips vaccinophilus</i> (Hood), <i>Systema frontalis</i> (Fabricius), <i>Sciopithes obscurus</i> Horn, <i>Paria fragariae fragariae</i> Wilcox</p>	
<p><i>Cingilia catenaria</i> (Drury), <i>Itame (Macaria) argillacearia</i> Packard, <i>Neopareophora litura</i> Klug, <i>Pristiphora idiota</i>, <i>Pseudanthonomus validus</i> Dietz, <i>Anthonomus musculus</i> Say, <i>Melanchra picta</i> (Harris), <i>Sparganothis sulfureana</i> Clemens, <i>Croesia curvalana</i> (Kearfott), <i>Acrobasis vaccinii</i> Riley, <i>Autoserica castanea</i> Arrow, <i>Altica sylvia</i> (Malloch), <i>Frankliniella vaccinii</i> Morgan, <i>Catinathrips kainos</i> (O'Neill), <i>Catinathrips vaccinophilus</i> (Hood), <i>Systema frontalis</i> (Fabricius), <i>Sciopithes obscurus</i> Horn, <i>Paria fragariae fragariae</i> Wilcox, <i>Amphimallon majalis</i> (Razaumovskii), <i>Acalitus vaccinii</i> (Keifer)</p>	<p><i>Vaccinium</i> plants for planting (other than seeds) must be free from plant debris, fruits and flowers. Soil is also prohibited. These requirements combat the risk of certain pests (some of which overlap with the column above) as they utilise these commodities in their lifecycle and could otherwise enter the UK on them.</p>
<p><b>Entomology – potential quarantine pests</b></p>	
<p><i>Argyrotaenia franciscana</i> Borden</p>	<p>The Pest Risk Analysis concluded that the entry of this pest into the UK was low risk, and that risk management may not be needed.</p>

## Appendix 1: Commodity pest list

The following pests are potentially associated with blueberry plants from Canada. For pests that are already regulated and/or present in the UK, not all of the sections under Supporting information are completed.

Bacteria				
Pest name	Present in PRA area (Y/N)	Regulated in the UK (Y/N)	Supporting information	Categorization required (Y/N)
<p><i>Agrobacterium tumefaciens</i> (Smith &amp; Townsend) Conn</p> <p>Crown gall</p> <p>Synonyms: <i>Achromobacter radiobacter</i> (Beijerinck &amp; van Delden) Bergey, <i>Agrobacterium radiobacter</i> subsp. <i>tumefaciens</i> (Beijerinck &amp; van Delden) Conn., <i>Rhizobium radiobacter</i> (Beijerinck &amp; van Delden) Young, Kuykendall, Martinez-Romero, Kerr &amp; Sawada</p>	Y	Y (RNQP)	<b>Distribution:</b> Present in Canada. Present in the UK (CABI 2022).	N
<p><i>Pseudomonas syringae</i> pv. <i>syringae</i> van Hall</p> <p>Bacterial canker</p> <p>Synonyms: <i>Phytomonas vignae</i> (Gardner &amp; Kendrick) Karassilnikov, <i>Pseudomonas holci</i> Kendrick, <i>Pseudomonas japonica</i> Loehnis &amp; Hansen</p>	Y	Y (RNQP)	<b>Distribution:</b> Present in Canada and the US. Present in the UK (CABI 2022).	N
<p><i>Rhizobium rhizogenes</i> (Riker, Banfield, Wright, Keitt &amp; Sagen) Young, Kuykendall, Martinez-Romero, Kerr &amp; Sawada</p> <p>Hairy root</p> <p>Synonyms: <i>Agrobacterium rhizogenes</i> (Riker, Banfield, Wright, Keitt</p>	Y (suspected presence)	Y (RNQP as an <i>Agrobacterium</i> sp.)	<b>Distribution:</b> Present in Canada and the US (CABI 2022). Evidence for presence in the UK (Weller <i>et al.</i> 2000).	N

<p>&amp; Sagen) Conn, <i>Pseudomonas rhizogenes</i> Riker</p>				
<p><i>Rhizobium rubi</i> (Hildebrand) Young, Kuykendall, Martinez-Romero, Kerr &amp; Sawada</p> <p>Knotting of raspberry</p> <p>Synonyms: <i>Agrobacterium rubi</i> (Hildebrand) Starr &amp; Weiss, <i>Phytomonas rubi</i> Hildebrand</p>	Y	Y (RNQP as an <i>Agrobacterium</i> sp.)	<p><b>Distribution:</b> Present in Canada and the U.S. (CABI 2022). Recorded in the UK (BioImages 2000).</p>	N
<p><i>Xylella fastidiosa</i> Wells, Raju, Hung, Weisburg, Parl &amp; Beemer</p> <p>Synonym: <i>Xylella fastidiosa</i> subsp. <i>piercei</i> Schaad et al.</p>	N	Y (QP)	<p><b>Distribution:</b> Present in Canada and the US. Absent in the UK (CABI 2022).</p> <p><b>Biology:</b> This bacterium colonises the xylem vessels of host plants, of which there are over 300 (including olive, grapevine and oak). Symptoms of this disease are wilts, diebacks, stunts and leaf scorchs, though many hosts remain asymptomatic.</p> <p>The bacterium is spread by xylem-feeding insects such as the meadow spittlebug <i>Philaenus spumarius</i>, a very common species in the UK and Europe. Vector insects often only fly short distances, though wind can increase these distances, and are not active in winter months. The pathogen is maintained in the gut of the vector and adults need to feed on infected plants in order to acquire and transmit the pathogen (Defra 2022b).</p> <p><b>Importance worldwide:</b> This pathogen was originally restricted to the Americas with the exception of a single outbreak in Taiwan. In recent years though, it has spread to parts of Europe, such as Italy, Spain and France, and caused significant damage (Defra 2022b).</p> <p><b>Risk to the UK on this commodity:</b> This pest is regulated in the UK as a Quarantine Pest, which limits the risk of this pest</p>	N

			<p>spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices). There are also specific import requirements in place for <i>Vaccinium</i> plants to prevent <i>Xylella fastidiosa</i> entering the UK on this commodity.</p>	
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Oomycetes				
Pest name	Present in PRA area (Y/N)	Regulated in the UK (Y/N)	Supporting information	Categorization required (Y/N)
<p><i>Phytophthora cinnamomi</i> Rands</p> <p>Phytophthora dieback, crown and root rot of blueberry</p>	Y	Y (RNQP)	<p><b>Distribution:</b> Present in Canada and the US. Present in the UK (EPPO 2022c).</p>	N
<p><i>Pythium aphanidermatum</i> (Edson) Fitzpatrick</p> <p>Damping-off</p>	Y	N	<p><b>Distribution:</b> Present in Canada and the US. Present in the UK (CABI 2022).</p>	N
<p><i>Pythium irregulare</i> Buisman</p> <p>Cavity spot of carrot</p> <p>Synonym: <i>Globisporangium irregulare</i> (Buisman) Uzuhashi, Tojo &amp; Kakishima</p>	Y	N	<p><b>Distribution:</b> Present in Canada and the US. Present in the UK (EPPO 2022c).</p>	N
<p><i>Pythium splendens</i> H. Braun</p> <p>Root rot</p> <p>Synonym: <i>Globisporangium splendens</i> (H. Braun)</p>	Y	N	<p><b>Distribution:</b> Present in Canada and the US (AAFC 2019, GBIF 2022). Present in the UK (GBIF 2022).</p>	N

Uzuhashi, Tojo & Kakishima				
<i>Pythium sylvaticum</i> Campbell & Hendrix  Seedling rot of conifers  Synonym: <i>Globidsporangium sylvaticum</i> (W.A. Campbell & F.F. Hendrix) Uzuhashi, Tojo & Kakishima	Y	N	<b>Distribution:</b> Present in Canada and the US (CABI 2022). Present in the UK (CABI 2005).	N

Fungi				
Pest name	Present in PRA area (Y/N)	Regulated in the UK (Y/N)	Supporting information	Categorization required (Y/N)
<i>Alternaria alternata</i> (Fries) Keissler  Alternaria leaf spot  Synonym: <i>Alternaria tenuis</i> Nees	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (CABI 2022).	N
<i>Alternaria tenuissima</i> (Kunze) Wiltshire  Nailhead spot of tomato  Synonym: <i>Helminthosporium tenuissimum</i> Kunze	Y	N	<b>Distribution:</b> Present in Canada and the US (CABI 2022, Strik & Yarborough 2005). Believed to be present in the UK after infecting an immunosuppressed patient (Robertshaw & Higgins 2005).	N

<i>Arcopilus aureum</i> X. Wei Wang, Samson & Crous  Synonym: <i>Chaetomium aureus</i>	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (GBIF 2022).	N
<i>Armillaria cepistipes</i> Velenovský	Y	N	<b>Distribution:</b> Present in Canada (CPDS 2016). Present in the UK (GBIF 2022).	N
<i>Armillaria gallica</i> Marxmüller & Romagnesi  Bulbous honey fungus  Synonyms: <i>Armillaria bulbosa</i> (Barla) Kile & Watlin, <i>Armillaria lutea</i> Gillet	Y	N	<b>Distribution:</b> Present in Canada (CPDS 2021). Present in the UK (GBIF 2022).	N
<i>Armillaria mellea</i> (Vahl) Kummer  Honey fungus  Synonym: <i>Agaricus melleus</i> , <i>Armillariella mellea</i>	Y	Y (RNQP)	<b>Distribution:</b> Present in Canada, the US and the UK (CABI 2022).	N
<i>Armillaria ostoyae</i> (Romagnesi) Herink  Dark honey fungus  Synonym: <i>Armillariella ostoyae</i>	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (CABI 2022).	N
<i>Aspergillus niger</i> van Tieghem  Seed rot  Synonym: <i>Sterigmatocystis niger</i> van Tieghem	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (GBIF 2022).	N
<i>Aureobasidium pullans</i> (de Bary) Arnaud  Blue stain of wood  Synonyms: <i>Dematium pullulans</i> de Bary,	Y	N	<b>Distribution:</b> Present in Canada and the US (CABI 2022). Present in the UK (Ogilvie 1924).	N

<i>Pullularia pullulans</i> (de Bary) Berkhout				
<p><i>Botryosphaeria corticis</i> (Demaree &amp; M.S.Wilcox) von Arx &amp; E.Müller</p> <p>Dieback of blueberry, Botryosphaeria stem canker</p> <p>Synonym: <i>Physalospora corticis</i></p>	N	N	<p><b>Distribution:</b> Present in Canada and the US. Absent in the UK (CABI 2022, CPDS 2020).</p> <p><b>Biology:</b> Symptoms vary between blueberry varieties. On susceptible varieties, large swollen cankers develop with deep fissures and cracks. Cankers are absent or much smaller in less susceptible varieties. In severe cases, cankers may girdle or kill the stem (Milholland 1972, Polashock <i>et al.</i> 2017).</p> <p>Spores are released by this fungus during wet weather and spread by wind (Polashock <i>et al.</i> 2017). Temperature does affect sporulation and infection, with an optimum of 27 degrees. A constant low temperature of 16°C is sufficient to significantly restrict Botryosphaeria stem canker occurring in susceptible blueberry varieties and no fungal growth occurs at 10 degrees (Milholland 1972).</p> <p><b>Importance worldwide:</b> This disease has been one of the most important limitations of northern highbush blueberry production in parts of the US for around 80 years (Polashock <i>et al.</i> 2017). It has recently been reported in other countries, namely in Canada, China and French Guiana (CPDS 2020, GBIF 2022, Zhuang <i>et al.</i> 2021).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. Potential risk to blueberry production in the UK via plants for planting as infected propagative material, such as wood, can spread this pathogen (Polashock <i>et al.</i> 2017). Categorization needed to assess risk.</p>	Y
<p><i>Botryosphaeria dothidea</i> (Mougeot) Cesati &amp; de Notaris</p> <p>Gummosis of blueberry</p> <p>Synonyms: <i>Botryosphaeria</i></p>	Y	N	<p><b>Distribution:</b> Present in Canada, the US, and the UK (CABI 2022).</p>	N

<i>berengeriana</i> de Notaris  <i>Camarosporium dalmaticum</i> Zachos & Tzavella-Klonari				
<i>Botrytis cinerea</i> Persoon  Grey mould, damping-off  Synonyms: <i>Botryotinia fuckeliana</i> (de Bary) Whetzel, <i>Sclerotinia fuckeliana</i> (de Bary) Fuckel	Y	Y (RNQP)	<b>Distribution:</b> Present in Canada and the US (CABI 2022). Present in the UK (Defra 2022a).	N
<i>Broomella acuta</i> Shoemaker & Müller  Synonyms: <i>Stilbospora angustata</i> Persoon, <i>Truncatella angustata</i> (Persoon) Hughes	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (AAFC 2019, GBIF 2022).	N
<i>Calcarisporium arbuscula</i> Preuss  Synonyms: <i>Calcarisporium antibioticum</i> Haller & Loeffler, <i>Cladobotryum elegans</i> G. Arnaud	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (GBIF 2022).	N
<i>Chaetomium globosum</i> Kunze  Antagonist of <i>Venturia</i>  Synonym: <i>Chaetomium olivaceum</i> Cooke & Ellis	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (GBIF 2022).	N
<i>Chondrostereum purpureum</i> (Persoon) Pouzar  Silver leaf disease  Synonyms: <i>Stereum purpureum</i> Persoon,	Y	Y (RNQP)	<b>Distribution:</b> Present in Canada, the US and the UK (CABI 2022).	N

<i>Thelephora purpurea</i> (Persoon) Persoon				
<i>Cladosporium herbarum</i> (Persoon) Link  Black mould of cereals  Synonyms: <i>Cladosporium graminum</i> Corda, <i>Davidiella tassiana</i> (de Notaris) Crous & Braun	Y	N	<b>Distribution:</b> Present in Canada, the US, and the UK (GBIF 2022).	N
<i>Clonostachys rosea</i> (Link) Schroers, Samuels, Seifert & Gams  Tuber rot of potato  Synonyms: <i>Penicillium roseum</i> Link, <i>Gliocaldium roseum</i> Bainier	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (CABI 2022).	N
<i>Colletotrichum acutatum</i> J. H. Simmonds  Anthracnose of strawberry  Synonyms: <i>Colletotrichum xanthii</i> Halsted, <i>Glomerella acutata</i> J. C. Guerber & J. C Correll	Y	Y (RNQP)	<b>Distribution:</b> Present in Canada and the US. Present in the UK (EPPO 2022c).	N
<i>Colletotrichum gloeosporioides</i> (Penzig) Penzig & Saccardo  Bitter rot  Synonyms: <i>Colletotrichum gloeosporioides</i> f.sp.	Y	Y (RNQP)	<b>Distribution:</b> Present in Canada (CABI 2022). Present in the UK (Defra 2022a).	N

<i>malvae, Glomerella cingulata</i>				
<i>Cytospora ceratosperma</i> (Tode) G.C Adams & Rossman  Canker of apple  Synonyms: <i>Cytospora sacculus</i> (Schweinitz) Gvritshvili, <i>Sphaeria ceratosperma</i> Tode	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (EPPO 2022c).	N
<i>Cytospora ceratosperma</i> (Tode) G.C. Adams & Rossman  Canker of apple  Synonyms: <i>Cytospora sacculus</i> (Schweinitz) Gvritshvili, <i>Sphaeria ceratosperma</i> Tode	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (EPPO 2022c).	N
<i>Diaporthe rudis</i> (Fries) Nitschke  Synonyms: <i>Phomopsis rudis</i> (Saccardo) Höhn, <i>Diaporthe macrostoma</i> Nitschke	Y	N	<b>Distribution:</b> Present in Canada (Guarnaccia <i>et al.</i> 2020). Present in the UK (Cannon 2011).	N
<i>Didymella glomerata</i> (Corda) Q. Chen & L. Cai  Blight of grapevine  Synonyms : <i>Coniothyrium glomeratum</i> Corda, <i>Phoma glomerata</i> (Corda) Wollenweber & Hochapfel	Y	N	<b>Distribution:</b> Present in Canada and the UK (AAFC 2019, GBIF 2022).	N
<i>Discostroma corticola</i> (Fuckel) Brockman  Fungal canker: rose	Y	N	<b>Distribution:</b> Present in Canada, the US, and the UK (GBIF 2022).	N

Synonyms: <i>Clathridium corticola</i> (Fuckel) Shoem. & E.Müller				
<i>Discostroma fuscellum</i> Twig canker of blueberry Synonym: <i>Sporocadus lichenicola</i>	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (CABI 2011).	N
<i>Exobasidium maculosum</i> M.T. Brewer Exobasidium leaf and fruit spot	N	N	<p><b>Distribution:</b> Present in the US and in Canada (Stewart <i>et al.</i> 2015). No record of presence in the UK.</p> <p><b>Biology:</b> Fruit and the upper side of leaves develop unsightly green spots and the affected fruit tissue is tough and chewy, preventing the sale of the fruit. Spots are white on the underside of infected leaves. Girdling and blighting could also occur on emerging shoots (Ingram <i>et al.</i> 2017). Crop losses of up to 60% have been reported (Cline <i>et al.</i> 2014).</p> <p>After maturation, spots produce basidiospores which are believed to enable long-distance dispersal of this fungus. Germination of these basidiospores produce yeast-like conidia that oversummer and overwinter on blueberry bushes and then serve as the primary inoculum.</p> <p>Infection is boosted by rainfall. It may also be limited by high temperatures, as is common for members of <i>Exobasidium</i> species (Ingram <i>et al.</i> 2017).</p> <p><b>Importance worldwide:</b> <i>E. maculosum</i> was recently identified in 2014. It has only impacted southern US states, where it has caused significant economic losses (Smith 2012). A report has identified this fungus on blueberry leaves in Canada (Jewell <i>et al.</i> 2021, Stewart <i>et al.</i> 2015). It has also been found in South Africa and Poland but not on blueberry plants (Behnke-Borowczyk <i>et al.</i> 2021, GBIF 2022).</p>	Y

			<p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. Potential risk to blueberry production in the UK. Plants for planting seems a likely pathway for entry to the UK. Categorization needed to assess phytosanitary risk.</p> <p><b>Taxonomy notes:</b> Previously confused with <i>Exobasidium vaccinii</i>. There was some debate of identity of this pathogen on lowbush blueberry, eventually it was confirmed to be <i>E. maculosum</i> (Stewart <i>et al.</i> 2015).</p>	
<p><i>Exobasidium vaccinii</i> (Fuckel) Woronin</p> <p>Leaf gall of blueberry, red leaf disease</p> <p>Synonym: <i>Exobasidium vaccinii</i> var. <i>vaccinii</i> (Fuckel) Woronin</p>	Y	Y (RNQP)	<p><b>Distribution:</b> Present in Canada and the US (CABI 2022). Present in the UK (Ing 1999).</p>	N
<p><i>Fusarium oxysporum</i> Schlechtendahl</p> <p>Basal rot</p> <p>Synonym: <i>Fusarium oxysporum</i> var. <i>orthocerus</i></p>	Y	N	<p><b>Distribution:</b> Present in Canada, the US and the UK (CABI 2022).</p>	N
<p><i>Gibbera vaccinicola</i> M.E. Barr</p> <p>Gibbera twig blight</p> <p>Synonym: <i>Dothidella vacciniicola</i></p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (Barr 1968, CPDS 2008). Absent from the UK.</p> <p><b>Biology:</b> Black, raised, cushion-shaped fruiting bodies form on twigs and stems. These fruiting bodies can occur on their own or in groups and have a red outline (Miles <i>et al.</i> 2020).</p> <p>Spores are released during rainy periods. Unfortunately, few other details on the epidemiology of this fungus are known (Polashock <i>et al.</i> 2017). Fruit yield may be reduced and twigs may be pre-disposed to winter injury or even killed following the</p>	Y

			<p>development of girdling cankers (Miles <i>et al.</i> 2020).</p> <p><b>Importance worldwide:</b> Appears to have a limited impact in eastern North America. Up to 40% twig and stem dieback has been reported on one variety (Moore 2016). However, few details are known about the epidemiology of this pathogen. This disease has only been reported on a few varieties of blueberry (ENYCH 2015, Polashock <i>et al.</i> 2017).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. Potential risk to blueberry production in the UK. Categorization needed to assess phytosanitary risk.</p>	
<p><i>Gloeosporium minus</i> Shear</p> <p>Gloeosporium leaf spot and stem canker, dieback of blueberry</p> <p>Synonym: <i>Gloeosporium myrtilli</i></p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (Hildebrand &amp; Nickerson 1989, Milholland 1974). No record of presence in the UK.</p> <p><b>Biology:</b> Symptoms are dark-red lesions surrounding leaf scars and flower buds on the stem of young shoots. Over time, cankers get bigger and the stems turn brown, then grey, then die, causing severe dieback on the plant (Milholland 1974). Large brown lesions and red flecks can also develop on the leaves and severe defoliation can occur. Finally, <i>G. minus</i> can cause serious fruit rot (Milholland 1970).</p> <p>Spore production and canker development is affected by temperature with an optimum temperature of 25-30°C. Some lesions were able to develop at 15°C, but no fruiting structures formed at this temperature (Milholland 1974). No fungal growth occurred at 6°C (Milholland 1970). Spores are dispersed by rain splash and overwinter in infected tissues (MSU Unknown).</p> <p><b>Importance worldwide:</b> Described as the most serious foliar disease of highbush blueberry in parts of the US (Polashock <i>et al.</i> 2017). However, no reports of significant damage could be found from</p>	Y

			<p>Canada or from its introduced range, in Estonia and Turkey (Hildebrand &amp; Nickerson 1989, Huseyinov &amp; Selçuk 2001, Pisek <i>et al.</i> 2015). Hildebrand and Nickerson (1989) also note that this disease is rarely found on the lowbush blueberry in Canada.</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. Potential risk to blueberry production in the UK. Categorization needed to assess phytosanitary risk.</p>	
<p><i>Godronia cassandrae</i> Peck</p> <p>Godronia canker</p> <p>Synonyms: <i>Dothiopsis myrtilli</i> Feltgen, <i>Fusicoccum petrefaciens</i> Shear</p>	Y	Y (RNQP)	<p><b>Distribution:</b> Present in Canada and the US. Reported in the UK in the 1960s (CABI 2022).</p>	N
<p><i>Hamigera striata</i> (Raper &amp; Fennell) Stolk &amp; Samson</p> <p>Synonyms: <i>Penicillium striatum</i>, <i>Talaromyces striatus</i></p>	N	N	<p><b>Distribution:</b> Present in Canada (Kikoku <i>et al.</i> 2008). No record of presence in the UK.</p> <p><b>Biology:</b> This mold was identified from frozen blueberry fruit and no record was found of it attacking plants. Little information was provided on its biology, though it was noted to be heat-resistant and present in soils (Kikoku <i>et al.</i> 2008, Sugiyama 2012).</p> <p><b>Importance worldwide:</b> Reported as being a rather rare fungus (Sugiyama 2012).</p> <p><b>Risk to the UK on this commodity:</b> Only appears to impact blueberry fruit. Little information can be found on this fungus (Kikoku <i>et al.</i> 2008).</p>	N
<p><i>Ilyonectria destructans</i> (Zinssmeister) Rossmann, L. Lombard &amp; Crous</p> <p>Cortical root rot</p> <p>Synonyms: <i>Cylindrocarpon</i></p>	Y	N	<p><b>Distribution:</b> Present in Canada, the US, and the UK (GBIF 2022).</p>	N

<i>destructans</i> (Zinssmeister) Schloten, <i>Nectria radicola</i> Gerlach & L. Nilsson				
<i>Lasiodiplodia theobromae</i> (Patouillard) Griffon & Maublanc  Foot rot  Synonyms: <i>Botryodiplodia elasticae</i> Petch, <i>Botryodiplodia gossypii</i> Ellis & Bartholomew, <i>Botryodiplodia theobromae</i>	Y	N	<b>Distribution:</b> Present in Canada and the US (CABI 2022). Present in the UK (GBIF 2022).	N
<i>Macrophomina phaseolina</i> (Tassi) Goidanich  Charcoal rot of bean  Synonyms: <i>Botryodiplodia phaseoli</i> (Maublanc) Thirumalachar, <i>Dothiorella cajani</i> Sydow & Butler	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (CABI 2022).	N
<i>Marquandomyces marquandii</i> (Masse) Samson, Houbraken & Luangsa-ard  Synonyms : <i>Paecilomyces marquandii</i> (Masse) Hughes, <i>Spicaria violacea</i> Abbott	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (AAFC 2019, GBIF 2022).	N
<i>Microsphaera vaccinii</i> (Schweinitz) Cooke & Peck  Blueberry powdery mildew	N	N	<b>Distribution:</b> Present in Canada and the US (Parmelee 1977). No record of presence in the UK.  <b>Biology:</b> Across the upper surface, leaves may pucker, develop mycelium or yellow-	N

<p>Synonym: <i>Erysiphe vaccinii</i> Schweinitz, <i>Microsphaeraalni</i> var. <i>vaccinii</i>, <i>Microsphaera penicillata</i></p>			<p>red spots. Water-soaked spots form on the lower surface of the leaf. Premature defoliation may also occur in cases of heavy infection (Polashock <i>et al.</i> 2017).</p> <p><b>Importance worldwide:</b> Powdery mildew is present at economically insignificant levels in most blueberry orchards in the US (Prodorutti <i>et al.</i> 2007). Damage from this pest is normally very slight. However, the disease can be very serious in some cases (Polashock <i>et al.</i> 2017).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. However, this pest was not chosen for a categorization under the recommendation that plants should be dormant and without leaves when imported into the UK.</p>	
<p><i>Monilinia vaccinii-corymbosi</i> (Reade) Honey</p> <p>Mummy disease of blueberry, Monilinia twig and blossom blight</p> <p>Synonym: <i>Monilinia vaccinii</i> (Voronin) Whetzel, <i>Sclerotinia vaccinii-corymbosi</i> Reade</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (CABI 2022). No record of presence in the UK.</p> <p><b>Biology:</b> Symptoms include shoot blight, flower blight and fruit mummification (where the infected fruit turns whitish gray, shrivels and hardens, and then drops off), all of which results in yield losses (Polashock <i>et al.</i> 2017). The fungus can also be identified from the leaves (Munda 2011).</p> <p><i>Monilinia vaccinii-corymbosi</i> overwinters on mummified fruit that falls on the ground under infected plants. In spring, ascospores are released and cause primary infection in buds (Munda 2011). Insect pollinators and wind then enable the spread of asexual spores (macroconidia) to healthy flowers (Batra &amp; Batra 1985). Infected or dead twigs can also serve as inoculum (Gosch 2003).</p> <p><b>Importance worldwide:</b> Mummy berry is listed among pathogens that have the greatest economic impact on blueberry production in North America, where it is widespread. It has also spread to at least 3 EU countries, including Austria and</p>	Y

			<p>Slovenia, with severe damage incurring (Gosch 2003, Munda 2011, Suffert <i>et al.</i> 2015).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. Potential risk to blueberry production in the UK. Long distance spread from North America is believed to be via infected planting material (Munda 2011). Categorization is needed to assess phytosanitary risk.</p>	
<p><i>Naohidemyces vaccinii</i> (Jørstad) S. Sato, Katsuya &amp; Y. Hiratsuka ex Vanderweyen &amp; Fraiture</p> <p>Blueberry rust</p> <p>Synonyms: <i>Melampsora vaccinii</i> Winter, <i>Thekopsora vaccinii</i> (Jørstad) Hiratsuka, <i>Pucciniastrum myrtilli</i> (Winter) Jørstad, <i>Pucciniastrum vaccinii</i></p>	Y	N	<p><b>Distribution:</b> Present in Canada and the US (Nelson 2008). Present in the UK (NBN 2021).</p>	N
<p><i>Nectria cinnabarina</i> (Tode) Fries</p> <p>Canker of apples</p> <p>Synonyms: <i>Sphaeria cinnabarina</i> Tode, <i>Tubercularia vulgaris</i> Tode</p>	Y	N	<p><b>Distribution:</b> Present in Canada, the US and the UK (CABI 2011).</p>	N
<p><i>Neofusicoccum parvum</i> (Pennycook &amp; Samuels) Crous, Slippers &amp; Phillips</p> <p>Dieback of Myrtaceae</p> <p>Synonym: <i>Botryosphaeria parva</i> Pennycook &amp; Samuels</p>	Y	N	<p><b>Distribution:</b> Present in Canada and the US (CABI 2022, CPDS 2013). Present in the UK (Defra 2022a).</p>	N

<i>Oidiodendron griseum</i> Robak	Y	N	<b>Distribution:</b> Present in Canada and the US (AAFC 2019, GBIF 2022). Present in the UK (GBIF 2022).	N
<i>Oidiodendron tenuissimum</i> (Peck) S. Hughes  Synonym: <i>Oidiodendron fuscum</i> Robak	Y	N	<b>Distribution:</b> Present in Canada (AAFC 2019). Present in the UK (GBIF 2022).	N
<i>Paecilomyces variotii</i> Bainier	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (AAFC 2019, GBIF 2022).	N
<i>Penicillium glabrum</i> (Wehmer) Westling  Synonym: <i>Penicillium frequentans</i> Westling	Y	N	<b>Distribution:</b> Present in Canada and the UK (GBIF 2022).	N
<i>Phaciidiopycnis tuberivora</i> (Güssow & W. R. Foster) B. Sutton  Dry rot of potato  Synonym: <i>Phomopsis tuberivora</i> Güssow & W. R. Foster	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (CABI 1998a).	N
<i>Diaporthe vaccinii</i> Shear  Blight of blueberry  Synonym: <i>Phomopsis vaccinii</i> Shear	N	Y (QP in GB, RNQP in NI)	<b>Distribution:</b> Present in Canada and the US. Absent in the UK (EPPO 2022c).  <b>Biology:</b> Following infection, this fungus can kill blueberry plants within a few months. Infected new shoots wilt and form long, narrow cankers often covered by bark or epidermis. <i>D. vaccinii</i> then spreads down through the stem, killing main branches or whole plants. Leaves turn yellow-red before they wilt. Any infected fruits turn reddish-brown and soft, often leading to fruit rot (Milholland & Daykin 1983, Weingartner & Klos 1975).  <i>Diaporthe vaccinii</i> overwinters on infected blueberry twigs and potentially plant debris (twigs, leaves, fruit) on the soil surface. This material then provides primary	N

			<p>inoculum in the form of conidia (EFSA 2017). Spore dispersal can occur via wind and water but mostly occurs over short distances.</p> <p><b>Risk to the UK on this commodity:</b> Plants for planting, particularly potted plants and cuttings, pose the greatest risk of spreading the fungus (EFSA 2017). However, this pest is regulated in GB as a Quarantine Pest<sup>4</sup> and in NI as a Regulated Non-Quarantine Pest<sup>5</sup>, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices). There are specific import requirements in place for <i>Vaccinium</i> plants for planting to prevent the entry of this pest.</p>	
<p><i>Phyllosticta vaccinii</i> Wikee, Crous, K.D. Hyde &amp; McKenzie</p> <p>Cranberry early rot, phyllosticta leaf spot and fruit rot</p> <p>Synonyms: <i>Botryosphaeria vaccinii</i>, <i>Guignardia vaccinii</i>, <i>Phyllostictina vaccinii</i></p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (Creelman 1967, Farr &amp; Rossman 2022). Believed to be absent from the UK.</p> <p><b>Biology:</b> Lesions develop on leaves (usually small, circular spots with a brown-purple perimeter with a grey centre) and on fruit (circular, grey-brown, hard lesions) where pycnidia develop (Creelman 1967, Polashock <i>et al.</i> 2017). Partial defoliation can also occur (Creelman 1967).</p> <p>Historically, up to 90% infestation levels have been observed on certain blueberry varieties (Creelman 1967). On <i>Vaccinium macrocarpon</i> (cranberry), the fungus is thought to overwinter on leaves and stems.</p> <p>On culture, the growth of <i>P. vaccinii</i> was slow at 24°C and optimal at 28°C (Weidemann <i>et al.</i> 1982). Higher disease incidence has been noted in cranberry after an incubation treatment of 28°C, suggesting that higher temperatures benefit infection (Weidemann &amp; Boone</p>	Y

			<p>1983). Studies on cranberry have also shown that fungal spores are released during wet weather and spread by rain (Sabaratnam <i>et al.</i> 2014). Unfortunately, very little is known about the epidemiology of this fungus on blueberry plants.</p> <p><b>Importance worldwide:</b> Chiefly been reported in the US, though potentially found in Turkey. Not considered a major pathogen in commercial production of blueberry and very little is known about the disease cycle on blueberries. It causes a major disease on cranberries (Dil <i>et al.</i> 2013, Zhang <i>et al.</i> 2013).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. This fungus has previously been introduced into new areas on planting stock, therefore it is possible this could happen in the UK. Phytosanitary risk to be assessed with a categorization.</p> <p><b>Taxonomy notes:</b> In the past, there was some debate over whether the fungi <i>Phyllosticta vaccinii</i> and <i>Guignardia vaccinii</i> were the same species and that <i>G. vaccinii</i> was the sexual reproductive stage of <i>P. vaccinii</i>. With the use of phylogenetic analysis, this theory has now been refuted.</p>	
<p><i>Physalospora vaccinii</i> (Shear) von Arx &amp; E.Müller</p> <p>Blotch rot of cranberry</p> <p>Synonym: <i>Acanthorhynchus vaccinii</i> Shear</p>	Y	N	<p><b>Distribution:</b> Present in Canada, the US and the UK (GBIF 2022).</p>	N
<p><i>Pithoascus intermedius</i> (Emmons &amp; Dodge) Arx</p> <p>Synonym: <i>Micoascus intermedius</i> Emmons &amp; Dodge, <i>Pithoascus nidicola</i> (Masse &amp; E.S.Salmon) Arx</p>	Y	N	<p><b>Distribution:</b> Present in Canada and the US (GBIF 2022, Gourley &amp; Nickerson 1979). Present in the UK (NBN 2021).</p>	N

<p><i>Podosphaera myrtillina</i> Kunze</p> <p>Powdery mildew of Vaccinium</p> <p>Synonym: <i>Podosphaera myrtillina</i> var. <i>myrtillina</i> (Schubert) Kunze, <i>Podosphaera myrtilli</i> Dufrénoy</p>	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (CABI 1998b).	N
<p><i>Protoventuria myrtilli</i> (Cooke)</p> <p>Synonym: <i>Gibbera myrtilli</i></p>	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (CABI 2016).	N
<p><i>Pucciniastrum goeppertianum</i> (J.G. Kühn) Klebahn</p> <p>Witches' broom rust of blueberry</p> <p>Synonym: <i>Calyptospora goeppertiana</i> J. G. Kühn</p>	Y	N	<b>Distribution:</b> Present in Canada and the US. Found in the UK on <i>Abies</i> spp. (firs) (Polashock <i>et al.</i> 2017).	N
<p><i>Rhizoctonia solani</i> Kühn</p> <p>Fruit rot</p> <p>Synonyms: <i>Botryobasidium solani</i> (Prillieux &amp; Delacroix) Donk, <i>Corticium areolatum</i> Stahel, <i>Thanatephorus cucumeris</i> (A. B. Frank) Donk</p>	Y	Y (RNQP)	<b>Distribution:</b> Present in Canada, the US and the UK (GBIF 2022).	N
<p><i>Rhizopus stolonifera</i> (Ehrenberg) Vuillemin</p> <p>Fruit rot</p> <p>Synonym : <i>Rhizopus nigricans</i> Ehrenberg</p>	Y	N	<b>Distribution:</b> Present in Canada and the US (CABI 2022, CPDS 2015). Present in the UK (GBIF 2022).	N

<p><i>Sclerotinia sclerotiorum</i> (Libert) de Bary</p> <p>Cottony soft rot</p> <p>Synonyms: <i>Peziza sclerotiorum</i> Libert, <i>Sclerotinia libertiana</i> Fuckel</p>	Y	Y (RNQP)	<p><b>Distribution:</b> Present in Canada, the US, and the UK (CABI 2022).</p>	N
<p><i>Sordaria fimicola</i> (Roberge ex Desmazières) Cesati &amp; de Notaris</p> <p>Synonym: <i>Sphaeria fimicola</i> Roberge ex Desmazières</p>	Y	N	<p><b>Distribution:</b> Present in Canada, the US and the UK (GBIF 2022).</p>	N
<p><i>Sphaerulina vaccinia</i> Ali, Hildebrand &amp; Abbasi</p> <p>Sphaerulina leaf spot and stem canker</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (Ali <i>et al.</i> 2021). Believed to be absent in the UK though no surveys have been conducted.</p> <p><b>Biology:</b> Initially, small water-soaked spots appear on the underside of leaves. Over time, irregular, red-brown spots appear on the upper surface and causes leaf and fruit drop, resulting in yield loss by up to 16%. Red-purple spots also develop on stems a year later that then enlarge and turn brown (Abbasi <i>et al.</i> 2022, Ali <i>et al.</i> 2021).</p> <p>Primary inoculum originates from pycnidia on overwintered leaves and cankers on fruiting stems (Ali <i>et al.</i> 2021). Spores are spread via rain splash and therefore does not spread over long distances (Hildebrand <i>et al.</i> 2010). Infection is aided by a high, constant humidity and moderately high temperature (20-25°C - infection failed to occur at 30°C) (Abbasi <i>et al.</i> 2022, Ali <i>et al.</i> 2021).</p> <p><b>Importance worldwide:</b> This pathogen has only been recently identified in 2021. It was found in certain areas of Canada and the US where it causes significant yield losses. Fortunately fungicides can help to control this disease (Ali <i>et al.</i> 2021),</p>	Y

			<p>although they may not be registered for their use on blueberries in either GB or NI.</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. Potential risk to blueberry production in the UK. The movement of infected plants or plant parts appear to be pathways, given that stems and leaves can be infected. Categorization is needed to assess phytosanitary risk.</p> <p><b>Taxonomy notes:</b> Previously confused with <i>Septoria</i> species.</p>	
<p><i>Stagonosporopsis cucurbitacearum</i> (Fries) Aveskamp, Gruyter &amp; Verkley</p> <p>Black rot of cucumber</p> <p>Synonyms: <i>Ascochyta citrullina</i> (Chester) Smith, <i>Cercospora citrullina</i> Cooke, <i>Didymella bryoniae</i> (Fuckel) Rehm</p>	Y	N	<p><b>Distribution:</b> Present in Canada, the US, and the UK (CABI 2022).</p>	N
<p><i>Terriera cladophila</i> (Lév.) B.Erikss.</p> <p>Synonym : <i>Hysterium cladophilum</i> Lév.</p>	Y	N	<p><b>Distribution:</b> Present in Canada and the UK (AAFC 2019, GBIF 2022).</p>	N
<p><i>Thekopsora minima</i> (Arthur) Sydow &amp; P. Sydow</p> <p>Blueberry rust</p> <p>Synonyms: <i>Peridermium peckii</i> Thümen, <i>Pucciniastrum minimum</i> (Schweinitz) Arthur</p>	Y	Y (RNQP in GB, unregulated in NI)	<p><b>Distribution:</b> Present in Canada, the US, and the UK (EPPO 2022c).</p>	N
<p><i>Trichoderma koningii</i> Oudemans</p>	Y	N	<p><b>Distribution:</b> Present in Canada and the UK (AAFC 2019, GBIF 2022).</p>	N

<i>Trichoderma viride</i> Persoon  Fruit rot of citrus  Synonyms: <i>Hypocrea rufa</i> (Persoon) Fries, <i>Trichoderma lignorum</i> (Tode) Harz	Y	N	<b>Distribution:</b> Present in Canada and the UK (AAFC 2019, GBIF 2022).	N
<i>Valdensinia heterodoxa</i> Peyronel	Y	N	<b>Distribution:</b> Present in Canada and the US (Annis 2009). Present in the UK (Mulencko & Woodward 1996).	N
<i>Venturia inaequalis</i> (Cooke) Winter  Black spot of apple  Synonyms: <i>Cladosporium dendriticum</i> , <i>Fusicladium pomi</i> (Fries) Lind	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (CABI 2022).	N
<i>Verticillium dahliae</i> Klebahn  Verticillium wilt  Synonyms: <i>Verticillium ovatum</i> Berk. & Jacks., <i>Verticillium tracheiphilum</i> Curzi	Y	Y (RNQP)	<b>Distribution:</b> Present in Canada, the US and the UK (EPPO 2022c).	N

Viruses				
Pest name	Present in PRA area (Y/N)	Regulated in the UK (Y/N)	Supporting information	Categorization required (Y/N)
<i>Blueberry fruit drop-associated virus</i>  BFDaV, blueberry fruit drop disease	N	N	<b>Distribution:</b> Present in Canada and the US (Diaz-Lara & Martin 2016b). No record of presence in the UK.  <b>Biology:</b> Symptoms of this virus include the reddening of young leaves and flowers, and the development of smaller fruit that then	Y

			<p>drops several weeks before harvest. Infected bushes drop nearly 100% of their fruit when the berries are about 3 to 5 mm in diameter. As time passes, the leaves return to their normal colour. Without fruit, these plants stand noticeably upright (Martin <i>et al.</i> 2006).</p> <p>The method of viral establishment and spread is not currently known. All recent attempts of mechanical transmission have failed, though blueberry fruit drop disease could be transmitted to other blueberry plants via grafting (Diaz-Lara &amp; Martin 2016a, Martin <i>et al.</i> 2008). Given that most Caulimoviridae viruses are transmitted by insect vectors, it is possible that this virus could be similarly transmitted (Alfredo Diaz-Lara, Tecnológico de Monterrey, pers. comm., May 05, 2022). However, spread appears to be very limited (Martin &amp; Tzanetakis 2018).</p> <p><b>Importance worldwide:</b> This virus has a very limited distribution, only reported in one county in the US and in British Columbia, Canada (Martin &amp; Tzanetakis 2018).</p> <p><b>Risk to the UK on this commodity:</b> It is likely that plants for planting is the highest risk pathway for this virus. This pest is not regulated in the UK. A categorization is needed to assess phytosanitary risk.</p>	
<p><i>Blueberry leaf mottle virus</i></p> <p>BLMoV</p> <p>Synonym: <i>Blueberry leaf mottle nepovirus</i></p>	N	Y (QP)	<p><b>Distribution:</b> Present in Canada and the US. Absent in the UK (EPPO 2022c).</p> <p><b>Biology:</b> Plants may remain symptomless after infection for up to four years, but eventual symptoms include mottling, stem dieback, leaf distortion, and significant yield losses (EPPO No date-a, Ramsdell &amp; Stace-Smith 1979).</p> <p>This virus is transmitted by infected seeds and pollen, the latter requiring bees and other pollinators for local spread (Childress &amp; Ramsdell 1986).</p>	N

			<p><b>Risk to the UK on this commodity:</b> The highest risk pathway would be via infected vegetative propagating stock. Regulated in the UK as a Quarantine Pest, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices).</p>	
<p><i>Blueberry mosaic associated virus</i></p> <p>BIMaV</p> <p>Synonym: Blueberry mosaic associated ophiovirus</p>	N	Y (RNQP)	<p><b>Distribution:</b> Present in Canada and the US. Absent in the UK (Defra 2022a, Thekke-Veetil <i>et al.</i> 2015).</p> <p><b>Biology:</b> After infection, there can be a long latent period before symptoms appear. Mild to brilliant yellow, yellowish green or pink mottle and mosaic patterns can develop on a few leaves that spread to most of the canopy (Thekke-Veetil <i>et al.</i> 2014). Blueberry mosaic disease may also cause late ripening, reduced yield, and poor berry quality (Ramsdell &amp; Stace-Smith 1979). Infected plants exhibiting an asymptomatic period have also been identified (Thekke-Veetil <i>et al.</i> 2014).</p> <p>Spread by the spores of a fungus, <i>Oplidium virulentus</i>, on infected roots (Shands <i>et al.</i> 2017, Thekke-Veetil <i>et al.</i> 2014)</p> <p><b>Risk to the UK on this commodity:</b> Regulated in the UK as a Regulated Non-Quarantine Pest, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices). Plants for planting appears to be the most likely pathway (Shands <i>et al.</i> 2017, Thekke-Veetil <i>et al.</i> 2014).</p>	N
<p><i>Blueberry red ringspot virus</i></p> <p>BRRV</p> <p>Synonyms: blueberry red ringspot caulimovirus, blueberry red ringspot soymovirus</p>	N	Y (RNQP)	<p><b>Distribution:</b> Present in the US, single finding in Canada (Arocha-Rosete <i>et al.</i> 2019). Absent in the UK (CABI 2022).</p> <p><b>Biology:</b> Following infection, red rings or blotches would develop on new growth of the plant in early to late summer and on the older leaves in the autumn (Schilder &amp; Miles 2008). There may be a latency period where no disease is shown (Saad <i>et al.</i></p>	N

			<p>2020). The impacts on each cultivar vary. Overall, the negative impacts of this pest appear limited (Williford <i>et al.</i> 2016).</p> <p>BRRV may also be spread by a member of the family <i>Pseudococcidae</i> (mealybugs), but there is no certainty around this (Schilder &amp; Miles 2008).</p> <p><b>Risk to the UK on this commodity:</b> Regulated in the UK as a Regulated Non-Quarantine Pest, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices). Spread can be spread by vegetative propagation, such as grafting diseased cuttings on to healthy plants (Saad <i>et al.</i> 2020).</p>	
<p><i>Blueberry scorch virus</i> BIScV Synonym: Blueberry scorch carlavirus</p>	N	Y (QP in GB, RNQP in NI)	<p><b>Distribution:</b> Present in Canada and US. Absent in the UK (EPPO, 2022).</p> <p><b>Biology:</b> Symptoms develop in the first or second year after infection. Sensitive cultivars suffer complete blighting of flowers, shoots and young leaves, and chlorosis. Yield was reduced by more than 85% in one cultivar. By contrast, tolerant cultivars exhibit no symptoms.</p> <p>Aphids such as <i>Ericaphis fimbriata</i> transmit this virus (Bristow <i>et al.</i> 2000) short distances.</p> <p><b>Risk to the UK on this commodity:</b> Long-distance spread occurs by infected propagative material. <i>Blueberry scorch virus</i> is regulated in GB as a Quarantine Pest and in NI as a Regulated Non-Quarantine Pest, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices).</p>	N
<p><i>Blueberry shock virus</i> BIShV</p>	N	Y (RNQP)	<p><b>Distribution:</b> Present in Canada and the US. Absent in the UK (Defra 2022a).</p>	N

<p>Synonym: Blueberry shock necrotic virus</p>			<p><b>Biology:</b> Following this infection there may be a period of 1-2 years with hosts showing no sign of disease (Bristow &amp; Martin 1999).</p> <p>Symptoms begin to develop during early summer, with foliage, young shoots and flowers becoming suddenly blighted and leaves falling prematurely (Gottula <i>et al.</i> 2012). This leads to general dieback, death of blossoms and subsequent yield losses with reports of up to 90%. However, these dramatic symptoms can be followed by a new flush of growth or the return to full health.</p> <p>This virus is transmitted by infected pollen, requiring bees and other pollinators for local spread (Bristow &amp; Martin 2002).</p> <p><b>Risk to the UK on this commodity:</b> Regulated in the UK as a Regulated Non-Quarantine Pest, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices). Spread can occur via infected vegetative propagating stock (Bristow &amp; Martin 2002).</p>	
<p><i>Blueberry shoestring sobemovirus</i>  BSSV</p>	<p>N</p>	<p>Y (QP in GB, RNQP in NI)</p>	<p><b>Distribution:</b> Present in Canada and the US. Absent in the UK (CABI 2022).</p> <p><b>Biology:</b> Infected plants develop narrow, leaves which may become curved and turn partly or entirely red. Some leaves may display a reddish 'oak leaf' pattern along the major veins and red streaks on stems. Flowers may have a pink tinge or develop reddish streaks, and developing fruit remains reddish purple instead of turning blue. Symptoms may be restricted to a few shoots or affect the entire plant with infected plants becoming stunted and weak over time. This can leave them vulnerable to environmental or mechanical damage as well as attack from other pests and diseases (Isaacs <i>et al.</i> 2008).</p> <p>The pathogen is transmitted by cuttings and by the blueberry aphid <i>Illinoia pepperi</i>,</p>	<p>N</p>

			<p>which can fly between plants, though most movement is within a single plant (Isaacs <i>et al.</i> 2008, Morimoto <i>et al.</i> 1985). Although symptoms may take between two and four years to show, the disease has resulted in severe losses due to reductions in yield and bush decline in the US (Isaacs <i>et al.</i> 2008).</p> <p><b>Risk to the UK on this commodity:</b> This pest can spread long distances by infected plants for planting. <i>Blueberry shoestring sobemovirus</i> is regulated in GB as a Quarantine Pest and in NI as a Regulated Non-Quarantine Pest, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices).</p>	
<p><i>Peach rosette mosaic virus</i></p> <p>PRMV</p> <p>Synonym: Peach rosette mosaic nepovirus</p>	N	Y (QP)	<p><b>Distribution:</b> Present in Canada and the US (EPPO 2022c). Absent in the UK (Defra 2022a).</p> <p><b>Biology:</b> Blueberry leaves are distorted and not uniformly distributed over the entire plant. No twig or fruit symptoms were observed. Impact on yield is unknown (Ramsdell &amp; Gillett 1981).</p> <p><b>Risk to the UK on this commodity:</b> Pathway assessed for entry to the UK is plants for planting (Defra 2022a).</p> <p>Regulated in the UK as a Quarantine Pest, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices).</p>	N
<p><i>Tobacco ringspot virus</i></p> <p>TRSV, necrotic ringspot of blueberry</p> <p>Synonym: Tobacco ringspot nepovirus</p>	Y	Y (QP)	<p><b>Distribution:</b> Present in Canada and the US. Present in the UK (EPPO 2022c).</p>	N
<p><i>Tomato ringspot virus</i></p> <p>ToRSV</p>	Y	Y (RNQP in GB, QP in NI)	<p><b>Distribution:</b> Present in Canada and the US. Present in the UK (EPPO 2022c).</p>	N

Synonym: Tomato ringspot nepovirus				
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### Phytoplasmas

Pest name	Present in PRA area (Y/N)	Regulated in the UK (Y/N)	Supporting information	Categorization required (Y/N)
<p><i>Candidatus</i> Phytoplasma 'asteris' Lee, Gundersen-Rindal, Davis, Bottner, Marccone &amp; Seemüller</p> <p>Aster yellows, blueberry stunt phytoplasma</p> <p>Synonyms: Aster yellows phytoplasma, blueberry stunt</p>	Y	Y (RNQP)	<p><b>Distribution:</b> Present in Canada and the US. Present in the UK (CABI 2022).</p>	N

### Nematodes

Pest name	Present in PRA area (Y/N)	Regulated in the UK (Y/N)	Supporting information	Categorization required (Y/N)
<i>Paratrichodorus renifer</i> Siddiqi	Y	N	<b>Distribution:</b> Present in Canada and the US (Forge <i>et al.</i> 2012). Present in the UK (Cotten & Hooper 1991).	N
<i>Pratylenchus crenatus</i> Loof	Y	N	<b>Distribution:</b> Present in Canada and the US (Zasada <i>et al.</i> 2017). Present in the UK (Corbett 1970).	N

<p><i>Xiphinema americanum sensu stricto</i> Cobb</p> <p>Dagger nematode</p> <p>Synonyms:  <i>Tylencholaimus americanus</i> (Cobb)  Micoletzky, <i>Xiphinema americanum</i> Lamberti &amp; Bleve-Zacheo</p>	N	Y (QP)	<p><b>Distribution:</b> Present in Canada and the US (EPPO 2022c). Believed to be absent from the UK (Defra 2022a).</p> <p><b>Biology:</b> This nematode lives entirely in moist soil and feeds on young growing roots. High populations of <i>X. americanum</i> can result in a loss of plant vigour and swelling of root tips. Significantly, this nematode can transmit several different viruses, such as <i>Tomato ringspot virus</i> and <i>Tobacco ringspot virus</i> (see Virus section for details).</p> <p>At least one year is required to complete the life cycle, though it cannot survive long periods in frozen soil. Overwintering is usually in the egg stage. Unless assisted by run-off, these nematodes travel a maximum of 1m per year (EPPO 2022a).</p> <p><b>Risk to the UK on this commodity:</b>  Regulated in the UK as a Quarantine Pest, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices).</p> <p>The movement of soil with plants for planting is the highest risk pathway into the UK. Soil accompanying imports of plants for planting is currently prohibited.</p>	N
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Insects				
Pest name	Present in PRA area (Y/N)	Regulated in the UK (Y/N)	Supporting information	Categorization required (Y/N)
<p><i>Acrobasis vaccinii</i> Riley</p> <p>Lepidoptera: Pyralidae</p> <p>Cranberry fruitworm</p> <p>Synonym: <i>Mineola vaccinii</i> Riley</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (Strik &amp; Yarborough 2005). No record of presence in the UK.</p> <p><b>Biology:</b> Eggs are laid on the developing berries. Once hatched, the larvae feed on the berries, destroying up to 12 blueberries during their development, and resulting in premature colouration and shrivelling. Shrivelled berries then hinder the harvest (Beckwith 1941, Hutchinson 1954). Larvae overwinter in the leaf detritus and soil. One generation is produced per year (Hutchinson 1954).</p> <p><b>Importance worldwide:</b> Has been described as a serious pest to blueberries, but only found in Canada and the US.</p> <p><b>Risk to the UK on this commodity:</b> This pest is not regulated in the UK, however the main pathway for entry is assessed to be via fruit and soil, both of which are not allowed to accompany imports of plants for planting (Suffert <i>et al.</i> 2015).</p>	N
<p><i>Actebia fennica</i> (Tauscher)</p> <p>Lepidoptera: Noctuidae</p> <p>Black army cutworm</p> <p>Synonyms: <i>Noctua fennica</i> Tauscher, <i>Ochropleura fennica</i> (Tauscher), <i>Rhyacia fennica</i> (Tauscher)</p>	Y	N	<p><b>Distribution:</b> Present in Canada (CABI 2022). Present in the UK (GBIF 2022) .</p>	N
<p><i>Altica sylvia</i> (Malloch)</p> <p>Coleoptera: Chrysomelidae</p> <p>Blueberry flea beetle</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US. Not believed to be present in the UK (Suffert <i>et al.</i> 2015).</p> <p><b>Biology:</b> Adults and larvae feed on leaves, resulting in leaves with a notched</p>	N

<p>Synonym: <i>Haltica sylvia</i> Malloch</p>			<p>appearance and severe damage at high population levels. Larvae also feed on the developing buds.</p> <p>Eggs are laid near the base of the plant or in leaf litter for overwintering. The pupal stage is also spent in the leaf litter (Government of New Brunswick 2013a). This beetle can have several generations per year (Turner &amp; Liburd 2007).</p> <p><b>Importance worldwide:</b> This pest has only been reported in North America where it can cause significant damage.</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. However, this pest was not chosen for a categorization as plants for planting imported into the UK must be free from plant debris, soil, flowers and fruits.</p> <p><b>Taxonomy notes:</b> <i>Altica torquata</i> was identified feeding on blueberry plants, however this was later corrected to <i>A. sylvia</i> (Weidhaas 1952).</p>	
<p><i>Amphimallon majalis</i> (Razoumowsky)</p> <p>Coleoptera: Scarabaeidae</p> <p>European chafer</p> <p>Synonyms: <i>Amphimallon majale</i> (Razaumovskii), <i>Rhizotrogus majalis</i> (Razaumovskii)</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (CABI 2022). No record of presence in the UK.</p> <p><b>Biology:</b> Adult beetles of the European chafer lay their eggs in the soil close to blueberry plants. Once hatched, larvae feed on the roots and overwinter in the soil (PMC 2021a). This pest also spends its pupal stage in the soil (MDA 2022).</p> <p>The European chafer has one generation per year. The impact of larvae feeding can cause significant crop losses on affected bushes when larvae are at certain levels – though it is assumed that plants will recover over time (PMC 2021a).</p> <p><b>Importance worldwide:</b> The European chafer is a very serious pest of turf (MDA 2022). The impact on blueberry seems less significant, though it is listed as a pest in a</p>	N

			<p>recent highbush blueberry profile (PMC 2020).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. However, this pest was not chosen for a categorization as plants for planting imported into the UK must be free from plant debris, soil, flowers and fruits.</p>	
<p><i>Anthonomus musculus</i> Say</p> <p>Coleoptera: Curculionidae</p> <p>Blueberry blossom weevil, cranberry weevil</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (Szendrei <i>et al.</i> 2011). No record of presence in the UK.</p> <p><b>Biology:</b> Adult weevil feeds on blueberry leaves and blossom buds, and lays eggs in the developing blossom buds. Once hatched, larvae feed inside the bud, causing the infested blossoms to turn brown-orange and fall from the plant unopened, which leads to a loss of potential fruit. Feeding on leaves causes small, irregular holes (Long 2001, Polashock <i>et al.</i> 2017).</p> <p>Most <i>A. musculus</i> move to alternative hosts, such as <i>Vaccinium macrocarpon</i> (cranberry), over time. They can fly up to 75 feet but do so rarely (Polashock <i>et al.</i> 2017). Adults tend to overwinter in leaf debris of wooded areas nearby blueberry fields (Szendrei <i>et al.</i> 2011).</p> <p><b>Importance worldwide:</b> Only present in North America. It is a major pest in certain regions of the US on blueberry and cranberry (Szendrei <i>et al.</i> 2011).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. However, this pest was not chosen for a categorization as plants for planting imported into the UK must be free from plant debris, soil, flowers and fruits.</p>	N
<p><i>Aphis fabae</i></p> <p>Hemiptera: Sternorrhyncha</p>	Y	N	<p><b>Distribution :</b> Present in Canada, the US and the UK (CABI 2022).</p>	N

Black bean aphid  Synonyms: <i>Aphis papaveris</i> (Fabricius), <i>Doralis fabae</i> (Scopoli)				
<i>Archips rosana</i> (Linnaeus)  Lepidoptera: Tortricidae  European leaf roller  Synonyms: <i>Archips rosanus</i> (Linnaeus), <i>Cacoecia rosana</i>	Y	N	<b>Distribution</b> : Present in Canada, the US and the UK (CABI 2022).	N
<i>Argyroploce urticana</i>  Lepidoptera: Tortricidae  Synonyms: <i>Badebecia urticana</i> , <i>Olethreutes urticana</i> , <i>Sericoris urticana</i>	Y	N	<b>Distribution:</b> Present in Canada (Gillespie & Beirne 1982). Present in the UK (Society 1909).	N
<i>Argyrotaenia franciscana</i> Borden  Lepidoptera: Tortricidae  Orange tortrix  Synonyms: <i>Argyrotaenia citrana</i> (Fernald), <i>Tortrix citrana</i> Fernald	N	N	<b>Distribution:</b> Present in Canada and the US (Cram & Nelson 1975, Gilligan & Epstein 2014a). Absent from the UK.  <b>Biology:</b> Eggs are laid on leaves, fruit and twigs of the plant (Basinger 1938). Larvae disperse by spinning down threads of silk which are often carried further by wind. Adult moths can also fly at least 100m to nearby fields (Knight 1986). This pest can often be identified by its behaviour of rolling up leaves either together or to fruits for shelter while feeding. Larvae overwinter in these shelters on the ground or plastered to canes (PNW 2022). They also overwinter in mummified fruits, under buds or on nearby herbaceous plants. There may be between two to five generations per year (Gilligan & Epstein 2014a).  Larvae feed on floral buds, blossom, and leaves, as well as fruit. This can cause leaf injury, girdling of the stems, as well as	Y

			<p>undesirable branching and loss of fruit quality and yield (Ebeling &amp; Pence 1957, Gilligan &amp; Epstein 2014a, PNW 2022). They can also cause issues by contaminating the fruit. Feeding on blossoms is also believed to spread disease (PNW 2022).</p> <p><b>Importance worldwide:</b> Limited to North America. Has over 80 hosts and causes significant damage to fruit quality and yield of crops such as apple, citrus and grapes (Gilligan &amp; Epstein 2014a).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. Potential risk to blueberry production in the UK via the import of plants for planting which may be challenging to inspect when the insect's rolled-up feeding shelters are present on the plants. Categorization is needed to assess phytosanitary risk.</p>	
<p><i>Aroga trialbamaculella</i> (Chambers)</p> <p>Lepidoptera: Gelechiidae</p> <p>Red-striped fireworm moth</p> <p>Synonym: <i>Gelechia trialbamaculella</i> Chambers</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US. Absent from the UK (Defra 2022a).</p> <p><b>Biology:</b> Eggs are laid on blueberry plants so when the larvae hatch, they can begin to feed within webbed leaves, causing the skeletonisation of the foliage (IPMCenters 1999). The effects of this feeding can reduce plant vigour and yield by fruit desiccation or harvesting issues. Injury can occur in up to 70% of shoots, though it does not normally cause significant damage (Wood 1972).</p> <p>The larvae then move to the leaf litter to pupate and overwinter. The spread of larvae can be carried out inadvertently by farm machinery, causing re-infestation of blueberry stems (IPMCenters 1999).</p> <p><b>Risk to the UK on this commodity:</b> This pest was assessed in 2017 as posing a low risk to the UK, so it is not a regulated pest. There is potential for the pest to be introduced either as dislodged larvae associated with contaminated fruit, on plants for planting as eggs, larvae or adults</p>	N

			and as pupae which can overwinter in leaf litter.	
<p><i>Autoserica castanea</i> Arrow</p> <p>Coleoptera: Scarabaeidae</p> <p>Asiatic garden beetle</p> <p>Synonyms: <i>Aserica castanea</i> (Arrow), <i>Maladera castanea</i> (Arrow)</p>	N	N	<p><b>Distribution:</b> Present in the US and Canada (Cutler &amp; Rogers 2009). No record of presence in the UK.</p> <p><b>Biology:</b> Beetles feed on the margins of leaves, and in severe cases, consume the whole leaf.</p> <p>Adult <i>A. castanea</i> spend the day on the ground by host plants, and feed on plants at night, though they require temperatures above 21 degrees to fly. Eggs are laid in the ground. Larvae feed and also overwinter in soil (Vittum 2020).</p> <p><b>Importance worldwide:</b> This beetle is native to parts of Asia, and spread to the US, where it is usually a minor pest. However, it can also cause serious economic damage (Cutler &amp; Rogers 2009). Nevertheless, this pest has many hosts and blueberry is not the most common (Vittum 2020).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. However, this pest was not chosen for a categorization under the recommendation that plants should be dormant and without leaves when imported into the UK. Currently, plants for planting imported into the UK must be free from plant debris, soil, flowers and fruits.</p>	N
<p><i>Brachycaudus helichrysi</i> (Kaltenbach)</p> <p>Hemiptera: Sternorrhyncha</p> <p>Leaf-curling plum aphid</p> <p>Synonyms: <i>Anuraphis helichrysi</i> (Kaltenbach), <i>Aphis helichrysi</i> Kaltenbach</p>	Y	N	<p><b>Distribution :</b> Present in Canada, the US and the UK (CABI 2022).</p>	N
<p><i>Choristoneura rosaceana</i> (Harris)</p>	N	Y (QP)	<p><b>Distribution:</b> Present in Canada and the US. Absent from the UK (Defra 2022a).</p>	N

<p>Lepidoptera: Tortricidae</p> <p>Oblique-banded leaf roller</p> <p>Synonyms: <i>Archips rosaceana</i> Harris, <i>Cacoecia rosaceana</i> Harris, <i>Loxotaenia rosaceana</i> Harris</p>			<p><b>Biology:</b> Eggs are laid on leaves (PNW 2022). Once hatched, larvae disperse by spinning down threads of silk which are often carried further by wind (Chapman <i>et al.</i> 1968). Larvae feed on floral buds, blossoms, and leaves, as well as fruit later on in the year. They can also cause issues by contaminating the fruit (Polashock <i>et al.</i> 2017).</p> <p>This pest can often be identified by its behaviour of rolling up a leaf for shelter. Larvae overwinter in these shelters, which are later sealed to form a case from which adults emerge. Usually, two generations of this pest occur per year (PNW 2022, Polashock <i>et al.</i> 2017).</p> <p><b>Risk to the UK on this commodity:</b> Regulated in the UK as a Quarantine Pest, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices). High-risk pathways for long distance spread are judged to be via plants for planting (Defra 2022a).</p>	
<p><i>Cingilia catenaria</i> (Drury)</p> <p>Lepidoptera: Geometridae</p> <p>Chain dot moth, chain-spotted geometer</p> <p>Synonym: <i>Phalaena catenaria</i> Drury</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (Wagner 2001). Absent in the UK.</p> <p><b>Biology:</b> An occasional pest of blueberry, this can completely destroy the leaves and fruit of blueberry plants, as well as attack other plants.</p> <p>Eggs are laid on the leaves of host plants, which overwinter in leaf debris on the ground. Caterpillars then emerge in early summer. Adult moths are found in the autumn. These are daily fliers (Maxwell &amp; Wood 1961).</p> <p><b>Importance worldwide:</b> Many trees and shrubs in woodlands, barrens, bogs and heathlands are hosts of this moth. Only present in North America (Wagner 2001).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. However, this pest was not chosen for a categorization under the</p>	N

			<p>recommendation that plants should be dormant and without leaves when imported into the UK. Currently, plants for planting imported into the UK must be free from plant debris, soil, flowers and fruits.</p>	
<p><i>Clastoptera saintcyri</i> Provancher</p> <p>Hemiptera: Cercopidae</p> <p>Blueberry spittlebug, heath spittlebug</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (GBIF 2022). No record of presence in the UK.</p> <p><b>Biology:</b> Eggs are laid in the dead stem, into the sheath of the growing plant or just beneath the bark on new growth, where they overwinter (Britton 1924). In spring, nymphs hatch and secrete a white foam substance as a protective mechanism while they suck the plant sap from the stem. This way of feeding can deform leaves, form galls, destroy shoot tips, transfer pathogens, defoliate branches or interfere with fruit and seed formation (Hamilton 1982).</p> <p><i>Clastoptera saintcyri</i> is encountered frequently in blueberry fields (SPBQ 2022). In the wild, it is found in heath environments in mixed pine-maple woods which appears to be a limiting factor of its native distribution (Hamilton 1982).</p> <p><i>Clastoptera saintcyri</i> is also not very agile at walking although it is noted that it will spring into the air when disturbed (Franklin 1919, SPBQ 2022).</p> <p><b>Importance worldwide:</b> Distribution of this pest appears to be limited to Canada and the US (GBIF 2022). Recently highlighted as a concern to blueberry production in Canada (PMC 2021a). This pest also feeds on <i>Vaccinium macrocarpon</i> (cranberry) and other ericaceous species (Hamilton 1982).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. Potential risk to blueberry production in the UK, as plants for planting appears to be a high-risk pathway.</p>	Y

<p><i>Conotrachelus nenuphar</i> (Herbst)</p> <p>Coleoptera: Curculionidae</p> <p>Plum curculio</p>	N	Y (QP)	<p><b>Distribution:</b> Present in Canada and the US, but absent in the UK (EPPO 2022c).</p> <p><b>Biology:</b> One egg is laid per fruit, resulting in crescent-shaped wounds. Feeding often causes the damaged fruit to distort or drop prematurely with some loss of yield or quality. Adults feed on flowers, leaves and young fruits and overwinter under debris (Pritts <i>et al.</i> 1992).</p> <p><i>Conotrachelus nenuphar</i> can disperse by flying but only over short distances (Lafleur &amp; Hill 1987).</p> <p><b>Risk to the UK on this commodity:</b> The main pathways to the UK are via fruit, soil and plants for planting (EFSA 2018a). This pest is regulated in the UK as a Quarantine Pest, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices).</p>	N
<p><i>Croesia curvalana</i> (Kearfott)</p> <p>Lepidoptera: Tortricidae</p> <p>Blueberry leaftier</p> <p>Synonyms: <i>Acleris curvalana</i> Kearfott, <i>Tortrix curvalana</i>, <i>Argyrotoza curvalana</i></p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (CABI 2022, NatureServe 2022). No record of presence in the UK.</p> <p><b>Biology:</b> Eggs are laid in leaf litter under blueberry plants for overwintering. Once hatched, larvae attack closed flower buds. Infested buds may be identified if there is the presence of a round hole surrounded by yellow frass. Leaves become webbed from feeding and are often folded to make shelters.</p> <p>Pupae can be found in shelters or hanging from blueberry twigs. Adults can disperse by flight (Alana 1988).</p> <p><b>Importance worldwide:</b> Only present in Canada and the US. Not believed to be a major pest, given its absence in blueberry pest lists (PMC 2021a, b, Polashock <i>et al.</i> 2017).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. Potential risk to blueberry production in the UK, as plants</p>	Y

			for planting appears to be a high-risk pathway.	
<p><i>Dasineura oxycoccana</i> (Johnson)</p> <p>Diptera: Cecidomyiidae</p> <p>Cranberry midge</p> <p>Synonyms: <i>Cecidomyia oxycoccana</i> Johnson, <i>Dasineura vaccinii</i> (Smith)</p>	Y	N	<b>Distribution:</b> Present in Canada and the US. Present in the UK (EPPO 2022c).	N
<p><i>Dasineura oxycoccana</i> (Johnson)</p> <p>Diptera: Cecidomyiidae</p> <p>Cranberry gall fly, cranberry tipworm</p> <p>Synonyms: <i>Cecidomyia oxycoccana</i> Johnson, <i>Dasineura vaccinii</i> (Smith)</p>	Y	N	<b>Distribution:</b> Present in Canada and the US. Present in the UK (EPPO 2022c).	N
<p><i>Dasystroma salicella</i> (Hübner)</p> <p>Lepidoptera: Chimabachidae</p> <p>Blueberry leafroller</p> <p>Synonym: <i>Cheimophila salicella</i></p>	Y	N	<b>Distribution:</b> Present in Canada and the UK (GBIF 2022).	N
<p><i>Drosophila suzukii</i> (Matsumura)</p> <p>Diptera: Drosophilidae</p> <p>Spotted-wing drosophila</p> <p>Synonym: <i>Leucophenga suzukii</i> (Matsumura)</p>	Y	N	<b>Distribution:</b> Present in Canada and the US. Present in the UK (EPPO 2022c).	N
<p><i>Ericaphis fimbriata</i> Richards</p>	Y	N	<b>Distribution:</b> Present in Canada (MacNay 1961). Present in the UK (Prior 1971).	N

<p>Hemiptera: Sternorrhyncha</p> <p>Blueberry aphid</p> <p>Synonyms: <i>Fimbriaphis fimbriata</i> Richards, <i>Fimbriaphis fimbriata pernettyae</i></p>				
<p><i>Eulecanium tiliae</i> (Linnaeus)</p> <p>Hemiptera: Sternorrhyncha</p> <p>Brown gooseberry scale</p> <p>Synonyms: <i>Eulecanium capreae</i> (Linnaeus), <i>Lecanium tiliae</i> (Linnaeus), <i>Physokermes coryli</i> Linnaeus</p>	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (CABI 2022).	N
<p><i>Exomala orientalis</i> (Waterhouse)</p> <p>Coleoptera: Scarabaeidae</p> <p>Oriental beetle</p> <p>Synonyms: <i>Anomala orientalis</i> (Waterhouse), <i>Blitopertha flavipennis</i> Reitter, <i>Phyllopertha orientalis</i> Waterhouse</p>	N	Y (QP)	<p><b>Distribution:</b> Present in Canada and the US (CABI 2022, Pavlis 2008). Absent in the UK (Defra 2022a).</p> <p><b>Biology:</b> Female <i>E. orientalis</i> lay eggs in the soil, where they remain over winter as they go through their larval and pupal stages. Adults emerge from soil in early summer. Dispersal is quite limited though, as these beetles rarely make long distance flights.</p> <p>Symptoms of feeding adults are skeletonised leaves that turn brown and drop from the plant (EFSA 2020). Larvae feeding on roots cause plants to have reduced vigour, have smaller leaves and fruit yields (Polavarapu <i>et al.</i> 2007).</p> <p><b>Risk to the UK on this commodity:</b> Regulated in the UK as a Quarantine Pest, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices).</p>	N

<p><i>Frankliniella vaccinii</i> Morgan, <i>Catinathrips kainos</i> (O'Neill), <i>Catinathrips vaccinophilus</i> (Hood)</p> <p>Thysanoptera: Thripidae</p> <p>Blueberry thrips complex</p> <p>Synonym for <i>Catinathrips vaccinophilus</i>: <i>Taeniothrips vaccinophilus</i></p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (Government of New Brunswick 2013d, Langille &amp; Forsythe 1972, Polashock <i>et al.</i> 2017, Wood 1960). No record of presence in the UK.</p> <p><b>Biology:</b> Symptoms of this pest feeding on the plant (as a larvae or adult) include distorted leaves such as rolling or wrapping around the stem. Leaves can also turn reddish. Affected plants are more vulnerable to winter damage and yield can be reduced by 50% or more.</p> <p>Eggs are laid on the blueberry leaves, and the pest development occurs within the blueberry leaves until, as an adult, it drops to the soil to overwinter (Government of New Brunswick 2013d).</p> <p><b>Importance worldwide:</b> This pest has only been reported in North America (parts of Canada and the US). Significant yield damage can occur.</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. However, this pest was not chosen for a categorization under the recommendation that plants should be dormant and without leaves when imported into the UK. In addition, plants for planting imported into the UK must be free from plant debris, soil, flowers and fruits.</p>	N
<p><i>Graphiphora smithi</i> (Snellen), <i>Graphiphora collaris</i> Grote and Robinson, <i>Eucirrhoedia pampina</i> (Guenee), <i>Lycophotia phyllophora</i> Grote, <i>Polia purpurissata</i> Grote, <i>Syngrapha epigaea</i> Grote</p> <p>Lepidoptera: Noctuidae</p> <p>Climbing cutworms</p>	N	N	<p><b>Distribution:</b> Present in Canada (Wood 1964). No record of presence in the UK.</p> <p><b>Biology:</b> Cutworms typically lay eggs on leaves or in soil (Floate 2017). Once hatched, most larval feeding is carried out as the blueberry buds are swelling and opening. Buds, blossoms and foliage are consumed by the larvae. Feeding is reduced by rainfall and low temperatures (Wood 1964).</p> <p>All species overwinter in the soil in the larval stage, other than <i>E. pampina</i> which</p>	N

			<p>overwinters in the egg stage (Wood 1960, Wood &amp; Neilson 1957, Wood <i>et al.</i> 1954).</p> <p><b>Importance worldwide:</b> Reports on the impact of these species affecting blueberries are quite old and focus on Canada. Along with <i>A. fennica</i>, combined losses are estimated to be around 10% of the crop, though each species by itself is not considered to be a serious pest (Wood 1964, Wood &amp; Neilson 1957).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. However, this pest was not chosen for a categorisation under the recommendation that plants should be dormant and without leaves when imported into the UK. In addition, plants for planting imported into the UK must be free from plant debris, soil, flowers and fruits.</p>	
<p><i>Grapholita packardi</i> Zeller</p> <p>Lepidoptera: Tortricidae</p> <p>Cherry fruitworm</p> <p>Synonyms: <i>Cydia parkardii</i> (Zeller), <i>Enarmonia packardi</i> (Zeller)</p>	N	Y (QP)	<p><b>Distribution:</b> Present in Canada and the US, but absent in the UK (EPPO 2022c).</p> <p><b>Biology:</b> Larvae attack blueberry fruit, and possibly growing shoots, after hatching from eggs laid on the fruit or fruit stems. Blueberries colour prematurely after attack. Fruit quality and yield is reduced.</p> <p>Following maturation, larvae emerge from fruit and overwinter inside branches or shoots of the plant. Adults can disperse by walking, flying, and short distances by wind (EFSA 2018b).</p> <p><b>Risk to the UK on this commodity:</b> Fruit and plants for planting are possible pathways (EFSA 2018b). This pest is regulated in the UK as a Quarantine Pest, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices).</p>	N
<p><i>Grapholita prunivora</i> (Walsh)</p>	N	Y (QP)	<p><b>Distribution:</b> Present in Canada and the US (GBIF 2022). No record of presence in the UK.</p>	N

<p>Lepidoptera: Tortricidae</p> <p>Plum moth</p> <p>Synonyms: <i>Cydia prunivora</i> (Walsh), <i>Enarmonia prunivora</i> Walsh</p>			<p><b>Biology:</b> Eggs are laid on the upper surface of host leaves and on young fruit. Once hatched, larvae feed inside blueberries, causing fruit damage. They then overwinter in leaf debris on the ground or under bark. This pest has two generations per year (PMC 2021a).</p> <p>This pest attacks a wide range of hosts in addition to blueberry, including apples, plums and cherries. Typical symptoms on the fruit are wrinkling, browning and premature fruit fall (EFSA 2018c).</p> <p><b>Risk to the UK on this commodity:</b> Regulated in the UK as a Quarantine Pest, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices).</p>	
<p><i>Halyomorpha halys</i> Stål</p> <p>Hemiptera: Pentatomidae</p> <p>Brown marmorated stink bug</p> <p>Synonyms: <i>Halyomorpha mista</i> (Uhler), <i>Pentatoma halys</i> Stål</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US. Absent in the UK (Malumphy <i>et al.</i> 2021).</p> <p><b>Biology:</b> This pest targets developing fruits and feeding causes deformities, necrosis of internal tissues and berry weight loss. Berries could also shrivel as a result. Blueberry plants are not a common host of <i>H. halys</i> however it has been shown to attack them (Haye <i>et al.</i> 2014, Wiman <i>et al.</i> 2015).</p> <p><b>Importance worldwide:</b> This insect is native to East Asia, but spread in recent years to North America and parts of Europe. In parts of the US, it is a severe agricultural pest (Haye <i>et al.</i> 2014).</p> <p><b>Risk to the UK on this commodity:</b> This pest is well-known for its hitchhiking abilities and spread by human activity and the movement of goods along transport lines (Haye <i>et al.</i> 2014).</p> <p>However, it is unregulated in GB following a UK PRA. It is not considered possible to regulate all the potential pathways that the pest could arrive on. It is often intercepted</p>	N

			on non-regulated commodities (Malumphy <i>et al.</i> 2021)	
<p><i>Hemadas nubilipennis</i> (Ashmead)</p> <p>Hymenoptera : Pteromalidae</p> <p>Blueberry stem gall wasp</p> <p>Synonym: <i>Megorismus nubilipennis</i> Ashmead</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US. Absent in the UK (CABI 2022, McAlister &amp; Anderson 1932).</p> <p><b>Biology:</b> Female wasps lay eggs in the vegetative shoots of the blueberry plant, resulting in the formation of multi-chambered galls for the larvae to hatch, overwinter and pupate (Hayman <i>et al.</i> 2003, McAlister &amp; Anderson 1932).</p> <p>The natural dispersal of <i>Hemadas nubilipennis</i> is very slow (McAlister &amp; Anderson 1932). This could be attributed to the fact that adults oviposit within minutes of leaving their stem galls (West &amp; Shorthouse 1989). They have been observed to hop very short distances, and can fly so the wind may help dispersing the adults (Isaacs <i>et al.</i> 2020, McAlister &amp; Anderson 1932). However, this pest is capable of spreading significant distances on infested plant material, as shown in northeast USA (Carlos Garcia-Salazar, Michigan State University, pers. comm., Jul. 09, 2022).</p> <p>The impact of this insect, though not significant in the past, can result in a loss of yield over time due to the gall destroying the apical meristem of new vegetative shoots (Carlos Garcia-Salazar, Michigan State University, pers. comm., Jul. 09, 2022; McAlister and Anderson 1932). Galls have been found to reduce berry production and shoot vigour, though this depends on the position of the gall (Hayman <i>et al.</i> 2003). Galls can also contaminate the harvest and cause infested fields to be abandoned (Isaacs <i>et al.</i> 2020).</p> <p><b>Importance worldwide:</b> This wasp is only found in eastern North America. It was not considered a risk to blueberry production in the past, however their populations have been increasing in recent years and are</p>	Y

			<p>significant pests in some regions of the U.S. (Hayman <i>et al.</i> 2003, Isaacs <i>et al.</i> 2020). In some cases, heavily-infested fields have been abandoned due to control costs becoming too great (Hayman 2004, Isaacs <i>et al.</i> 2020).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. Potential risk to blueberry production in the UK via the import of plants for planting. Categorization is needed to assess phytosanitary risk.</p>	
<p><i>Hyalopterus pruni</i> Fabricius</p> <p>Hemiptera: Sternorrhyncha</p> <p>Mealy plum aphid</p> <p>Synonym: <i>Hyalopterus arundinis</i> Fabricius</p>	Y	N	<p><b>Distribution :</b> Present in Canada, the US and the UK (CABI 2022).</p>	N
<p><i>Hyperomyzus lactucae</i> (Linnaeus)</p> <p>Hemiptera: Sternorrhyncha</p> <p>Currant-lettuce aphid</p> <p>Synonyms: <i>Amphorophora cosmopolitana</i> Mason, <i>Amphorophora lactucae</i> (Linnaeus)</p>	Y	N	<p><b>Distribution:</b> Present in Canada, the US and the UK (CABI 2022).</p>	N
<p><i>Hyphantria cunea</i> Drury</p> <p>Lepidoptera: Erebidae</p> <p>Fall webworm</p> <p>Synonym: <i>Hyphantria textor</i> (Harris)</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US. Absent in the UK (CABI 2022).</p> <p><b>Biology:</b> Eggs are laid on the lower surface of host leaves. Insects overwinter in the pupal stage. Adults can spread by flight and are able to fly several kilometres in search of food (Yaroshenko 1975).</p> <p>Symptoms of a pest infestation include woven silk nests enclosed with leaves and the rapid defoliation of host plants.</p>	N

			<p><b>Importance worldwide:</b> This pest is present in a lot of European countries, including Spain and Italy. However, it is not commonly reported on blueberry and it mainly impacts forest and fruit trees (CABI 2022). However it can attack blueberry when pest numbers are prevalent (Pickett 1943).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in GB after a UK Pest Risk Analysis concluded that this pest was low risk (Defra 2022a). A categorization was therefore deemed unnecessary.</p>	
<p><i>Itame (Macaria) argillacearia</i> Packard</p> <p>Lepidoptera: Geometridae</p> <p>Blueberry spanworm</p> <p>Synonyms: <i>Speranza argillacearia</i> (Packard), <i>Macaria argillacearia</i> (Packard)</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US. No record of presence in the UK.</p> <p><b>Biology:</b> Eggs overwinter in the leaf litter. Once hatched, larvae feed on leaves, flower buds, blossoms and shoots, resulting in a reduction in yield. In severe cases, plants appear burnt as they have lost all of their foliage.</p> <p>Larvae often feed during the night, spending the day in the leaf litter. They then pupate on the ground (Government of New Brunswick 2013c). The adults are weak fliers. One generation occurs per year (Polashock <i>et al.</i> 2017).</p> <p><b>Importance worldwide:</b> This pest appears to be limited to North America. In Canada, this is an occasional pest to blueberries, with many years between infestations.</p> <p><b>Risk to the UK on this commodity:</b> This pest is not regulated in the UK. However, this pest was not chosen for a categorization as plants for planting imported into the UK must be free from plant debris, soil, flowers and fruits.</p>	N
<p><i>Lambdina fiscellaria</i></p> <p>Lepidoptera: Geometridae</p> <p>Hemlock looper</p>	N	Y (provisional QP)	<p><b>Distribution:</b> Present in Canada and the US. Absent in the UK (EPPO 2022c).</p> <p><b>Biology:</b> Eggs are laid for overwintering on twigs, needles or on bark of living hosts, as well as found on buildings, roof shingles and tree stumps. Larvae are dispersed by</p>	N

<p>Synonyms: <i>Ellopia fiscellaria</i>, <i>Therina fiscellaria</i></p>			<p>spinning down threads of silk which are often carried further by wind or rain. They pupate on living trees or on the ground, under leaf debris and under stones.</p> <p>Historically, blueberry plants were reported as being completely defoliated by this pest (De Gryse &amp; Schedl 1934), however more recent reports do not recognise blueberry as a host (see section on risk to the UK).</p> <p><b>Risk to the UK on this commodity:</b> Regulated in the UK as a provisional Quarantine Pest which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices).</p>	
<p><i>Lygus lineolaris</i> (Palisot de Beauvois)</p> <p>Hemiptera: Miridae</p> <p>Tarnished plant bug</p> <p>Synonyms: <i>Capsus lineolaris</i> Palisot de Beauvois, <i>Lygus oblineatus</i> (Say)</p>	<p>N</p>	<p>N</p>	<p><b>Distribution:</b> Present in Canada and the US (CABI 2022). Absent in the UK (Defra 2022a).</p> <p><b>Biology:</b> The tarnished plant bug overwinters in the leaf litter as an adult, before feeding and laying its eggs on the stems of plants in the spring (Capinera 2020, PMC 2021a). Optimum temperatures for this pest appear to be 27-30 degrees (Capinera 2020).</p> <p>Feeding from this pest on blueberry injures fruit and leaf buds, and leads to fruit deformation (PMC 2021a).</p> <p><b>Importance worldwide:</b> This pest has a vast range of hosts – over half of the cultivated plant species grown in the United States are listed as host plants (Capinera 2020). Although damage has been reported on blueberry (PMC 2021a), it has not been listed as a major host for this pest (Capinera 2020, Defra 2022a, EPPO 2022c, Mueller <i>et al.</i> 2003).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK, however this pest is already on the UK list for a PRA so was not chosen for a categorization.</p>	<p>N</p>

<p><i>Malacosoma californicum pluviale</i> (Dyar)</p> <p>Lepidoptera: Lasiocampidae</p> <p>Northern tent caterpillar</p> <p>Synonym: <i>Malacosoma pluviale</i> Dyar</p>	N	N	<p><b>Distribution</b> : Present in Canada and the US (CABI 2022). No record of presence in the UK.</p> <p><b>Biology</b>: Eggs are laid in masses on twigs and branches of host plants (Ciesla &amp; Ragenovich 2008). Larvae emerge in spring to form silk tents on which they group together between feeding. This species has one generation a year typically (Myers 2000).</p> <p>Damage from this pest is exhibited by defoliation of blueberry bushes (Fitzpatrick 1967).</p> <p><b>Importance worldwide</b>: This pest has a wide host range of broadleaf trees and shrubs. Present in the United States, Canada and Mexico. Only one historical publication could be found reporting damage to blueberries (Fitzpatrick 1967).</p> <p><b>Risk to the UK on this commodity</b>: Not regulated in the UK, however blueberry is not named as a consistent host of this pest (Ciesla &amp; Ragenovich 2008, Garbutt &amp; Wood 1993, Natural Resources Canada 2015). This is potentially because damage on blueberry is very rarely reported.</p> <p><b>Taxonomy notes</b>: The western tent caterpillar, <i>Malacosoma californicum</i>, is comprised of several subspecies including <i>M. californicum pluviale</i> the northern tent caterpillar.</p>	N
<p><i>Melanchra picta</i> (Harris)</p> <p>Lepidoptera: Noctuidae</p> <p>Zebra caterpillar</p> <p>Synonyms: <i>Ceramica picta</i> (Harris), <i>Mamestra picta</i> Harris</p>	N	N	<p><b>Distribution</b>: Present in Canada and the US (Fitzpatrick &amp; Troubridge 1991). No record of presence in the UK.</p> <p><b>Biology</b>: <i>Melanchra picta</i> spends its pupal stage in the soil, before emerging as adults to lay eggs on leaves. After hatching, larvae feed on the leaves, resulting in skeletonization, and disperse across the plant over time.</p>	N

			<p>Two generations often occur per year. Overwintering occurs in the soil in the form of pupae (CSU 2022).</p> <p><b>Importance worldwide:</b> Only present in Canada and the US. Not believed to be a major pest, given its absence in blueberry pest lists (PMC 2021a, b, Polashock <i>et al.</i> 2017). It is a minor pest on cranberries (Fitzpatrick &amp; Troubridge 1991).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. However, this pest was not chosen for a categorization under the recommendation that plants should be dormant and without leaves when imported into the UK. Currently, plants for planting imported into the UK must be free from plant debris, soil, flowers and fruits.</p>	
<p><i>Myzus persicae</i> (Sulzer)</p> <p>Hemiptera: Sternorrhyncha</p> <p>Green peach aphid</p> <p>Synonyms: <i>Aphis convolvuli</i> Kaltenbach, <i>Aphis cynoglossi</i> Walker</p>	Y	N	<p><b>Distribution :</b> Present in Canada, the US and the UK (CABI 2022).</p>	N
<p><i>Neochlamisus cribripennis</i> (Le Conte)</p> <p>Coleoptera: Chrysomelidae</p> <p>Blueberry case beetle, blueberry casebearer</p> <p>Synonym: <i>Chlamisus cribripennis</i> (Le Conte)</p>	N	N	<p><b>Biology:</b> Present in Canada and the US (CABI 2022). No record of presence in the UK.</p> <p><b>Biology:</b> The adult beetle overwinters in the leaf litter. Adults and larvae cause defoliation by feeding on leaves. Adult beetles cause the most significant damage by feeding on the stem bark, which causes drying and death over winter. Very low numbers of this beetle have been found in nearly every blueberry field sampled without causing noticeable impacts, yet in a small number of fields <i>N. cribripennis</i> has caused considerable damage (Wood 1966).</p> <p>During egg stages, <i>N. cribripennis</i> is enclosed in a case attached to a leaf or stem of the plant by a stalk. After hatching,</p>	Y

			<p>the larvae break the case off from the stalk and moves about, still within the case. During the pupal stage, the case is attached to the main stem or branches (Wood 1966).</p> <p>The activity of <i>Neochlamisus cribripennis</i> adults appear sensitive to changes in weather (Wood &amp; Small 1970). <i>N. cribripennis</i> requires high humidity to complete its lifecycle (Ellis &amp; LeRoux 1964).</p> <p><b>Importance worldwide:</b> This pest has only been reported in North America where it can cause significant damage at high population levels.</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. Potential risk to blueberry production in the UK, as plants for planting appears to be a high-risk pathway. Categorization is needed to assess phytosanitary risk.</p>	
<p><i>Neopareophora litura</i> Klug and <i>Pristiphora</i> <i>idiota</i></p> <p>Hymenoptera: Tenthredinidae</p> <p>Blueberry sawflies</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (Government of New Brunswick 2013b, Polashock <i>et al.</i> 2017). No record of presence in the UK.</p> <p><b>Biology:</b> Adults lay eggs inside the leaf bud. Larvae feed on this bud then feed on developing leaf edges, creating a scalloped appearance. Defoliation can occur. The larvae then move to the ground where they overwinter in the leaf litter within cocoons. Pupae are also found in the litter layer (Government of New Brunswick 2013b, Polashock <i>et al.</i> 2017).</p> <p>Both species only have one generation a year (Polashock <i>et al.</i> 2017).</p> <p><b>Importance worldwide:</b> Present in North America but do not usually cause significant damage.</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. Potential risk to blueberry production in the UK. Categorization is needed to assess phytosanitary risk.</p>	Y

<p><i>Operophtera bruceata</i> (Hulst)</p> <p>Lepidoptera: Geometridae</p> <p>Bruce spanworm</p> <p>Synonyms: <i>Cheimatobia bruceata</i> (Hulst), <i>Rachela bruceata</i> Hulst</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (Polashock <i>et al.</i> 2017). No record of presence in the UK.</p> <p><b>Biology:</b> The larvae of <i>O. bruceata</i> web leaves together with silk to feed, or feed openly on leaf tissue, fruit and flower clusters resulting in damage to yield (Gillespie 1985). Severe defoliation can occur and hosts can be heavily covered in silk which reduces the plant's photosynthetic capacity (Brown 1962). Infestations can range from a few hectares to thousands of square kilometres (for example, an outbreak in 1958 covered 130,000 km<sup>2</sup>) (Rose &amp; Lindquist 1982, Volney 1995).</p> <p><i>Operophtera bruceata</i> is adapted for winter survival and is able to survive in areas much colder than its relative, <i>O. brumata</i>, which can withstand temperatures as low as -36°C (Elkinton <i>et al.</i> 2010). It lays eggs on the stems of blueberry plants (Fitzpatrick 2008). Larvae can then disperse by spinning down threads of silk which are often carried further by wind and could travel long distances. Dispersal at the adult stage is limited as the adult females are wingless (Brown 1962).</p> <p><b>Importance worldwide:</b> Native to North America, though has been reported in Greenland (GBIF 2022). Feeds on a wide range of broadleaved trees and other hosts and is a recognised pest of blueberry and <i>Vaccinium macrocarpon</i> (cranberry) (Brown 1962).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. Potential risk to blueberry production in the UK, as plants for planting appears to be a high-risk pathway. Categorization is needed to assess phytosanitary risk.</p>	Y
<p><i>Operophtera brumata</i> (Linnaeus)</p>	Y	N	<p><b>Distribution:</b> Present in Canada, the US and the UK (EPPO 2022c).</p>	N

<p>Lepidoptera: Geometridae</p> <p>European winter moth</p> <p>Synonym: <i>Cheimatobia brumata</i> (Linnaeus)</p>				
<p><i>Orgyia leucostigma</i> (Smith)</p> <p>Lepidoptera: Erebidae</p> <p>White-marked tussock moth</p> <p>Synonyms: <i>Hemerocampa leucostigma</i> (Smith), <i>Phalaena leucostigma</i> Smith</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US, but absent in the UK (EPPO 2022c).</p> <p><b>Biology:</b> Eggs are laid in a single mass normally on leaves (Thurston 1981). Larvae then emerge from the overwintering egg mass and disperse across the bush (Isaacs &amp; Van Timmeren 2009). They also spin a silk thread to enable them to be dispersed long distances. Pupation occurs on the underside of host branches (Thurston 1981).</p> <p>The larvae can defoliate large portions of a field by feeding on the foliage and bark of a plant, contaminating the blueberries and even killing young plants. Damage can affect growth the following year (Crozier 1997, Isaacs &amp; Van Timmeren 2009, Thurston 1981). Unfortunately, infestations are often not detected until economic damage has been caused (Isaacs &amp; Van Timmeren 2009). They also impact the health of fruit pickers as the hairs from the larvae can cause severe allergic reactions, including rashes and anaphylaxis in sensitive people (Thurston 1981).</p> <p><b>Importance worldwide:</b> This pest is present in North America and causes defoliation in large areas of forests. It is currently on the EPPO A1 list of pests recommended for regulation as quarantine pests (EPPO 2021).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. Potential risk to blueberry production in the UK as the movement of plants for planting is the highest risk pathway, followed by round wood with bark (EPPO 2021).</p>	Y

			Categorization is needed to assess phytosanitary risk.	
<p><i>Otiorhynchus ovatus</i> (Linnaeus)</p> <p>Coleoptera: Curculionidae</p> <p>Strawberry root weevil</p> <p>Synonym: <i>Otiorhynchus rosae</i> De Geer, <i>Brachyrhinus ovatus</i></p>	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (CABI 2022).	N
<p><i>Otiorhynchus rugosostriatus</i> (Goeze)</p> <p>Coleoptera: Curculionidae</p> <p>Rough strawberry weevil</p> <p>Synonym: <i>Otiorhynchus scabrosus</i> Marsham, <i>Brachyrhinus rugosostriatus</i></p>	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (CABI 2022).	N
<p><i>Otiorhynchus singularis</i> (Linnaeus)</p> <p>Coleoptera: Curculionidae</p> <p>Clay-coloured weevil</p> <p>Synonyms: <i>Brachyrhinus singularis</i>, <i>Curculio picipes</i> Fabricius</p>	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (CABI 2022).	N
<p><i>Otiorhynchus sulcatus</i> Fabricius</p> <p>Coleoptera: Curculionidae</p> <p>Black vine weevil</p> <p>Synonym: <i>Brachyrhinus sulcatus</i> Fabricius</p>	Y	N	<b>Distribution:</b> Present in Canada, the US and the UK (EPPO 2022c).	N

<p><i>Pandemis cerasana</i> (Hübner)</p> <p>Lepidoptera: Tortricidae</p> <p>Currant twist moth</p> <p>Synonym: <i>Pandemis ribeana</i> (Hübner)</p>	Y	N	<p><b>Distribution</b> : Present in Canada, the US and the UK (CABI 2022).</p>	N
<p><i>Paria fragariae fragariae</i> Wilcox</p> <p>Coleoptera: Chrysomelidae</p> <p>Strawberry rootworm</p> <p>Synonym: <i>Paria fragariae</i></p>	N	N	<p><b>Distribution:</b> Present in Canada and the US. Absent in the UK (GBIF 2022).</p> <p><b>Biology:</b> Adults overwinter in the leaf litter of blueberry plants or on the surrounding forest floor. Adults can damage blueberry plants by feeding on foliage.</p> <p>Eggs are laid in the soil. Larvae burrow into the ground and feed on roots of strawberries and raspberries (not an issue on blueberries) (Drummond &amp; Groden 2000).</p> <p><b>Importance worldwide:</b> Limited to North America. Mainly a pest of strawberries.</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. However, this pest was not chosen for a categorisation under the recommendation that plants should be dormant and without leaves when imported into the UK. In addition, plants for planting imported into the UK must be free from plant debris, soil, flowers and fruits.</p>	N
<p><i>Parthenolecanium corni</i> (Bouché)</p> <p>Hemiptera: Sternorrhyncha</p> <p>European fruit scale</p> <p>Synonyms: <i>Eulecanium corni</i> (Bouché), <i>Eulecanium robiniarum</i></p>	Y	N	<p><b>Distribution</b> : Present in Canada, the US and the UK (CABI 2022).</p>	N

(Douglas), <i>Lecanium corni</i> Bouché				
<i>Popillia japonica</i> Newman  Coleoptera: Scarabaeidae  Japanese beetle	N	Y (QP)	<p><b>Distribution:</b> Present in Canada and the US. Absent from the UK (Defra 2022a).</p> <p><b>Biology:</b> Eggs are laid in soil and spend their larval stage overwintering underground and feeding on host roots (CFIA 2017). Adult beetles then appear. They feed on blueberry leaves, chewing the tissue between veins. This pest can also impact yield by feeding on berries, and contaminating the harvest by its presence (Szendrei &amp; Isaacs 2006).</p> <p>Most flights are short distance but the adult beetle can fly up to 8km (EPPO 2020).</p> <p><b>Risk to the UK on this commodity:</b> Regulated in the UK as a Quarantine Pest, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices). High-risk pathways for long distance spread are judged to be via hitchhiking or plants for planting (Defra 2022a).</p>	N
<i>Pristiphora cincta</i> Newman  Hymenoptera: Tenthredinidae  Blueberry sawfly	Y	N	<p><b>Distribution:</b> Present in Canada (Government of New Brunswick 2013b). Present in the UK (Green 2021).</p>	N
<i>Prodiplosis vaccinii</i> (Felt)  Diptera: Cecidomyiidae  Blueberry tip worm, blueberry tip midge  Synonym: <i>Contarinia vaccinii</i> Felt	N	N	<p><b>Distribution:</b> Present in Canada and the US. No record of presence in the UK.</p> <p><b>Biology:</b> Eggs are deposited in clusters between the loosely folded leaves of the unfolding bud (Driggers 1926). After hatching, larvae of <i>P. vaccinii</i> feed on the inside of unfurled young shoots, causing leaf distortion. Injured leaves turn yellow and develop red spots. Bud tips then dry out, blacken and eventually die (Calvo <i>et al.</i> 2004, Maxwell &amp; Wood 1961).</p>	N

			<p>Mature larvae then migrate to the soil, from which adults emerge. Two or three generations may be produced in a year (Calvo <i>et al.</i> 2004).</p> <p><b>Importance worldwide:</b> The damage from this pest is much more severe in the southern states of the US (in combination with <i>D. oxycoccana</i>, it can destroy 20-80% of the crop) (Sampson <i>et al.</i> 2013). In Canada, <i>P. vaccinii</i> is considered a minor pest (Gough &amp; Korcak 1995, Lees <i>et al.</i> 2008). The pest has also spread to Spain (Calvo <i>et al.</i> 2004).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. However, this pest was not chosen for a categorization under the recommendation that plants should be dormant and without leaves when imported into the UK. Currently, plants for planting imported into the UK must be free from plant debris, soil, flowers and fruits.</p>	
<p><i>Pseudanthonomus validus</i> Dietz</p> <p>Coleoptera: Curculionidae</p> <p>Currant fruit weevil</p>	N	N	<p><b>Distribution :</b> Present in Canada and the US (Maxwell &amp; Wood 1961, Tomlinson Jr 1960). No record of presence in the UK.</p> <p><b>Biology:</b> Eggs are laid in the developing blueberry fruits, from which the larvae feeds or in the blueberry stem (in which case, the larvae tunnels up the stem and into the berry). Berries may drop as a result of this feeding (Maxwell &amp; Wood 1961, Tomlinson Jr 1960).</p> <p>Pupation occurs in the blueberry fruit. Adult weevils then emerge and will also feed on the blueberry fruit. Adults then overwinter in the ground or leaf litter. In the spring, they will eat the leaves leaving them punctured with small dots (Wood 1915).</p> <p><b>Importance worldwide:</b> Reported in North America, where reports of economic impacts were chiefly back in the 1960s. Infestations were reported to be light or</p>	N

			<p>negligible (Maxwell &amp; Wood 1961, Tomlinson Jr 1960).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. However, this pest was not chosen for a categorization as plants for planting imported into the UK must be free from plant debris, soil, flowers and fruits.</p>	
<p><i>Pyrrhalta vaccinii</i> (Fall)</p> <p>Coleoptera: Chrysomelidae</p> <p>Blueberry leaf beetle</p> <p>Synonyms: <i>Galerucella vaccinii</i> Fall, <i>Tricholochmaea vaccinii</i> (Fall)</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (CABI 2022). Absent in the UK.</p> <p><b>Biology:</b> <i>Pyrrhalta vaccinii</i> is capable of short distance dispersal as it usually overwinters at the forest edge before moving into the fields in springtime in search of blueberry foliage (Drummond <i>et al.</i> 2009, Pickett 1943). The adult beetles also can overwinter in the leaf debris at the base of blueberry plants, before emerging to feed on developing leaf buds. Eggs are laid in the crevices or coarse surfaces at the base of the stem. The larvae pupate in the soil (Woods 1924).</p> <p>Adults and larvae feed on the lower leaf surfaces, resulting in skeletonisation and browning of the upper leaf surfaces. At high population levels, this beetle causes the defoliation of large patches of blueberry plants (Drummond <i>et al.</i> 2009, Wood 1966). Severe feeding attacks in successive years can kill the plants (Neilson &amp; Crozier 1972, Wood 1966). However, this damage is rare, usually in newly developed or poorly managed fields, and mainly affects field edges (Drummond <i>et al.</i> 2009, Loeber 1950, Neilson &amp; Crozier 1972).</p> <p><b>Importance worldwide:</b> Limited to North America. Noted as a pest that occasionally causes damage to blueberry plants (Neilson &amp; Crozier 1972).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. Potential risk to blueberry production in the UK.</p>	Y

<p><i>Rhagoletis mendax</i> Curran</p> <p>Diptera: Tephritae</p> <p>Blueberry maggot</p> <p>Synonyms: <i>Spilographa mendax</i> Curran, <i>Zonosema mendax</i> Curran</p>	N	Y (QP)	<p><b>Distribution:</b> Present in eastern Canada and the US, but absent in the UK (EPPO 2022c).</p> <p><b>Biology:</b> <i>Rhagoletis mendax</i> lays its eggs in the blueberry fruit, resulting in visible puncture holes on the skin of each berry (CFIA 2019). Larvae then feed on the fruit pulp, resulting in a loss of turgidity and causing the berries to collapse and shrivel (Rodriguez-Saona <i>et al.</i> 2015). Infested fields will have a lot of fruit on the ground (CFIA 2019). After feeding, larvae will pupate in the soil and overwinter until the following season, or remain in the soil for up to five years (Steck &amp; Payne 1993).</p> <p><b>Risk to the UK on this commodity:</b> Regulated in the UK as a Quarantine Pest, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices).</p> <p>The movement of infected fruits is the main pathway for long distance spread, though there is also a risk of transporting the pest in soil or packaging with plants for planting (EPPO No date-b).</p>	N
<p><i>Sciopithes obscurus</i> Horn</p> <p>Coleoptera: Curculionidae</p> <p>Obscure root weevil</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (GBIF 2022). No record of presence in the UK.</p> <p><b>Biology:</b> Larvae and adults of this pest overwinter in soil. Eggs are laid on the leaves. Once hatched, the larvae burrow into the soil to feed on blueberry roots which causes the most pest damage. Little damage is caused, after the pupa stage, by the adults feeding on the plant foliage.</p> <p>The presence of weevils feeding on blueberry plants can be first identified from notching of the leaves. Weevils can also contaminate the blueberry crop (Shanks 1980).</p>	N

			<p><b>Importance worldwide:</b> Native distribution appears to be North America (Canada, the US and Mexico). Recently highlighted as a concern to blueberry production in Canada (PMC 2021a).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. However, this pest was not chosen for a categorization under the recommendation that plants should be dormant and without leaves when imported into the UK. Plants for planting imported into the UK must already be free from plant debris, soil, flowers and fruits.</p>	
<p><i>Sparganothis sulfureana</i> Clemens</p> <p>Lepidoptera: Tortricidae</p> <p>Sulphur-coloured leaf roller, <i>Sparganothis</i> fruitworm</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US. Absent in the UK (GBIF 2022).</p> <p><b>Biology:</b> Eggs of the <i>Sparganothis</i> fruitworm are laid on the upper side of leaves. Larvae overwinter in the leaf litter and then emerge to feed. Larvae consume host leaves, blossoms and fruit, resulting in a decrease in yield and scarring of fruit.</p> <p>Larvae spin a web on the underside of a leaf or stem to include new plant growth. They pupate inside the fruit. There are two generations of this insect per year (Turner &amp; Liburd 2007).</p> <p><b>Importance worldwide:</b> This pest has a wide host range. Its presence is limited to North America. It is a more serious pest in the US than Canada and chiefly impacts <i>Vaccinium macrocarpon</i> (cranberry) (Gilligan &amp; Epstein 2014b).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. However, this pest was not chosen for a categorization under the recommendation that plants should be dormant and without leaves when imported into the UK. Currently, plants for planting imported into the UK must be free from plant debris, soil, flowers and fruits.</p>	N
<p><i>Spilonota ocellana</i> (Denis &amp; Schiffermüller)</p>	Y	N	<p><b>Distribution :</b> Present in Canada, the US and the UK (CABI 2022).</p>	N

<p>Lepidoptera: Tortricidae</p> <p>Eyespotted bud moth</p> <p>Synonyms: <i>Eucosma ocellana</i> (Denis &amp; Schiffermüller), <i>Tmetocera ocellana</i> (Denis &amp; Schiffermüller),</p>				
<p><i>Spodoptera frugiperda</i> (Smith)</p> <p>Lepidoptera: Noctuidae</p> <p>Fall armyworm</p> <p>Synonym: <i>Laphygma frugiperda</i> (Smith)</p>	N	Y (QP)	<p><b>Distribution:</b> Present in Canada and the US, but absent in the UK (EPPO 2022c).</p> <p><b>Biology:</b> This pest causes damage by leaf-eating. On host species, defoliation and destruction of the seedlings and young plants will occur in severe cases (EPPO 2022b). Blueberry plants are not reported as a main host however (Defra 2022a).</p> <p><i>Spodoptera frugiperda</i> is able to fly considerable distances (100km per night) (EPPO 2022b).</p> <p><b>Risk to the UK on this commodity:</b> Regulated in the UK as a Quarantine Pest, which limits the risk of this pest spreading to the UK from Canada on blueberry plants for planting (see section on potential risk mitigation practices). Long distance spread can occur by trade of produce, parts of plants, and on international flights (EPPO 2022b).</p>	N
<p><i>Systema frontalis</i> (Fabr.)</p> <p>Coleoptera: Chrysomelidae</p> <p>Red-headed flea beetle</p>	N	N	<p><b>Distribution:</b> Present in Canada and the US (CABI 2022, Maltais &amp; Ouellette 2000). No record of presence in the UK.</p> <p><b>Biology:</b> Eggs are laid in the soil for overwintering and remain in the soil during the larval stages. Larvae can feed on roots though this doesn't usually cause noticeable damage.</p> <p>Emerging as adults, <i>S. frontalis</i> feed on blueberry leaves, creating holes and even skeletonising them. Faecal matter (frass) is</p>	N

			<p>deposited near the attacked areas (Joseph &amp; Hudson 2020).</p> <p><b>Importance worldwide:</b> Distribution is limited to North America. It was noted, when found in New Brunswick, that it was a pest that should not be of economic concern at low populations. It is also suspected that blueberry is not a main host – it has a wide host range (Maltais &amp; Ouellette 2000).</p> <p><b>Risk to the UK on this commodity:</b> Not regulated in the UK. However, this pest was not chosen for a categorization under the recommendation that plants should be dormant and without leaves when imported into the UK. Currently, plants for planting imported into the UK must be free from plant debris, soil, flowers and fruits.</p>	
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Mites				
Pest name	Present in PRA area (Y/N)	Regulated in the UK (Y/N)	Supporting information	Categorization required (Y/N)
<i>Acalitus vaccinii</i> (Keifer) Acarida: Eriophyidae Blueberry bud mite	N	N	<b>Distribution:</b> Present in Canada and the US (Weibelzahl & Liburd 2010). Absent from the UK.	Y

<p>Synonyms: <i>Aceria vaccinii</i> (Keifer), <i>Eriophyes vaccinii</i> Keifer</p>			<p><b>Biology:</b> Mites remain almost continuously in the bud where they feed. An infestation may be spotted by reddish buds with rough bumps on bud scales. This pest causes distorted flowers and buds that are desiccated or fail to open. This may impact upon fruit yield (Weibelzahl &amp; Liburd 2010).</p> <p>This mite disperses by air and by honeybee pollinators (Baker &amp; Neunzig 1970).</p> <p><b>Importance worldwide:</b> Only present in North America. May cause serious yield losses.</p> <p><b>Risk to the UK on this commodity:</b> This pest is not regulated in the UK and a potential risk to blueberry production in the UK via the import of plants for planting. Categorization is needed to assess phytosanitary risk.</p>	
<p><i>Tetranychus urticae</i> Koch</p> <p>Acarida: Tetranychidae</p> <p>Common red spider mite</p> <p>Synonyms: <i>Tetranychus althaeae</i> von Hanstein, <i>Tetranychus bimaculatus</i> Harvey</p>	Y	N	<p><b>Distribution:</b> Present in Canada, the US and the UK (CABI 2022).</p>	N

Molluscs				
Pest name	Present in PRA area (Y/N)	Regulated in The UK (Y/N)	Supporting information	Categorization required (Y/N)
N/A	N/A	N/A	N/A	N/A



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