Animal and Plant Health Inspection Service
U.S. DEPARTMENT OF AGRICULTURE

Importation of blueberry fruit (*Vaccinium angustifolium, V. ashei, V. corymbosum*, and *V. virgatum*) from Chile into the United States for consumption

A Qualitative, Pathway Initiated Pest Risk Assessment

Version 1

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Executive Summary

The purpose of this report is to assess the pest risks associated with importing fresh fruit of blueberry, *Vaccinium angustifolium* Aiton*, V. ashei* J. M. Reade*, V. corymbosum* L.*,* and *V. virgatum* L. (Ericaceae), from Chile into the United States for consumption.

The pest risk assessment was developed in response to a modification of existing market access request for the importation of fresh blueberry submitted by Chile. We did not consider any production, harvest, post-harvest, shipping, or storage conditions during the development of this assessment. As such, blueberry fruit produced under different conditions were not evaluated and may pose a different pest risk.

We used scientific literature, port-of-entry pest interception data, and information from the government of Chile to develop a list of pests with quarantine significance for the United States. These are pests that occur in Chile on any host and are associated with the commodity plant species anywhere in the world. Then we determined the likelihood of introduction for each pest that has a reasonable likelihood of being associated with the pathway.

The following organisms are candidates for pest risk management because they have met the threshold for unacceptable consequences of introduction and can follow the commodity import pathway.

Pest type	**Taxonomy**	**Scientific name**	**Likelihood of Introduction**
INSECT	Diptera: Tephritidae	*Ceratitis capitata* (Wiedemann)	High
INSECT	Hemiptera: Pseudococcidae	*Pseudococcus meridionalis* Prado	Medium
INSECT	Lepidoptera: Tortricidae	*Lobesia botrana* Denis & Schiffermüller	Medium
INSECT	Thysanoptera: Thripidae	*Frankliniella australis* Morgan	Medium

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1. Introduction

1.1. Background

The purpose of this report is to present PPQ's assessment of the pest risk associated with the importation of fresh fruit of blueberry (*Vaccinium angustifolium* Aiton, *V. ashei* J. M. Reade, *V. corymbosum* L., and *V. virgatum* L.) from Chile (referred to as the export area) into the United States[1] (referred to as the pest risk analysis or PRA area) for consumption.

This is a qualitative risk assessment. The likelihood of pest introduction is expressed as a qualitative rating rather than using numerical terms. This methodology is consistent with guidelines provided by the International Plant Protection Convention (IPPC) in the International Standard for Phytosanitary Measures (ISPM) No. 11, "Pest Risk Analysis for Quarantine Pests" (IPPC, 2023). The use of biological and phytosanitary terms is consistent with ISPM No. 5, "Glossary of Phytosanitary Terms" (IPPC, 2023).

As defined in ISPM No. 11, this document comprises Stage 1 (Initiation) and Stage 2 (Risk Assessment) of risk analysis. Stage 3 (Risk Management) will be covered in a separate document.

1.2. Initiating event

The commodity is currently permitted into the United States, but recent detections of European grapevine moth (*Lobesia botrana*) infesting plum fruit have prompted a re-evaluation of the current operational work plan of blueberry. Therefore, this risk assessment was initiated to update the pest list in preparation for a new operational work plan for blueberries from Chile.

1.3. Potential weediness of the commodity

In some cases, an imported commodity could become invasive in the PRA area. If warranted, we analyze the commodity for weed risk. A weed risk analysis is not required when (a) the commodity is already enterable into the PRA area from other countries, (b) the commodity plant species is widely established or cultivated in the PRA area, or (c) the imported plant part(s) cannot easily propagate on its own or be propagated. We determined that the weed risk of blueberry does not need to be analyzed because *Vaccinium* spp. are widely established or cultivated in the PRA area (USDA NRCS, 2026).

1.4. Description of the pathway

A pathway is "any means that allows the entry or spread of a pest" (IPPC, 2023). In the context of this document, the pathway is the commodity to be imported. The following description includes those conditions and processes the commodity undergoes from production through importation and distribution that may have an impact on pest risk and therefore were considered in our assessment. Commodities produced under different conditions were not considered.

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[1]The *United States* includes all states, the District of Columbia, Guam, the Northern Mariana Islands, Puerto Rico, the U.S. Virgin Islands, and any other territory or possession of the United States.

<u>1.4.1. Description of the commodity</u>
The specific pathway of concern is the importation of fresh fruit of blueberry for consumption from Chile to the United States, etc.

<u>1.4.2. Summary of the production, harvest, post-harvest, shipping, and storage conditions considered</u>
Fresh fruit of blueberry (*Vaccinium angustifolium, V. ashei, V. corymbosum*, and *V. virgatum*) from Chile may include peduncles, but no stems or leaves. Production, harvesting, and post-harvesting procedures and shipping and storage conditions in the export area were not considered during this assessment.

2. Pest List and Pest Categorization

The pest list is a compilation of plant pests of quarantine significance to the United States. This list includes pests that are present in Chile on any host, are known to be associated with *Vaccinium angustifolium, V. ashei, V. corymbosum,* and *V. virgatum* anywhere in the world. Pests are of quarantine significance if they are not present in the PRA area, are actionable at U.S. ports of entry, are federal noxious weeds, are considered for or under federal official control, or require evaluation for regulatory action. Species with a reasonable likelihood of following the pathway into the PRA area are analyzed to determine their pest risk potential.

2.1. Pest list

We developed the pest list based on scientific literature, port-of-entry pest interception data, and information provided by the government of Chile. We listed the pests that are of quarantine significance to the PRA area in Table 1. For each pest, we provided evidence for presence in Chile and its association with *Vaccinium angustifolium, V. ashei, V. corymbosum,* and *V. virgatum*. We included pests on the pest list if we found evidence that at least one of the *Vaccinium* species is a host. For those organisms that we identified as following the pathway, we provided additional host associations for each *Vaccinium* species that has been documented and within the scope of this assessment. We indicated the plant parts with which the pest is generally associated. Pests that are likely to remain associated with the harvested commodity in a viable form are indicated by bolded text. For those pests that we indicate as following the pathway, if applicable, we may include additional information about the organism such as presence in the United States, domestic regulations, etc. to justify continued quarantine treatment. We summarize the pests that follow the pathway in Table 2.

Table 1. List of quarantine pests associated with *Vaccinium angustifolium, V. ashei, V. corymbosum,* and *V. virgatum* anywhere in the world and present in Chile on any host.

Pest name	Presence in Chile	Host association	Plant part(s) [2]	Considered further?[3]
INSECT: Diptera: Tephritidae *Ceratitis capitata* (Wiedemann)	**(SAG, 2026b)**	***V. ashei*: (Bisognin et al., 2015); *V. corymbosum*: (Follett et al., 2011; Vaccaro and Bouvet, 2006)**	**Fruit (Follett et al., 2011; Vaccaro and Bouvet, 2006)**	**Yes[4]**
INSECT: Hemiptera: Coreidae: *Leptoglossus chilensis* Spinola	(Faúndez and Carvajal, 2016)	*V. corymbosum*: (Rocca, 2010)	Leaves, flowers, fruits, buds (Rocca, 2010)	No Leaf-footed bugs feed externally on fruit, and fly or disperse quickly when disturbed (Ingels and Haviland, 2014). They are conspicuous and would disperse during harvest and processing.
INSECT: Hemiptera: Pseudococcidae: *Pseudococcus meridionalis* Prado; syn. *Pseudococcus rubigena* González	**(Correa et al., 2011; Suh, 2026)**	***Vaccinium* / Blueberry: (Suh, 2026)**	**Intercepted on fruit (Suh, 2026)**	**Yes**
INSECT: Lepidoptera: Tortricidae: *Lobesia botrana* Denis & Schiffermüller	**(SAG, 2026c; Simmons et al., 2021)**	***Vaccinium* / Blueberry: (Benelli et al., 2023; Simmons et al., 2021): *V. ashei:* (Calvo and Molina, 2011): *V.***	**Flower buds, fruits (Molina, 1998)**	**Yes[5]**

[2] The plant part(s) listed are those for the plant species under analysis. If the information has been extrapolated, such as from plant part association on other plant species, we note that.

[3] "Yes" indicates simply that the pest has a reasonable likelihood of being associated with the harvested commodity; the level of pest prevalence on the harvested commodity (high, medium, or low) is qualitatively assessed as part of the Likelihood of Introduction assessment (section 3).

[4] While this insect is under eradication-based official control in Chile (SAG, 2026b), we analyzed the likelihood of introduction because it can be associated with blueberry fruit.

[5] While this insect is regulated by Chile (SAG, 2026c), we analyzed the likelihood of introduction because it can be associated with blueberry fruit.

Pest name	Presence in Chile	Host association	Plant part(s) [2]	Considered further?[3]
		corymbosum**: (Altimira et al., 2019; Calvo and Molina, 2011; Molina, 1998)**		
INSECT: Thysanoptera: Thripidae: *Frankliniella australis* Morgan, syn. *Frankliniella cestrum* (Moulton)	**(Funderburk et al., 2002; Undurraga and Vargas, 2013)**	***V. corymbosum*****: (Undurraga and Vargas, 2013)**	**Twigs, peduncles, flowers, and fruits (Undurraga and Vargas, 2013)**	**Yes Intercepted often and expected to follow the pathway for *Vaccinium* fruits (Suffert et al., 2018).**
PHYTOPLASMA '*Candidatus* Phytoplasma solani' (16SrXII-A subgroup)	(Gajardo et al., 2009)	*V. corymbosum* (Starović et al., 2013)	Systemic (Gajardo et al., 2009)	No This phytoplasma is vectored by phloem feeding insects in the family Cixiidae and they would not feed on fruit (Quaglino et al., 2013; Weintraub and Beanland, 2006). Without an associated vector to spread the disease, fruit can be considered a dead-end pathway for the organism.
FUNGUS *Diaporthe asheicola* L. Lombard & Crous	(Lombard et al., 2014)	*V. ashei* (Lombard et al., 2014)	Stems (Guarnaccia et al., 2020)	No
FUNGUS *Diaporthe passiflorae* Crous & L. Lombard	(Elfar et al., 2013)	*V. corymbosum* (Elfar et al., 2013)	Stems (Elfar et al., 2013). Disease was observed when inoculated onto fruit (Elfar et al., 2013).	No
FUNGUS *Fusarium oxysporum* Schltdl.: Fr.	(Moya-Elizondo et al., 2019)	*V. corymbosum* (Moya-Elizondo et al., 2019)	Crowns, Leaves (Moya-Elizondo et al., 2019)	No

Pest name	Presence in Chile	Host association	Plant part(s) [2]	Considered further?[3]
FUNGUS *Neofusicoccum arbuti* (D.F. Farr & M.E. Elliott) Crous, Slippers & A.J.L. Phillips; syn. *Fusicoccum arbuti* D.F. Farr & M.E. Elliott	(Espinoza et al., 2009)	*V. corymbosum* (Espinoza et al., 2009)	Stems (Espinoza et al., 2009)	No
FUNGUS *Neofusicoccum australe* (Slippers, Crous & M.J. Wingf.) Crous, Slippers & A.J.L. Phillips; syn. *Botryosphaeria australis* Slippers, Crous & M.J. Wingf., *Fusicoccum australe* Slippers, Crous & M.J. Wingf.	(Espinoza et al., 2009)	*V. corymbosum* (Espinoza et al., 2009)	Stems (Espinoza et al., 2009)	No
FUNGUS *Neofusicoccum nonquaesitum* Inderb., Trouillas, Bostock & Michailides	(Pérez F et al., 2014)	*V. corymbosum* (Inderbitzin et al., 2010; Pérez F et al., 2014)	Stems (Pérez F et al., 2014)	No
FUNGUS *Neopestalotiopsis mesopotamica* Maharachch., K.D. Hyde & Crous	(Barrera-Merino et al., 2025)	*V. corymbosum* (Barrera-Merino et al., 2025)	Stems (Barrera-Merino et al., 2025)	No

2.2. Pests considered but not included on the pest list

2.2.1. Organisms with non-quarantine status

We found evidence of organisms that are associated with blueberry fruit and are present in Chile but do not meet the definition of a quarantine pest for the PRA area. Because those pests are considered non-quarantine by the United States, they were not considered further.

Armored scales (Hemiptera: Diaspididae): These insects are highly unlikely to establish via the fruits or vegetables for consumption pathway due to their very limited ability to disperse to new host plants (Miller et al., 1985; PERAL, 2007). Also, diaspidids on fruits and vegetables for consumption are considered non-actionable at U.S. ports of entry (NIS, 2024). For these reasons, armored scales are not included in Table 1, even if they are not present in the PRA area.

2.2.2. Quarantine pests considered but not included on the pest list

The fungus, *Diaporthe neotheicola* (Sacc.) Udayanga & Castl., is present in Chile and *V. corymbosum* has been recorded as a host (Elfar et al., 2013). However, the disease only occurred when fruit was inoculated with *D. neotheicola* in the laboratory. Because we found no evidence that this fungus naturally infests blueberry fruit, we did not include this fungus in Table 1.

2.3. Pests selected for further analysis or already regulated

We identified the following quarantine pests for further analysis (Table 2)

Table 2. Pests selected for further analysis

Pest type	Taxonomy	Species names
Arthropod	Diptera: Tephritidae	*Ceratitis capitata* (Wiedemann)
Arthropod	Hemiptera: Pseudococcidae	*Pseudococcus meridionalis* Prado
Arthropod	Lepidoptera: Tortricidae	*Lobesia botrana* Denis & Schiffermüller
Arthropod	Thysanoptera: Thripidae	*Frankliniella australis* Morgan

3. Assessing Pest Risk Potential

3.1. Introduction

Risk is described by the likelihood of introduction, the potential consequences, and the associated uncertainty. For each pest, we determined if an endangered area exists within the United States. The endangered area is defined as the portion of the PRA area where ecological factors favor the pest's establishment and where the pest's presence will likely result in economically important impacts. If a pest causes an unacceptable impact, that means it could adversely affect agricultural production. Examples include causing a yield loss of 10 percent or greater, increasing U.S. production costs, impacting an environmentally important host, or impacting international trade. After the endangered area is defined, we assessed the pest's likelihood of introduction into that area via the imported commodity.

The likelihood of introduction is based on the potential entry and establishment of a pest. The likelihood of entry and likelihood of establishment are interdependent and part of the pathway continuum. We qualitatively assessed this using the ratings: High, Medium, and Low. Additionally, we provide uncertainty ratings for each element that goes into determining the likelihood of entry and establishment. We defined the ratings as follows:

> **High**: This outcome is highly likely to occur because the events required occur frequently.
> **Medium**: This outcome can occur; however, the combination of required events does not occur frequently.
> **Low**: This outcome is less likely to occur because the exact combination of required events seldom happens.

We addressed uncertainty associated with each element as follows:

> **High:** Reliable evidence is not available.
> **Moderate:** Additional or more reliable evidence may or may not change rating.
> **Low:** Additional or more reliable evidence is unlikely to change the rating.
> **Negligible:** Additional or more reliable evidence is very unlikely to change the rating.

3.2. Assessment

3.2.1. *Ceratitis capitata* (Diptera: Tephritidae)

The Mediterranean fruit fly is a highly invasive species that has been established in many parts of the world. This fruit fly is highly polyphagous, feeding on pulp inside fruit where they easily go unnoticed and eventually leave the fruit unmarketable (De Meyer et al., 2002; Liquido et al., 1990; Thomas et al., 2005). The introduction of the fruit fly into the United States (outside of Hawaii where the pest is already established) triggers costly eradication programs to prevent widespread damage (NAPPO, 2022; NAPPO, 2023; NAPPO, 2024; NAPPO, 2025).

The endangered area for *Ceratitis capitata* within the United States

Geographic potential: Mediterranean fruit fly is widely distributed in Africa, the Mediterranean region, South and Central America, west Asia, and Australia (CABI, 2026; EPPO, 2026; White and Elson-Harris, 1994). Based on a comparison of plant hardiness zones (PHZs) (SAFARIS, 2026) where this species has been detected, we estimate that Mediterranean fruit fly could establish from PHZ 8 to 13 in the United States. The Mediterranean fruit fly is already present in Hawaii (Liquido et al., 1990; Mason, 1932).

Hosts in PRA area: Larvae are known to feed on hundreds of hosts (CABI, 2026; Liquido et al., 1990; Thomas et al., 2005; White and Elson-Harris, 1994), many of which are present within Plant Hardiness Zones 8 to 13 in the United States (NRCS, 2026; SAFARIS, 2026). In addition to *Vaccinium* (**Ericaceae**), some examples include **Cactaceae:** *Opuntia ficus-indica* (Barbary fig); **Caricaceae:** *Carica papaya* (papaya); **Cucurbitaceae:** *Momordica charantia* (balsampear); **Moraceae:** *Ficus carica* (edible fig); **Myrtaceae:** *Psidium guajava* (guava); **Juglandaceae:** *Juglans nigra* (black walnut), *Juglans regia* (English walnut); **Rosaceae:** *Eriobotrya japonica* (loquat), *Prunus persica* (peach), *Pyrus communis* (pear), *Rubus lucidus* (manatee dewberry); **Rutaceae:** *Citrus* × *aurantiifolia* (lime), *Citrus* × *paradisi* (grapefruit), *Citrus reticulata* (mandarin), *Citrus* × *sinensis* (orange); and **Solanaceae:** *Capsicum annuum* (pepper), *Solanum lycopersicum* (tomato), *Solanum melongena* (eggplant) (Liquido et al., 1990).

Economically important hosts[6]: Economically important hosts are present (NRCS, 2026) in the endangered area (Plant Hardiness Zones 8 to 13 within the United States). The United States is the largest global producer of blueberries (Protzman, 2021) with millions of acres grown throughout the country (NASS, 2024). Hosts with thousands of acres of farming area include fig, grapefruit, lime, mandarin, orange, peach, pear, pepper, plum, and walnut (NASS, 2024).

Potential consequences on economically important hosts at risk: This pest is likely to cause unacceptable consequences because damage to fruit crops may reach 100 percent on unprotected

[6] As defined by ISPM No. 5, potential economic importance applies to crops, the environment (ecosystems, habitats, or species), and to other specified values such as tourism, recreation and aesthetics (IPPC, 2022).

hosts (Thomas et al., 2005). Larvae feed inside fruit on the pulp, leaving the fruit unmarketable (Thomas et al., 2005).

Endangered area: The endangered area includes Plant Hardiness Zones 8 through 13 within the United States where host plants are present.

The likelihood of entry of *Ceratitis capitata* into the endangered area via blueberry fruit imported from Chile

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Pest prevalence on the harvested commodity	High	Moderate	Several blueberry cultivars are considered good or very good hosts for *Ceratitis capitata* (Follett et al., 2021). It has been reported infesting the fruits of blueberries in different countries (Follett et al., 2021; Shi, 2026; Vaccaro and Bouvet, 2006). Larvae create galleries within the fruit (Habibe et al., 2006; Roditakis et al., 2008) which may protect them from removal and allow them to escape detection during harvest. Therefore, we have chosen a risk rating of High. Because field infestation studies are lacking, and susceptibility of different blueberry cultivars may reduce infestation rates (Follett et al., 2011), we increased our uncertainty level to Moderate.
Likelihood of surviving post-harvest processing before shipment	High	n/a	Post-harvest processing was not considered in this assessment; therefore, we maintain a risk rating of High.
Likelihood of surviving shipping and storage conditions of the consignment	High	n/a	Transport and storage conditions were not considered in this assessment; therefore, we maintain a risk rating of High.
Overall Likelihood of Entry	High	n/a	n/a

The likelihood of establishment of *Ceratitis capitata* into the endangered area via blueberry fruit imported from Chile

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Establishment	High	Negligible	Mediterranean fruit fly has an expansive host range (Liquido et al., 1990) and suitable hosts are widely available throughout the endangered area (NRCS, 2026). Should it enter the country, this pest is likely to find new hosts because it is capable of flight over short distances and wind can disperse individuals over a mile (Thomas et al., 2005). Females can lay multiple eggs

			within a single grape (McDonald and McInnis, 1985), creating an opportunity for one infested fruit to produce multiple offspring and potentially establish a population. Each female can lay several hundred eggs (Thomas et al., 2005), allowing for a population to build up quickly. The Mediterranean fruit fly has invaded multiple countries via the human-assisted movement of fruits (CABI, 2026; Karsten et al., 2015), demonstrating its ability to invade new lands. Based on this evidence we expect eggs, larvae, and pupae to be found with the exported commodity. Mediterranean fruit fly has been introduced into the United States multiple times, prompting costly eradication programs (NAPPO, 2022; NAPPO, 2023; NAPPO, 2024; NAPPO, 2025). Therefore, we consider the likelihood of establishment to be High.
Overall Likelihood of Establishment	High	n/a	n/a

The likelihood of introduction (combined likelihoods of entry and establishment) of *Ceratitis capitata* into the endangered area via blueberry fruit imported from Chile is High.

3.2.2. *Pseudococcus meridionalis* (Hemiptera: Pseudococcidae)

This species was first described in 2011 from specimens collected in Chile (Correa et al., 2011). This mealybug has three generations a year (González, 2011; Zaviezo, 2015). The first generation emerges from the soil and typically colonizes lower parts of the host plant. The second and third generations spread into the foliage and fruit, creating an overlap of generations and life stages which may be present on the fruit (González, 2011). The presence of immature stages of *Psuedococcus* spp. on blueberry has been particularly problematic for Chile, where their presence on the fruit has led to high levels of shipment rejections (González, 2011).

The endangered area for *Pseudococcus meridionalis* within the United States

Geographic potential: *Pseudococcus meridionalis* is present in **South America:** Argentina (Granara de Willink and González, 2018), Brazil (da Silva et al., 2017), and Chile (Correa et al., 2011; Correa et al., 2015; Correa et al., 2012). Based on a comparison of PHZs (SAFARIS, 2026) where this species has been detected, we estimate that this mealybug could establish from PHZ 9 to 10 in the United States.

Hosts in PRA area: Hosts in the PRA area (NRCS, 2026) include **Amaranthaceae:** *Alternanthera pungens* (khakiweed) (Granara de Willink and González, 2018); **Asteraceae:** *Conyza bonariensis* (asthmaweed), *Parthenium hysterophorus* (Santa Maria feverfew) (Granara de Willink and González, 2018); **Chenopodiaceae:** *Atriplex lampa* (South American saltbush); **Ebenaceae:** *Diospyros* spp. (persimmon) (Correa et al., 2011); **Ericaceae:** *Vaccinium* spp. (blueberry) (Correa et al., 2011); **Punicaceae:** *Punica granatum* (pomegranate) (Correa et al., 2011); **Rosaceae:** *Cydonia oblonga* (quince) (SAG, 2026a), *Prunus persica* (peach), *Prunus* *persica* var. *nucipersica* (nectarine), *Prunus* spp. (plum), *Pyrus communis* (common pear) (Granara de Willink and González, 2018), *Pyrus pyrifolia* (Chinese pear) (Correa et al., 2011); and **Vitaceae:** *Vitis vinifera* (grape) (Correa et al., 2011).

Economically important hosts[7]*:* Economically important hosts are present (NRCS, 2026) in the endangered area (Plant Hardiness Zones 9 to 10 within the United States). The United States is the largest global producer of blueberries (Protzman, 2021) with millions of acres grown throughout the country (NASS, 2024). Hosts with thousands of acres of farming area include, nectarine, peach, pear, persimmon, plum, and pomegranate (NASS, 2024).

Potential consequences on economically important hosts at risk: This pest is likely to cause unacceptable consequences because it was identified as one of the main mealybug pests of grape in Chile (Correa et al., 2015; Correa et al., 2012). Feeding damage may lead to loss of flower buds and newly formed fruits and a loss of vigor and reduced growth in grapevines (Zaviezo, 2015).

Endangered area: The endangered area includes Plant Hardiness Zones 9 through 10 within the United States where host plants are present.

The likelihood of entry of *Pseudococcus meridionalis* into the endangered area via blueberry fruit imported from Chile

[7] As defined by ISPM No. 5, potential economic importance applies to crops, the environment (ecosystems, habitats, or species), and to other specified values such as tourism, recreation and aesthetics (IPPC, 2022).

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Pest prevalence on the harvested commodity	High	Negligible	The eggs, nymphs, and adults of unidentified *Pseudococcus* spp. intercepted on blueberry from Chile accounted for more than 60% of rejections to Japan (González, 2011). This species, *P. meridionalis*, was also intercepted on blueberries from Chile to Korea (Suh, 2026), confirming the presence of this species in the exported commodity. *Pseudococcus meridionalis* is multivoltine and has at least three generations a year; from the second generation onward, this species feeds and lays ovisacs (a mass of eggs in a protective waxy enclosure) on fruit (González, 2011; Zaviezo, 2015). Therefore, blueberry fruit can host all life stages (ovisacs, early and late instar nymphs, and adults) (González, 2011). For these reasons, we chose a risk rating of High.
Likelihood of surviving post-harvest processing before shipment	High	n/a	Post-harvest processing was not considered in this assessment; therefore, we maintain a risk rating of High.
Likelihood of surviving shipping and storage conditions of the consignment	High	n/a	Transport and storage conditions were not considered in this assessment; therefore, we maintain a risk rating of High.
Overall Likelihood of Entry	High	n/a	n/a

The likelihood of establishment of *Pseudococcus meridionalis* into the endangered area via blueberry fruit imported from Chile

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Establishment	Low	Low	Ovisacs, early and late instar nymphs, and adults may be found on fruits (González, 2011). The natural mobility of ovisacs, later instar nymphs, and adult females is very limited. However, 1st instar nymphs and adult males are more mobile, with adult males having wings to fly and 1st instar nymphs (crawlers) walking or being carried on the wind (Gullan, 1997; Mani et al., 2014). While mealybugs can spread to other plants (see (Browning, 1959; Charles, 2009; da Silva-Torres, 2013), Grasswitz (2008) found that

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
			individuals did not move far from their hosts, with most moving less than 90 cm before settling. Crawlers have the highest potential to disperse long distances with the wind (Gullan, 1997), and they are commonly transported as part of the "aerial plankton" at upper-altitudes (Gertsson, 2015; Sengonca, 1999). However, wind is slow and sporadic near the ground (Aylor, 1993), which is the likely location for crawlers emerging from discarded fruit (Hennessey, 2013). Additionally, crawlers arriving on imported fruit would be at significant risk of starvation, needing to settle and begin feeding within about 24 hours of hatching (Greathead, 1990). Other factors reducing prospects for survival include increased risk of death by desiccation and attack by natural enemies (da Silva-Torres, 2013). It is unlikely that a significant number of *P. meridionalis* will accompany consignments of blueberries, complete development, disperse to find a suitable host and a mate, and establish. Therefore, we rate the likelihood of establishment as Low.
Overall Likelihood of Establishment	Low	n/a	n/a

The likelihood of introduction (combined likelihoods of entry and establishment) of *Pseudococcus meridionalis* into the endangered area via blueberry fruit imported from Chile is Medium.

3.2.3. *Lobesia botrana* (Lepidoptera: Tortricidae)

Blueberry is a host for this species, but research on this pest in blueberry is sparse, with the majority of efforts focusing on grapes (Altimira et al., 2019; Benelli et al., 2023; Simmons et al., 2021). Impacts of this moth can be significant, with reported grape losses of 80% (Whittle, 1985). The moth was introduced into California's wine-producing region in Napa County in 2009, prompting an eradication program that continued to 2016 (NAPPO, 2010; NAPPO, 2016). Larval feeding and tunneling directly damages fruit and expose fruit to secondary attack by opportunistic saprophytes or pathogens, particularly *Botrytis cinerea* (CABI, 2026; Roehrich and Boller, 1991). Silk webbing and feces deposited by larvae require labor- and time-intensive cleaning of grape bunches, which may account for 30-40% of the harvesting effort (Avidov and Harpaz, 1969). *Lobesia botrana* damage, particularly secondary fungal contamination, also interferes with wine-making and may result in a low-quality product (Rousseau et al., 2005). Damage due to larvae feeding and developing within other fruit crops, such as persimmon, pome and stone fruit, may be significant (Ben-Yehuda et al., 1999). Mobility of adults is limited. Virgin females within vineyards rarely disperse further than 80 m (Schmitz et al., 1996) and males were observed dispersing no more than 40 m (Saour, 2016). Fecundity may exceed 300 eggs per female, with a maximum of four generations per year (Avidov and Harpaz, 1969).

The endangered area for *Lobesia botrana* within the United States

<u>Geographic potential:</u> *Lobesia botrana* is present in **Africa**: Algeria, Egypt, Eritrea, Ethiopia, Kenya, Libya, Morocco, Tunisia; **Asia**: Armenia, Azerbaijan, Georgia, Iran, Iraq, Israel, Jordan, Kazakhstan, Lebanon, Syria, Tajikistan, Turkey, Turkmenistan, Uzbekistan; **Europe**: Albania, Armenia, Austria, Belarus, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, France (including Corsica), Georgia, Germany (Rhineland-Palatinate), Greece (including Crete), Hungary, Italy (including Sardinia and Sicily), Lithuania, Luxembourg, Macedonia, Malta, Moldova, Montenegro, Poland, Portugal, Romania, Russia, Serbia, Slovakia (Bratislava), Slovenia, Spain (including Balearic Islands), Switzerland, United Kingdom (England, Wales), Ukraine; **Oceania**: Samoa, Tuvalu; and **South America**: Argentina, Chile (EPPO, 2026; Hopkins, 1927; SAG, 2025). By comparing Plant Hardiness Zones (PHZs) from the known distribution of *L. botrana* to the United States, we estimate the endangered areas encompass PHZs 7 through 14 (SAFARIS, 2026).

<u>Hosts in PRA area:</u> Hosts in the PRA area (NRCS, 2026) include **Anacardiaceae**: *Rhus glabra* (smooth sumac) (Whittle, 1985); **Araliaceae**: *Hedera helix* (English ivy) (Whittle, 1985); **Asteraceae**: *Tanacetum vulgare* (common tansy) (Brown et al., 2008); **Berberidaceae**: *Berberis vulgaris* (common barberry) (Whittle, 1985); **Ebenaceae**: *Diospyros virginiana* (persimmon) (Whittle, 1985); **Ericaceae**: *Vaccinium* (blueberry) (Benelli et al., 2023; DeVetter et al., 2015; Simmons et al., 2021), **Fabaceae**: *Medicago sativa* (alfalfa), *Trifolium pratense* (red clover) (Whittle, 1985); **Grossulariaceae**: *Ribes rubrum* (currant), *R. uva-crispa* (European gooseberry) (Whittle, 1985); **Oleaceae**: *Ligustrum vulgare* (European privet) (Whittle, 1985), *Olea europaea* (olive) (Brown et al., 2008), *Syringa vulgaris* (common lilac); **Punicaceae**: *Punica granatum* (pomegranate), **Ranunculaceae**: *Clematis vitalba* (evergreen clematis) (Brown et al., 2008); **Rosaceae**: *Eriobotrya japonica* (loquat), *Malus domestica* (apple), *Prunus avium* (sweet cherry), *P. domestica* (plum), *P. persica* (peach), *P. persica* var. *nucipersica* (nectarine), *P. spinosa* (blackthorn), *Pyrus communis* (pear) (Whittle, 1985); **Rubiaceae**: *Coffea arabica* (coffee); **Solanaceae**: *Solanum tuberosum* (potato); and **Vitaceae**: *Vitis vinifera* (grape) (Brown et al., 2008).

<u>Economically important hosts:</u> Economically important hosts are present (NRCS, 2026) in the endangered area (Plant Hardiness Zones 7 to 14 within the United States). Hosts with millions of acres of farming area include alfalfa, blueberry, grape, and potato (NASS, 2024). Hosts with thousands of acres of farming area include apple, cherry, coffee, nectarine, olive, peach, pear, plum, and pomegranate (NASS, 2024).

<u>*Potential consequences on economically important hosts at risk:*</u> This pest is likely to cause unacceptable consequences because the moth is serious pest of grapes with reported losses of 80% (Whittle, 1985). Impacts include direct damage to fruit, increased exposure to secondary diseases, particularly *Botrytis cinerea* (CABI, 2026; Roehrich and Boller, 1991), and silk webbing and feces that requires intensive labor to remove (Avidov and Harpaz, 1969).

<u>Endangered area:</u> The endangered area includes Plant Hardiness Zones 7 through 14 within the United States where host plants are present.

The likelihood of entry of *Lobesia botrana* into the endangered area via blueberry fruit imported from Chile

Risk Element	**Risk Rating**	**Uncertainty Rating**	**Evidence for rating (and other notes as necessary)**
Pest prevalence on the harvested commodity	High	Negligible	While the literature states that blueberry is not a primary host (Altimira et al., 2019; Benelli et al., 2023; Simmons et al., 2021), larvae have been intercepted in shipments from numerous countries (including Chile) on blueberry fruit destined to the United States (ARM, 2026), demonstrating entry on the commodity. Therefore, we chose a risk rating of High.
Likelihood of surviving post-harvest processing before shipment	High	n/a	Post-harvest processing was not considered in this assessment; therefore, we maintain a risk rating of High.
Likelihood of surviving shipping and storage conditions of the consignment	High	n/a	Transport and storage conditions were not considered in this assessment; therefore, we maintain a risk rating of High.
Overall Likelihood of Entry	High	n/a	n/a

The likelihood of establishment of *Lobesia botrana* into the endangered area via blueberry fruit imported from Chile

Risk Element	**Risk Rating**	**Uncertainty Rating**	**Evidence for rating (and other notes as necessary)**
Likelihood of Establishment	Medium	Low	Opportunities to establish are limited because *Lobesia botrana* moths lay eggs singly on fruit, after which larvae penetrate the pulp to feed (Whittle, 1985). Should the larvae survive, isolated adults emerging from the infested fruit would need to find a mate. Then, if a mate is located, gravid females would need to locate new host material to lay eggs. Their mobility is limited; Schmitz et al. (1996) found dispersal of virgin females within vineyards rarely to exceed 80 m. Males

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
			were observed dispersing no more than 40 m (Saour, 2016). Despite these challenges, this moth has been introduced into several countries outside of its native range (Argentina, Chile, and United States) (CABI, 2026), demonstrating its ability to invade new lands. Moreover, pupae have been found in fruit for export (ARM, 2026), eliminating the need to complete development and increasing their ability to survive. Additionally, the moth has a wide host range, which further aids in this insect's ability to establish. Because of these reasons we rate the likelihood of establishment as Medium.
Overall Likelihood of Establishment	Medium	n/a	n/a

The likelihood of introduction (combined likelihoods of entry and establishment) of *Lobesia botrana* into the endangered area via blueberry fruit imported from Chile is Medium.

3.2.4. *Frankliniella australis* (Thysanoptera: Thripidae)
Frankliniella australis is one of the main thrips species associated with blueberry crops in Chile (Undurraga and Vargas, 2013). They lay eggs in tender tissue such as fruit, flowers, and peduncles where the larvae feed before pupating and emerging as adults (Undurraga and Vargas, 2013). Oviposition scars and feeding by thrips larvae are known to damage blueberry plants and fruits, causing russeting and pitting (Undurraga and Vargas, 2013). This species is only known from Argentina, Brazil, and Chile (CABI, 2026) and is expected to follow the pathway as it has been intercepted on fruits exported from these areas (Suffert et al., 2018).

The endangered area for *Frankliniella australis* within the United States

Geographic potential: *Frankliniella australis* is present in **South America:** Argentina, Brazil (CABI, 2026; da Silva et al., 2017), and Chile (CABI, 2026; Funderburk et al., 2002). Based on a comparison of PHZs (SAFARIS, 2026) where this species has been detected, we estimate that this thrips could establish from PHZ 9 to 10 in the United States

Hosts in PRA area: *Frankliniella australis* is polyphagous, having been found on more than 100 plant species across 27 families (CABI, 2026). Economically important hosts include **Ericaceae**: *Vaccinium corymbosum* (blueberry) (Undurraga and Vargas, 2013); **Fabaceae**: *Pisum sativum* (pea), *Vicia faba* (faba bean) (CABI, 2026); **Lauraceae**: *Persea americana* (avocado) (CABI, 2026); **Liliaceae**: *Allium cepa* (onion) (CABI, 2026); **Rosaceae**: *Cydonia oblonga* (quince), *Fragaria ananassa* (strawberry), *Malus domestica* (apple), *Prunus avium* (sweet cherry), *P. domestica* (plum), *P. persica* (peach), *Rosa sp.* (roses), *Rubus idaeus* (raspberry) (CABI, 2026);

Solanaceae: *Capsicum annuum* (bell pepper), *Solanum lycopersicum* (Tomato), *S. muricatum* (melon), *S. tuberosum* (potato) (CABI, 2026); **Vitaceae**: *Vitis vinifera* (grape) (ref for all hosts (CABI, 2026).

Economically important hosts: Economically important hosts are present (NRCS, 2026) in the endangered area (Plant Hardiness Zones 9 to 10 within the United States). The United States is the largest global producer of blueberries (Protzman, 2021) with millions of acres grown throughout the country (NASS, 2024). Other significant hosts include grape, bell pepper, peach, cherry, tomato, potato, plum, and melon (NASS, 2024).

Potential consequences on economically important hosts at risk: This pest is likely to cause unacceptable consequences because oviposition scars and feeding by larvae causes russeting and pitting (Undurraga and Vargas, 2013), which may make fruit unmarketable. Larvae and adult feeding on tender tissues can act as disease vectors transmitting fungi, bacteria, and viruses (Undurraga and Vargas, 2013). It is not known whether *F. australis* is a vector for diseases. Furthermore, it is a pest of quarantine significance for several countries (Suffert et al., 2018) making the consequences of introduction unacceptable.

Endangered area: The endangered area includes Plant Hardiness Zones 9 through 10 within the United States where host plants are present.

The likelihood of entry of *Frankliniella australis* into the endangered area via blueberry fruit imported from Chile.

Risk Element	**Risk Rating**	**Uncertainty Rating**	**Evidence for rating (and other notes as necessary)**
Pest prevalence on the harvested commodity	High	Negligible	*Frankliniella australis* is one of the main thrips species associated with blueberry crops in Chile (Undurraga and Vargas, 2013). All life stages are associated with fruit. They lay eggs in tender tissue, including fruit, flowers, and peduncles, where the larvae feed before emerging as adults (Undurraga and Vargas, 2013). This species has been intercepted on fruit exported from South America, demonstrating entry on the commodity, and it is expected to follow the pathway (Suffert et al., 2018). Therefore, we chose a risk rating of High.
Likelihood of surviving post-harvest processing before shipment	High	Negligible	Post-harvest processing was not considered in this assessment; therefore, we maintain a risk rating of High.
Likelihood of surviving shipping and storage conditions of the consignment	High	Negligible	Transport and storage conditions were not considered in this assessment; therefore, we maintain a risk rating of High.
Overall Likelihood of Entry	High	n/a	n/a

The likelihood of establishment of *Frankliniella australis* into the endangered area via blueberry fruit imported from Chile

Risk Element	**Risk Rating**	**Uncertainty Rating**	**Evidence for rating (and other notes as necessary)**
Likelihood of Establishment	Medium	Moderate	*Frankliniella australis* lays eggs in tender tissue such as fruit, flowers, and peduncles where the larvae feed before pupating and emerging as adults. Adults are highly active after emergence and are capable of flight (Undurraga and Vargas, 2013). We expect adults to move off the commodity during harvest, but eggs and larvae are likely to be present. The life cycle takes 15 to 20 days and adult females do not require a mate as they can reproduce parthenogenetically (Undurraga and Vargas, 2013). Therefore, a single female surviving to adulthood could start a new population. As a highly polyphagous species (CABI, 2026) with highly active, flying adults (Undurraga and Vargas, 2013) we expect these thrips could easily find hosts in unmanaged areas." or something like that Therefore, we rate the likelihood of establishment as Medium.
Overall Likelihood of Establishment	Medium	n/a	n/a

The likelihood of introduction (combined likelihoods of entry and establishment) of *Pseudococcus meridionalis* into the endangered area via blueberry fruit imported from Chile is Medium.

4. Summary

The following pests are considered quarantine significant for the United States. The pests have a reasonable likelihood of following the commodity pathway and would likely cause unacceptable consequences if introduced into the PRA area (Table 3). Thus, the pests are candidates for risk management.

Table 3. Summary of quarantine pests that are candidates for risk management.

Pest type	Scientific name	Likelihood of introduction	Notes
Arthropod	*Ceratitis capitata* (Wiedemann)	High	n/a
Arthropod	*Pseudococcus meridionalis* Prado	Medium	n/a
Arthropod	*Lobesia botrana* Denis & Schiffermüller	Medium	n/a
Arthropod	*Frankliniella australis* Morgan	Medium	n/a

Our assessment of risk is contingent on the application of all components of the pathway as described in section 1.4. The detailed examination and choice of appropriate phytosanitary measures to mitigate pest risk are addressed in a separate document.

5. Literature Cited

Altimira, F., De La Barra, N., Rebufel, P., Soto, S., Soto, R., Estay, P., Vitta, N. and Tapia, E., 2019. Potential biological control of the pupal stage of the European grapevine moth *Lobesia botrana* by the entomopathogenic fungus *Beauveria pseudobassiana* in the winter season in Chile. BMC Research Notes, 12(1): 548.

ARM, 2026. Agricultural Risk Management System. Animal and Plant Health Inspection Service, United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine. https://arm.aphis.usda.gov/.

Aylor, D.E., Y. Wang, and D.R. Miller, 1993. Intermittent wind close to the ground within a grass canopy. Boundary-Layer Meteorology, 66(4): 427–448.

Barrera-Merino, I., Castro, J., Moya-Elizondo, E., Barra-Bucarei, L., Cisterna-Oyarce, V., Millas, P., Carrasco-Fernández, J., Santelices, C., Guerra, M. and Ortiz-Campos, J., 2025. First report of *Neopestalotiopsis mesopotamica* causing stem blight on *Vaccinium corymbosum* in Chile. New Disease Reports, 51(1).

Benelli, G., Lucchi, A., Anfora, G., Bagnoli, B., Botton, M., Campos-Herrera, R., Carlos, C., Daugherty, M.P., Gemeno, C. and Harari, A.R., 2023. European grapevine moth, *Lobesia botrana* Part II: Prevention and management. Entomologia Generalis, 43(2): 281–304.

Bisognin, M., Nava, D., Diez-Rodríguez, G., Valgas, R., Garcia, M., Krolow, A. and Antunes, L., 2015. Development of *Anastrepha fraterculus* (Diptera: Tephritidae) related to the phenology of blueberry, blackberry, strawberry guava, and surinam cherry fruits. Journal of Economic Entomology, 108(1): 192–200.

Brown, J.W., Robinson, G. and Powell, J.A., 2008. Food plant database for the leafrollers of the world (Lepidoptera: Tortricidae).

Browning, T.O., 1959. The long-tailed mealybug, *Pseudococcus adonidum* (L.), in South Australia. Australian Journal of Agricultural Research, 10(3): 322–339.

CABI, 2026. Crop Protection Compendium. Centre for Agriculture and Bioscience International (CABI). Wallingford, UK. https://www.cabidigitallibrary.org/product/qc.

Calvo, D. and Molina, J., 2011. Insectos asociados al cultivo del arándano en Andalucía Occidental [Insects associated with blueberry cultivation in Western Andalusia]. Vida Rural: 66–70.

Charles, J.G., K.J. Froud, R. van den Brink, and D.J. Allan, 2009. Mealybugs and the spread of grapevine leafroll-associated virus 3 (GLRaV-3) in a New Zealand vineyard. Australasian Plant Pathology, 38(6): 576–583.

Correa, M., Aguirre, C., Germain, J.-F., Hinrichsen, P., Zaviezo, T., Malausa, T. and Prado, E., 2011. A new species of *Pseudococcus* (Hemiptera: Pseudococcidae) belonging to the "*Pseudococcus maritimus*" complex from Chile: molecular and morphological description. Zootaxa, 2926: 46–54.

Correa, M.C., Lombaert, E., Malausa, T., Crochard, D., Alvear, A., Zaviezo, T. and Palero, F., 2015. Mealybug species from Chilean agricultural landscapes and main factors influencing the genetic structure of *Pseudococcus viburni*. Scientific Reports, 5(1): 1–10.

Correa, M.C.G., Germain, J.-F., Malausa, T. and Zaviezo, T., 2012. Molecular and morphological characterization of mealybugs (Hemiptera: Pseudococcidae) from Chilean vineyards. Bulletin of Entomological Research, 102(5): 524–530.

da Silva-Torres, C.S.A., M.D. de Oliveira, and J.B. Torres, 2013. Host selection and establishment of striped mealybug, *Ferrisia virgata*, on cotton cultivars. Phytoparasitica, 41(1): 31–40.

da Silva, V.C.P., Kaydan, M.B., Malausa, T., Germain, J.-F., Palero, F. and Botton, M., 2017. Integrative taxonomy methods reveal high mealybug (Hemiptera: Pseudococcidae) diversity in southern Brazilian fruit crops. Scientific Reports, 7(1): 1–9.

De Meyer, M., Copeland, R.S., Lux, S.A., Mansell, M., Quilici, S., Wharton, R., White, I.M. and Zenz, N.J., 2002. Annotated Check List of Host Plants for Afrotropical Fruit Flies (Diptera:Tephritidae) of the Genus *Ceratitis*. Documentation Zoologiques, 27. Royal Museum for Central Africa, Tervuren, Belgium, 1–91 pp.

DeVetter, L.W., Granatstein, D., Kirby, E. and Brady, M., 2015. Opportunities and challenges of organic highbush blueberry production in Washington State. HortTechnology, 25(6): 796–804.

Elfar, K., Torres, R., Díaz, G.A. and Latorre, B.A., 2013. Characterization of *Diaporthe australafricana* and *Diaporthe* spp. associated with stem canker of blueberry in Chile. Plant Disease, 97(8): 1042–1050.

EPPO, 2026. EPPO Global Database. European and Mediterranean Plant Protection Organization. https://gd.eppo.int/.

Espinoza, J., Briceño, E., Chávez, E., Úrbez-Torres, J. and Latorre, B., 2009. *Neofusicoccum* spp. associated with stem canker and dieback of blueberry in Chile. Plant Disease, 93(11): 1187–1194.

Faúndez, E.I. and Carvajal, M.A., 2016. Sobre la relación entre *Leptoglossus chilensis* (Spinola, 1852) y *Leptoglossus concaviusculus* Berg, 1892 stat. rest.(Heteroptera: Coreidae), con nuevos datos acerca de su morfología [On the relationship between *Leptoglossus chilensis* (Spinola, 1852) and *Leptoglossus concaviusculus* Berg, 1892 stat. rest. (Heteroptera: Coreidae), with notes about their morphology], Anales del Instituto de la Patagonia. SciELO Chile, pp. 65–70.

Follett, P.A., Haynes, F.E. and Dominiak, B.C., 2021. Host suitability index for polyphagous tephritid fruit flies. Journal of Economic Entomology, 114(3): 1021–1034.

Follett, P.A., Zee, F.T., Hamasaki, R.T., Hummer, K. and Nakamoto, S.T., 2011. Susceptibility of low-chill blueberry cultivars to Mediterranean fruit fly, Oriental fruit fly, and melon fly (Diptera: Tephritidae). Journal of Economic Entomology, 104(2): 566–570.

Funderburk, J., Ripa, R., Espinoza, F. and Rodriguez, F., 2002. Parasitism of *Frankliniella australis* (Thysanoptera: Thripidae) by *Thripinema khrustalevi* (Tylenchida: Allantonematidae) isolate Chile. Florida Entomologist, 85(4): 645–649.

Gajardo, A., Fiore, N., Prodan, S., Paltrinieri, S., Botti, S., Pino, A., Zamorano, A., Montealegre, J. and Bertaccini, A., 2009. Phytoplasmas associated with grapevine yellows disease in Chile. Plant Disease, 93(8): 789–796.

Gertsson, C.-A.a.C.H., 2015. Coccoidea (scale insects). In: N.P.K. J. Böcher, T. Pape, and L. Vilhelmsen (Editor), The Greenland Entomofauna: An Identification Manual of Insects, Spiders and Their Allies. Koninklijke Brill NV., Leiden, Netherlands, pp. 132–147.

González, R.H., 2011. Pseudocóccidos de Importancia Frutícola en Chile (Hemiptera: Pseudococcidae). Universidad de Chile Facultad de Ciencias Agronómicas Publicaciones en Ciencias Agrícolas. Universidad de Chile Facultad de Ciencias Agronómicas, Santiago.

Gordh, G. and McKirdy, S. (Editors), 2014. The Handbook of Plant Biosecurity: Principles and Practices for the Identification, Containment and Control of Organisms that Threaten Agriculture and the Environment Globally. Springer, New York, 723 pp.

Granara de Willink, M.C. and González, P., 2018. Revisión taxonómica de Pseudococcus Westwood (Hemiptera: Pseudococcidae) de Centro y Sud América con descripciones de especies nuevas. Insecta Mundi, 0673: 1–118.

Greathead, D.J., 1990. Crawler behaviour and dispersal. In: D. Rosen (Editor), Armored Scale Insects: Their Biology, Natural Enemies and Control. World Crop Pests. Elsevier Science Publishers B.V., Amsterdam, pp. 305–308.

Guarnaccia, V., Martino, I., Tabone, G., Brondino, L. and Gullino, M.L., 2020. Fungal pathogens associated with stem blight and dieback of blueberry in northern Italy. Phytopathologia Mediterranea, 59(2): 229–245.

Gullan, P.J.a.M.K., 1997. Adaptations in scale insects. Annual Review of Entomology, 42: 23–50.

Habibe, T.C., Viana, R.E., Damasceno, I.C., Malavasi, A., Nascimento, A.S., Paranhos, B.A., Haji, F.N.P. and Carvalho, R.S., 2006. Infestation of grape *Vitis vinifera* by *Ceratitis capitata* (Wiedemann) (Diptera: Tephritidae) in sub-medium Sao Francisco Valley, Brazil, In Fruit Flies of Economic Importance: From Basic to Applied Knowledge, Proceedings of the 7th International Symposium on Fruit Flies of Economic Importance, 10-15 September 2006, Salvador, Brazil. https://www.osti.gov/etdeweb/biblio/21518541, pp. 183–185.

Hennessey, M.K., J.E. Peña, M. Zlotina, and K. Santos, 2013. Likelihood of disperal of the armored scale, *Aonidiella orientalis* (Hemiptera: Diaspididae), to avocado trees from infested fruit discarded on the ground, and observations on spread by handlers. In: J.E. Peña (Editor), Potential Invasive Pests of Agricultural Crops. CAB International, Wallingford, U.K., pp. 401–411.

Inderbitzin, P., Bostock, R.M., Trouillas, F.P. and Michailides, T.J., 2010. A six locus phylogeny reveals high species diversity in Botryosphaeriaceae from California almond. Mycologia, 102(6): 1350–1368.

Ingels, C.A. and Haviland, D.R., 2014. Leaffooted Bug, University of California IPM, UC ANR Publication 74168. https://ipm.ucanr.edu/home-and-landscape/leaffooted-bug/#gsc.tab=0.

IPPC, 2023. ISPM No. 5: Glossary of phytosanitary terms. Food and Agriculture Organization-International Plant Protection Convention (IPPC). https://www.ippc.int/en/publications/622/, pp. 38.

Karsten, M., Jansen van Vuuren, B., Addison, P. and Terblanche, J.S., 2015. Deconstructing intercontinental invasion pathway hypotheses of the Mediterranean fruit fly (*Ceratitis capitata*) using a Bayesian inference approach: are port interceptions and quarantine protocols successfully preventing new invasions? Diversity and Distributions, 21(7): 813–825.

Liquido, N.J., Cunningham, R.T. and Nakagawa, S., 1990. Host plants of Mediterranean fruit fly (Diptera: Tephritidae) on the island of Hawaii (1949-1985 survey). Journal of Economic Entomology, 83(5): 1863–1878.

Lombard, L., van Leeuwen, G., Guarnaccia, V., Polizzi, G., van RIuswick, P., Rosendahl, K., Gabler, J. and Crous, P., 2014. *Diaporthe* species associated with *Vaccinium*, with specific reference to Europe. Phytopathologia Mediterranea, 53(2): 287–299.

Mani, M., Shivaraju, C. and Kulkarni, N.S., 2014. The Grape Entomology. Springer, New Dehli, 202 pp.

Mason, A.C., 1932. The economic importance of the Mediterranean fruit fly to Hawaiian horticulture. Proceedings Hawaiian Entomological Society.

http://scholarspace.manoa.hawaii.edu/bitstream/10125/15839/1/PHES08_163-178.pdf, 8: 163–178.
McDonald, P.T. and McInnis, D.O., 1985. *Ceratitis capitata*: Effect of host fruit size on the number of eggs per clutch. Entomologia Experimentalis et Applicata, 37(3): 207–211.
Miller, D., Blackburn, V., Davidson, J. and Gimpel Jr, W., 1985. Pest risk assessment of armored scales on certain fruit. United States Department of Agriculture, Agricultural Research Service, Beltsville, Maryland.
Molina, J.M., 1998. Lepidópteros asociados al cultivo del arándano en Andalucía occidental [Lepidoptera associated with blueberry cultivation in Western Andalusia]. Boletín de Danidad Vegetal: Plagas, 24(4): 763–772.
Moya-Elizondo, E., Doussoulin, H., San Martin, J., Ruiz, B. and Del Valle, P., 2019. First report of *Fusarium oxysporum* causing Fusarium wilt on blueberry (*Vaccinium corymbosum*) in Chile. Plant Disease, 103(10): 2669.
NAPPO, 2022. *Ceratitis capitata* (Mediterranean fruit rly): APHIS establishes quarantine area in San Bernardino and Los Angeles Counties, California. North American Plant Protection Organization (NAPPO), Phytosanitary Alert System. https://www.pestalerts.org/nappo/official-pest-reports/1001/.
NAPPO, 2023. APHIS establishes Mediterranean fruit fly and Queensland fruit fly quarantines in California. North American Plant Protection Organization (NAPPO), Phytosanitary Alert System.
NAPPO, 2024. *Ceratitis capitata* (Mediterranean fruit fly): APHIS establishes a quarantine in Alameda and Santa Clara Counties, California. North American Plant Protection Organization (NAPPO), Phytosanitary Alert System. https://www.pestalerts.org/nappo/official-pest-reports/1116/.
NAPPO, 2025. *Ceratitis capitata* (Mediterranean fruit fly): APHIS establishes and expands the quarantine in Santa Clara County, California, North American Plant Protection Organization (NAPPO), Phytosanitary Alert System. https://www.pestalerts.org/nappo/official-pest-reports/1160/.
NASS, 2024. 2022 Census of Agriculture - United States. In: N.A.S.S.N. United States Department of Agriculture (Editor). United States Department of Agriculture, National Agricultural Statistics Service (NASS). https://www.nass.usda.gov, pp. 658.
NIS, 2024. Revised phytosanitary action exemption policy for armored scales (Hemiptera: Diaspididae) intercepted from non-propagative articles (NIS action policy, Sept. 25, 2024), United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, National Identification Services (NIS).
NRCS, 2026. PLANTS Database. United States Department of Agriculture, Natural Resources Conservation Service (NRCS). https://plants.usda.gov/.
PERAL, 2007. Phytosanitary risks associated with armored scales in commercial shipments of fruit for consumption to the United States, Revision Original, United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, Center for Plant Health Science and Technology, Plant Epidemiology and Risk Analysis Laboratory (PERAL), Raleigh, NC.
Pérez F, S., Meriño-Gergichevich, C. and Guerrero C, J., 2014. Detection of *Neofusicoccum nonquaesitum* causing dieback and canker in highbush blueberry from Southern Chile. Journal of Soil Science and Plant Nutrition, 14(3): 581–588.

Protzman, E., 2021. Blueberries around the globe – past, present, and future, International Agricultural Trade Report. Foreign Agricultural Service, United States Department of Agriculture, Foreign Agricultural Service (FAS). https://www.fas.usda.gov/data/blueberries-around-globe-past-present-and-future.

Quaglino, F., Zhao, Y., Casati, P., Bulgari, D., Bianco, P.A., Wei, W. and Davis, R.E., 2013. '*Candidatus* Phytoplasma solani', a novel taxon associated with stolbur-and bois noir-related diseases of plants. International Journal of Systematic and Evolutionary Microbiology, 63(Pt_8): 2879–2894.

Rocca, M., 2010. Diversidad de los artrópodos fitófagos del cultivo de arándano [*Vaccinium corymbosum*] en la Argentina, Universidad Nacional de La Plata, Buenos Aires, Argentina, 278 pp.

Roditakis, E., Tsagkarakou, A. and Roditakis, N., 2008. Extensive damage on white variety table grapes by the Mediterranean fruit fly Ceratitis capitata (Wiedemann) in Crete. EPPO Bulletin, 38(2): 216–219.

SAFARIS, 2026. Spatial analytic framework for advanced risk information systems (SAFARIS). United States Department of Agriculture (USDA) and North Carolina State University (NCSU). Raleigh, NC. https://safaris.cipm.info/.

SAG, 2026a. Archivo entomologico SAG, Servicio Agrícola y Ganadero (SAG). https://microimagenes.sag.gob.cl/.

SAG, 2026b. Fruit fly, Regulations, Servicio Agrícola y Ganadero (SAG). https://www.sag.cl/ambitos-de-accion/mosca-de-la-fruta/normativas.

SAG, 2026c. *Lobesia botrana* or vine cluster moth, Servicio Agricola y Ganadero (SAG). https://www.sag.gob.cl/ambitos-de-accion/lobesia-botrana-o-polilla-del-racimo-de-la-vid.

Saour, G., 2016. Flight ability and dispersal of European grapevine moth gamma-irradiated males (Lepidoptera: Tortricidae). Florida Entomologist, 99 Special Issue 1: 73–78.

Schmitz, V., Roehrich, R. and Stockel, J., 1996. Déplacements d'adultes de *Lobesia botrana* marqués et lachés dans un vignoble isolé: étude de l'effet de la phéromone sexuelle synthétique sur leurs mouvements. Journal International des Sciences de la Vigne et du Vin, 30(2): 67–72.

Sengonca, C.a.C.A., 1999. Survey on the distribution of the horse chestnut scale *Pulvinaria regalis* Canard (Hom., Coccidae) in Germany in the years 1996 to 1998. Anzeiger für Schädlingskunde, Pflanzenschutz, Umweltschutz, 72(6): 153–157.

Shi, R., 2026. Evaluation of Mediterranean fruit fly (*Ceratitis capitata*) host preference and metabolomics changes under acid-base stress to understand the biological and physiological changes, Murdoch University, Perth, Western Australia, 154 pp.

Simmons, G.S., Salazar Sepulveda, M.C., Fuentes Barrios, E.A., Idalsoaga Villegas, M., Medina Jimenez, R.E., Garrido Jerez, A.R., Henderson, R. and Donoso Riffo, H., 2021. Development of sterile insect technique for control of the European grapevine moth, *Lobesia botrana*, in urban areas of Chile. Insects, 12(5): 378.

Starović, M., Kojic, S., Kuzmanovic, S., Stojanovic, S., Pavlovic, S. and Josic, D., 2013. First report of blueberry reddening disease in Serbia associated with 16SrXII-A (Stolbur) phytoplasma. Plant Disease, 97(12): 1653.

Suffert, M., Wilstermann, A., Petter, F., Schrader, G. and Grousset, F., 2018. Identification of new pests likely to be introduced into Europe with the fruit trade. EPPO Bulletin, 48(1): 144–154.

Suh, S.-J., 2026. Recent detection trends of scale insects (Hemiptera: Coccomorpha) in quarantine inspections in South Korea. Insecta Mundi, 1181: 1–15. https://doi.org/10.64338/im.1181.59q90.

Thomas, M.C., Heppner, J.B., Woodruff, R.E., Weems, H.V., Steck, G.J. and Fasulo, T.R., 2005. Mediterranean fruit fly, *Ceratitis capitata* (Wiedemann) (Insecta: Diptera: Tephritidae) (EENY214), University of Florida, Institute of Food and Agricultural Sciences (IFAS). https://ask.ifas.ufl.edu/publication/IN371.

Undurraga, P. and Vargas, S., 2013. Manual del arándano (Boletín INIA - No. 263) [Blueberry Manual (INIA Bulletin - No. 263)], Instituto de Investigaciones Agropecuarias INIA, Centro Regional de Investigación Quilamapu, Chillán, Chile. https://hdl.handle.net/20.500.14001/7627.

USDA NRCS, 2026. The PLANTS Database, National Plant Data Team, Greensboro, NC 27401-4901 USA. http://plants.usda.gov.

Vaccaro, N. and Bouvet, J., 2006. Presence of *Ceratitis capitata* Wied. and *Anastrepha fraterculus* (Wied.) on blueberries (*Vaccinium* spp.) in the department of Concordia, Entre Ríos and in the department of Curuzú Cuatía, Corrientes, Argentina, INTA-EEA, Concordia, Entre Ríos.

Weintraub, P.G. and Beanland, L., 2006. Insect vectors of phytoplasmas. Annual Review of Entomology, 51(1): 91–111.

White, I.M. and Elson-Harris, M.M., 1994. Fruit Flies of Economic Significance: Their Identification and Bionomics. CAB International, Wallingford, UK, 608 pp.

Whittle, K., 1985. Pests not known to occur in the United States or of limited distribution. European grape vine moth: *Lobesia botrana* (Denis & Schiffermüller), United States Department of Agriculture, Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ). https://caps.ceris.purdue.edu/wp-content/uploads/2025/07/Lobesia_botrana_PNKTO.pdf.

Zaviezo, T., A. Romero, and M. Soledad Oyarzún, 2015. Biología de nuevas especies de chanchitos blancos. Revista Agronomía y Forestal, 52: 28–32.