Importation of Two Fresh Fruit Hybrids of Unshu, Sweet, and Mandarin Oranges, *Citrus* spp., from Korea into the Continental United States

A Qualitative, Pathway-Initiated Risk Analysis

May 14, 2013

Version 1

Agency Contact:
Plant Epidemiology and Risk Analysis Laboratory
Center for Plant Health Science and Technology

United States Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
1730 Varsity Drive, Suite 300
Raleigh, NC 27606

Executive Summary

This risk assessment was initially prepared by the staff at the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ), Center for Plant Health Science and Technology (CPHST), Plant Epidemiology and Risk Analysis Laboratory (PERAL) for Cheju Island of the Republic of Korea for the importation into the continental United States of two hybrids of Unshu, sweet, and mandarin oranges:

- Shiranuhi [(*C. reticulata* ssp. *unshiu* × (*C.* × *sinensis*)) × *C. reticulata*]
- Setoka [(*C. reticulata* ssp. *unshiu* × (*C.*× *sinensis*)) × *C. reticulata*] × *C. reticulata*]

Citrus × *sinensis* (L.) Osbeck is otherwise known as the sweet orange, while *C. reticulata* Blanco is the mandarin orange. We have previously assessed the pest risk for Unshu orange, *Citrus reticulata* Blanco ssp. *unshiu* Swingle. Here, we examined the risks associated with the importation of fresh fruit of these two Unshu-sweet orange hybrids from Cheju Island of the Republic of Korea into the continental United States. We analyzed pests using the methodology described in our pest risk assessments guidelines, examining pest biology related to the Likelihood and Consequences of Introduction.

We identified *Elsinoë australis* and *Xanthomonas citri* subsp. *citri* as quarantine pests likely to follow the pathway. These pests pose a phytosanitary risk to U.S. agriculture. We gave both a Pest Risk Potential of **Medium**. Specific phytosanitary measures may be necessary for pests rated Medium, as port-of-entry inspection might not provide phytosanitary security.

Table of Contents

1. Introduction

1.1. Background

We have previously assessed the pest risk for Unshu orange, *Citrus reticulata* Blanco ssp. *unshiu* Swingle. Here we examined the pest risks associated with the importation into the continental United States of fresh fruit of two hybrids of tangerine, Unshu, and sweet oranges from the Republic of Korea:

- Shiranuhi [(*C. reticulata* ssp. *unshiu* × (*C.* × *sinensis*)) × *C. reticulata*]
- Setoka [(*C. reticulata* ssp. *unshiu* × (*C.*× *sinensis*)) × *C. reticulata*] × *C. reticulata*]

Citrus × *sinensis* (L.) Osbeck (pro. sp.) is the sweet orange, while *C. reticulata* Blanco is the tangerine or mandarin orange. These commodities are proposed to come from Cheju Island of Korea into the continental United States. In this analysis, we express risk ratings as High, Medium, and Low, rather than in numerical terms, such as probabilities or frequencies. The details of the methodology and rating criteria can be found in Guidelines for Pathway-Initiated Pest Risk Assessments, Version 5.02 (PPQ, 2000).

International plant protection organizations such as the North American Plant Protection Organization (NAPPO) and the International Plant Protection Convention (IPPC) provide standards for conducting pest risk analyses. The methods used to initiate, conduct, and report this assessment, as well as the use of biological and phytosanitary terms, are based on these standards (IPPC, 2011). The IPPC standards describe three stages of pest risk analysis: Stage 1, Initiation; Stage 2, Risk Assessment; and Stage 3, Risk Management. This document satisfies the requirements of Stages 1 and 2, and provides mitigation options for Stage 3.

1.2. Standard Post-Harvest Processing Measures

The current regulations governing Korean Unshu oranges contain two parts that describe specific practices designed to remove pests from the pathway (7 CFR § 319.28, 2008). Currently, Unshu oranges are produced on Cheju Island of the Republic of Korea; we did not assess the pest risk posed by orange hybrids produced elsewhere in Korea.

First, the protocol requires culling diseased or damaged fruit, and cleaning fruit with “high-pressure air or water spray in combination with brushing.”

Second, mandatory inspection is directed at the armored scale *Unaspis yanonensis* and the pathogen *Xanthomonas citri* subsp. *citri* (citrus canker). Each shipment must be accompanied by a phytosanitary certificate stating that “These oranges were inspected and are considered to be free from citrus canker (*Xanthomonas citri* subsp. *citri*) and arrowhead scale (*Unaspis yanonensis*).” We note, however, that PPQ does not currently regulate armored scales on fruit for consumption (PPQ, 2008).

In addition, Korea is required to surface sterilize the fruit (7 CFR § 319.28, 2008). Hence, in the packinghouse, fruit will be washed in detergent, and in disinfectant with one of the following:

200 ppm chlorine (Cl) (2 minutes), sodium orthophenylphenate (SOPP) (1 minute), or 85ppm peroxy acid (1 minute). Finally, the fruit is dried and waxed.

2. Risk Assessment

2.1. Initiating Event: Proposed Action

In this commodity-based, pathway-initiated risk assessment we evaluate the pest risks associated with the commercial importation of fresh fruit of two tangerine, Unshu, and sweet orange hybrids from Cheju Island of the Republic of Korea into the continental United States. In 2011, the National Plant Quarantine Service of the Republic of Korea requested market access for the Shiranuhi and Setoka hybrid varieties (NPQS, 2011).

2.2. Assessment of Weed Risk Potential

We previously assessed the weed risk potential of Unshu oranges, *C. reticulata* ssp. *unshiu* (PPQ, 2009), concluding that the commodity had low potential to be a weed. The hybrids here are simply crosses with other common *Citrus* commodities, tangerines and sweet oranges, which also have low potential to be weeds. Therefore, we concluded that screening the hybrids further would not prompt a pest-initiated risk assessment.

2.3. Decision History, Previous Risk Assessments, Current Status and Pest Interceptions

2.3.1. Decision history

In 1994, the USDA approved entry of Korean Unshu oranges produced only in Cheju Island to any state in the United States. This was revoked in 2002 due to interceptions of citrus canker. In 2007, Korea Unshu oranges were again allowed in, but only to Alaska.

In 1995, the United States accepted Unshu oranges from Japan into all states except Arizona, California, Florida, Louisiana, and Texas.

Table 1. Prior decisions made by the United States about requests to import *Citrus* spp.

Year	Country	*Citrus* spp.	Decision	Reason/Conditions
1932	Curacoa	*C. aurantium*	Denied	No acceptable treatment available
1949	Turkey	*C. limon*	Approved	North Atlantic/not in citrus-growing states
1951	Liberia	*C. aurantifolia*	Approved	
1961	Japan	*C. aurantifolia*	Denied	No acceptable treatment available
1961	Japan	*Citrus limon*	Denied	No acceptable treatment available
1962	Chile	*C. aurantifolia*	Denied	No acceptable treatment available
1962	Chile	*Citrus limon*	Denied	No acceptable treatment available
1971	Ceylon	*C. aurantifolia*	Denied	No acceptable treatment available
1971	Chile	*C. limon*	Denied	No acceptable treatment available
1971	Australia	*C. limon*	Denied	No treatment available
1977	Niue Island	*C. aurantifolia*	Denied	Exotic fruit flies attacking limes

Year	Country	*Citrus* spp.	Decision	Reason/Conditions
1977	Bermuda	*C. limon*	Approved	Inspection and treatment if warranted
1982	Chile	*C. limon*	Approved	Inspection and fumigation [T101 (a)]
1984	Turkey	*C. limon*	Approved	Inspection and treatment if warranted
1988	Solomon Island	*C. aurantifolia*	Denied	No acceptable treatment available
1988	Jordan	*C. aurantifolia*	Denied	No acceptable treatment available
1988	Jordan	*C. limon*	Denied	No treatment available
1988	Mexico	*C. limettioides*	Denied	No acceptable treatment
1988	Jordan	*C. limettioides*	Denied	No acceptable treatment
1989	Bermuda	*C. aurantifolia*	Approved	Inspection and treatment
1989	Bermuda	*C. aurantium*	Approved	All ports
1989	Bermuda	*C. limon*	Approved	Inspection and treatment if warranted
1990	Cook Island	*C. aurantifolia*	Denied	No acceptable treatment for *Dacus melanotus*
1990	Sierra Leone	*C. aurantium*	Denied	No approved treatment
1991	Mexico	*C. aurantifolia*	Approved	Subject to inspection
1992	Chile	*C. aurantifolia*	Approved	Subject to treatment T101 (a) at 50°C
1994	French Guyana	*C. aurantifolia*	Denied	PPQ lacks approved treatment for *Bactrocera tryoni*
1994	Italy	*C. aurantium*	Approved	All ports
1994	French Guyana	*C. limon*	Approved	
1994	Korea	*C. reticulata*	Approved	Enterable into all states except Arizona, California, Florida, Louisiana, Texas, PR, CNMI, and U.S. VI
1995	Japan	*C. reticulata*	Approved	Enterable into all states except Arizona, California, Florida, Louisiana, and Texas
2001	Argentina	*C. limon*	Approved	Enterable into all states except Arizona, California, Florida, Louisiana, and Texas
2007	Korea	*C. reticulata*	Approved	Alaska
2008	Japan	*C. reticulata*	Approved	Enterable into all states except Arizona, California, Florida, Louisiana, and Texas
2010	Korea	*C. reticulata*	Approved	All ports in the continental United States

2.3.2. Previous risk assessments

In 1994, the USDA approved entry of Unshu oranges—*Citrus reticulata* Blanco var. *unshu*, Swingle—also known as Satsuma mandarin, grown in the Republic of Korea. They were subject to the safeguards outlined in 7 CFR §319.28(b), and could enter any area of the United States except Arizona, California, Florida, Louisiana, Texas, American Samoa, Puerto Rico, Northern Mariana Islands, and the U.S. Virgin Islands. The 1994 assessment stated, "Permit entry of clean fruit subject to preclearance inspection and the safeguards [specified in an operational work plan]." Subsequent site visits by PPQ officials did not detect *G. citricarpa* on Cheju Island.

In 1995, USDA also approved entry of Unshu oranges from Japan into all States in the continental United States except Arizona, California, Florida, Louisiana, and Texas (these States are hereby defined as the citrus-producing States) (PPQ, 1995) (Fig. 1). The quarantine pests that could follow the Unshu fruit pathway were *Bactrocera tsuneonis* Miyake, *Candidatus* "Liberobacter asiaticum," *Diaphorina citri* Kuway, *Eotetranychus kankitus* Ehara, *Eotetranychus asiaticus* Ebara, *Parlatoria cinerea* Hadden, *Planococcus lilacinus* (Cockerell), *P. kraunhiae* Kuwana, *Pseudococcus cryptus* Hempl., *Tetranychus kanzawai* Kishida, *Toxoptera citricida* Kirkaldy, *Unaspis yanonensis* Kuwana, and *Xanthomonas citri* subsp. *citri*.
The mitigation options recommended in the 1995 risk assessment for unshu oranges were:

1. Presented a work plan with mandatory treatments (methyl bromide) for microarthropods and with options for *Bactrocera tsuneonis* which include:
   a) mandatory treatment (methyl bromide),
   b) fruit fly free zone (by definition 319.562(f)), and
   c) systems approach.
2. Biometric sampling.
3. Full preclearance at origin.
4. Optional treatments such as oil soapy water dips.
5. Port-of-entry inspection.

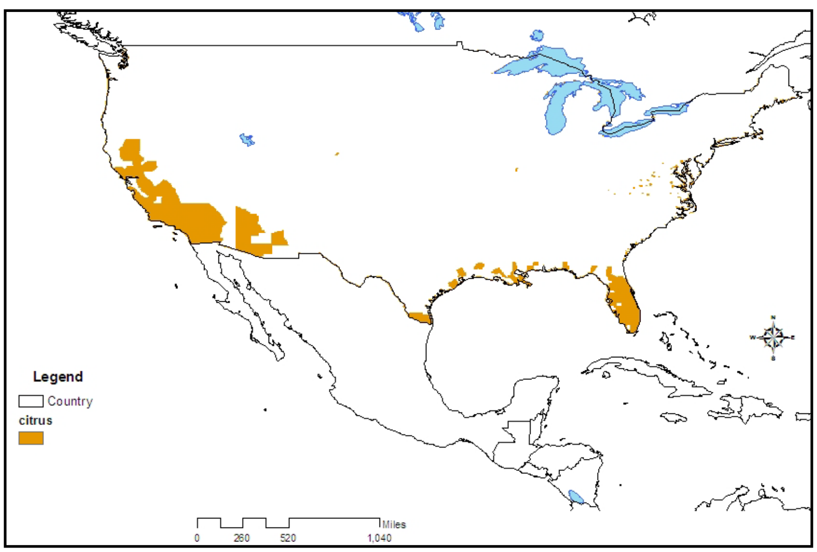

Figure 1. Citrus production in the continental United States [Source: NAPPFAST generated plant hardiness zone using climate data from 1997-2006].

2.3.3. Current status and pest interceptions

Pest interceptions on citrus *(Citrus* spp., *C. reticulata* ssp. *unshiu*, *C. reticulata*, and *C.* × *sinensis*) from the Republic of Korea from January 1985 through December 2012 are listed in Appendix A. During this time, inspectors intercepted actionable pests 556 times on *Citrus* spp. from Korea (PestID, 2013). These include 98 interceptions of *Xanthomonas citri* subsp. *citri* (citrus canker); 34 interceptions of *Guignardia citricarpa* Kiely; 34 interceptions of *Parlatoria ziziphi* Lucas; and 31 interceptions of *Unaspis yanonensis* Kuwana.

2.4. Pest Categorization: Identification of Quarantine Pests and Quarantine Pests Likely to Follow the Pathway

Below we list the pests associated with *C. reticulata*, *C. reticulata* ssp. *unshiu*, or *C.* × *sinensis* (in any country) that occur in Korea on any host (Table 2). We identify 1) the pest's scientific name, 2) the presence of pests in Korea and in the United States, 3) the reference(s) that report the pest on the host, 4) the quarantine status of the pest in the United States, 5) the generally affected plant part or parts, and 6) if the pest is likely to follow the pathway. Each pest report has the pertinent citation for the distribution, record on the host, and plant part association. Scientific names in bold text are currently accepted.

Many organisms are phytosanitary risks but they do not satisfy the definition of a quarantine pest. A quarantine pest is defined as "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" (IPPC, 2007). When "Yes" appears in brackets in the Quarantine Pest column, it indicates that the pest has a limited distribution in the continental United States.

Even if non-quarantine pests are able to follow the pathway, phytosanitary measures against these pests would not be justified considering the pest already occurs in the continental United States. Therefore, information on plant part association and whether the pest is likely to follow the pathway is not needed for non-quarantine pests. For non-quarantine pests in Table 2, we put N/A (Not Applicable) in the columns for "Plant part(s) affected" and "Follow pathway."

Pest risk analyses must focus on organisms for which biological information is available. Lack of specific information or identification to the specific level does not indicate that a pest is not a phytosanitary risk to U.S. agriculture. It may reflect the poor quality of the specimen or the limits of current taxonomic identification. If pests identified to higher taxa are intercepted in the future, APHIS may take action at the port-of-entry and we may reevaluate their risk.

Table 2. Pests reported on *Citrus reticulata* (tangerine or orange), *C. reticulata* ssp. *unshiu* (Unshu orange), or *C.* × *sinensis* (sweet orange), in any country and present in Korea on any host. Pests in rows shaded gray were selected for further analysis.

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quarantine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
ARTHROPODA					
Acari: Eriophyidae					
Aculops pelekassi (Keifer)	KR (CABI, 2013), US (Villanueva and Childers, 2007)	CABI, 2013; Lee et al., 1992	No	N/A	N/A
Acari: Tarsonemidae					
Polyphagotarsonemus latus Banks	KR, US (CABI, 2013)	CABI, 2013	No	N/A	N/A
Tarsonemus sp.	KR (PestID, 2013)	PestID, 2013	Yes	F (PestID, 2013)	Yes
Acari: Tenuipalpidae					
Brevipalpus obovatus Donnadieu	KR (Anonymous, 1986b), US (CABI, 2013)	CABI, 2013	No	N/A	N/A
Acari: Tetranychidae					
Bryobia praetiosa Koch	KR, US (Migeon and Dorkeld, 2013)	Migeon and Dorkeld, 2013	No	N/A	N/A
Bryobia rubrioculus Scheuten	KR, US (Migeon and Dorkeld, 2013)	Migeon and Dorkeld, 2013	No	N/A	N/A
Eotetranychus sexmaculatus (Riley)	KR (Migeon and Dorkeld, 2013), US (CABI, 2013)	CABI, 2013; Migeon and Dorkeld, 2013	No	N/A	N/A

[1] KR = Korea, US = United States, AL = Alabama, CA = California, FL = Florida, HI = Hawaii, IA = Iowa, LA = Louisiana, MS = Mississippi, TX = Texas, WA = Washington. Individual U.S. states are listed only if the pest species is considered a quarantine pest for the United States.
[2] For non-quarantine pests, we used N/A (Not Applicable) in the columns for "Plant part(s) affected" and "Follow pathway."
[3] Plant Parts: F = Fruit, I = Inflorescence/Flower, L = Leaf or foliage, R = Root, Sd = Seed; S = Shoot or Stem, , Tr = Trunk, and WP = Whole plant.

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quarantine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Panonychus citri McGregor	KR, US (CABI, 2013; Migeon and Dorkeld, 2013)	CABI, 2013; Migeon and Dorkeld, 2013	No	N/A	N/A
Panonychus elongatus Manson	KR (Migeon and Dorkeld, 2013)	Migeon and Dorkeld, 2013	Yes	F, L, S (CABI, 2013)[4]	No[5]
Panonychus ulmi (Koch)	KR, US (CABI, 2013; Migeon and Dorkeld, 2013)	CABI, 2013; Migeon and Dorkeld, 2013	No	N/A	N/A
Petrobia harti Ewing	KR, US (Migeon and Dorkeld, 2013)	Migeon and Dorkeld, 2013	No	N/A	N/A
Petrobia latens *Müller*	KR, US (Migeon and Dorkeld, 2013)	Migeon and Dorkeld, 2013	No	N/A	N/A
Tetranychus kanzawai Kishida (Syn: *T. hydrangea*)	KR, US (CABI, 2013; Migeon and Dorkeld, 2013)	CABI, 2013; Migeon and Dorkeld, 2013;	No	N/A	N/A
Tetranychus urticae (Koch) (Syn: *T.cinnabarinus*)	KR, US (CABI, 2013)	CABI, 2013; Lee et al., 1992	No	N/A	N/A
Coleoptera: Anthribidae					
Araecerus fasciculatus DeGeer (Syn: *A. coffeae*)	KR, US (CABI, 2013)	CABI, 2013;	No	N/A	N/A
Coleoptera: Buprestidae					
Chalcophora japonica (Gory)	KR (KES, 1994; Lee et al., 1992)	Lee et al., 1992	Yes	S/Tr (Hill, 2002; Hill, 2008)	No
Chrysochroa fulgidissima Schöenherr	KR (KES, 1994)	Anonymous, 1990	Yes	S/Tr (Hill, 2002; Hill, 2008)	No

[4] *Panonychus elongatus* is commonly misidentified as *P. citri* (Manson, 1968). We found limited information on plant part association for *P. elongatus*. We assume that *P. elongatus* will affect hosts similarly to *P. citri*.

[5] *Panonychus elongatus* is an external feeder that is highly likely to be removed from the commodity during standard post-harvest procedures and washing of the fruit. *Panonychus* sp. has been intercepted four times on permitted fruit from Mexico (1987), Canada (2010), New Zealand (2011), and Australia (2012) (PestID, 2013).

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quarantine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Coleoptera: Cantharidae					
Athemus suturellus Motschulsky	KR (KES, 1994)	Anonymous, 1990	Yes	I (Gillott, 1995)	No
Coleoptera: Cerambycidae					
Anoplophora chinensis (Forster)	KR(CABI, 2013), US (eradicated) (CABI, 2013)	CABI, 2013	Yes	L, R, S (CABI, 2013)	No
Anoplophora macularia (Thomson)	KR (FFTC, 2003)	FFTC, 2003	Yes	S/Tr (FFTC, 2003)	No
Anoplophora malasiaca (Thomson)	KR (KES, 1994; Lee et al., 1992)	EPPO, n.d.-a; Lee et al., 1992	Yes	L, S/Tr (EPPO, n.d.-a)	No
Apriona germari Hope	KR (KES, 1994)	Anonymous, 1990	Yes	S/Tr (Hill, 1987; Hill, 2008)	No
Chlorophorus annularis (Fabricius)	KR, (KES, 1994); US (HI) (CABI, 2013)	Anonymous, 1990; CABI, 2013	Yes; except HI	S (CABI, 2013)	No
Mesosa myops (Dalman)	KR (KES, 1994)	Anonymous, 1990	Yes	S/Tr (Duffy, 1960)	No
Pterolophia jugosa (Bates)	KR (KES, 1994)	Anonymous, 1990	Yes	I, L, S/Tr (Gillott, 1995)	No
Pterolophia zonata Bates	KR (KES, 1990; Anonymous, 1997)	Anonymous, 1990	Yes	I, L, S/Tr (Gillott, 1995)	No
Coleoptera: Chrysomelidae					
Aulacophora femoralis (Motschulsky) (Syn: *Rhaphidopalpa femoralis*)	KR (Anonymous, 1990)	Anonymous, 1990	Yes	L (Livia, 2006)	No
Aulacophora nigripennis Motschulsky	KR (KES, 1994)	Anonymous, 1990	Yes	L (Livia, 2006)	No
Exosoma flaviventre (Motschulsky) (Syn: *Coptocephala flaviventre*)	KR (KES, 1994)	Anonymous, 1990	Yes	L (Livia, 2006)	No
Luperomorpha funesta Baly	KR (KES, 1994)	Umeya and Okada, 2003	Yes	L (Livia, 2006)	No

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quarantine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Physauchenia bifasciata Jacoby	KR (Anonymous, 1990	Anonymous, 1990	Yes	L (Livia, 2006)	No
Coleoptera: Curculionidae					
Ornatalcides trifidus (Pascoe) (Syn: *Mesalcidodes trifidus*)	KR (KES, 1994)	Anonymous, 1990	Yes	L, S (Frye et al., 2007)	No
Scepticus insularis Roelofs	KR (KES, 1994)	Anonymous, 1990	Yes	L, R (NPQS, 1998)	No
Sympiezomias lewisi Roelofs (Syn. *S. lewisii*)	KR (KES, 1994; Catling et al., 1977)	Catling et al., 1977	Yes	L (Remadevi et al., 2005)	No
Coleoptera: Dermestidae					
Anthrenus verbasci (Linnaeus)	KR (KES, 1994), US (AK only) (CABI, 2013)	Anonymous, 1990	No	N/A	N/A
Coleoptera: Elateridae					
Agrypnus binodulus Motschulsky (Syn: *Lacon binodulus*)	KR (KES, 1994)	Anonymous, 1990	Yes	R (Jedlicka and Frouz, 2007)	No
Cardiophorus vulgaris Motschulsky	KR (KES, 1994)	Anonymous, 1990	Yes	R (Jedlicka and Frouz, 2007)	No
Ectinus sericeus **(**Candèze)	KR (KES, 1994)	Anonymous, 1990	Yes	R (Jedlicka and Frouz, 2007)	No
Melanotus annosus Candèze	KR (KES, 1994)	Anonymous, 1990; Anonymous, 1997	Yes	R (Jedlicka and Frouz, 2007)	No
Melanotus legatus Candèze	KR (KES, 1994; Shiraki, 1952a)	Anonymous, 1990	Yes	R (Jedlicka and Frouz, 2007)	No
Paracardiophorus pullatus (Candeze)	KR (KES, 1994)	Anonymous, 1990	Yes	R (Jedlicka and Frouz, 2007)	No
Coleoptera: Nitidulidae					
Epuraea domina Reitter	KR (NISA-KR, 2009)	NISA-KR, 2009	Yes	I, F (Ewing and Cline, 2005)	No[6]

[6] *Epuraea* species are pests of stored products and may attack overripe or rotting fruit (Ewing and Cline, 2005). They are

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quaran-tine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Epuraea fallax Grouvelle	KR (NISA-KR, 2009)	NISA-KR, 2009	Yes	F (Ewing and Cline, 2005)	No[6]
Coleoptera: Oedemeridae					
Xanthochroa waterhousei Harold	KR (KES, 1994)	Anonymous, 1990	Yes	I (Anonymous, 1990)	No
Coleoptera: Scarabaeidae					
Adoretus sinicus Burmeister (Syn: *A. tenuimaculatus* Waterhouse)	KR (KES, 1994), US (HI) (CABI, 2013)	Anonymous, 1990	Yes	L (Mau and Kessing, 1991)	No
Anomala albopilosa Hope	KR (KES, 1994)	Anonymous, 1990	Yes	L, R (Muraji et al., 2008)	No
Anomala cuprea Hope	KR (KES, 1994; CABI, 2013)	Anonymous, 1990	Yes	L, R (Hill, 1987; Hill, 2008; Mitsuhashi, 2003)	No
Anomala daimiana Harold	KR (KES, 1994; Lee et al., 1992)	Lee et al., 1992	Yes	L, R (Hill, 1987; Hill, 2008)	No
Anomala rufocuprea Motschulsky	KR (KES, 1994; CABI, 2013; Lee et al., 1992)	Lee et al., 1992	Yes	L, R (Hill, 1987; Hill, 2008)	No
Ectinohoplia obducta Motschulsky	KR (KES, 1994)	Anonymous, 1990	Yes	I, L, R (Anonymous, 1990)	No
Cetonia pilifera (Motschulsky) (Syn: *Eucetonia pilifera*)	KR (KES, 1994)	Anonymous, 1990	Yes	I, L, R (Anonymous, 1990)	No
Exomala orientalis Waterhouse (Syn: *Anomala orientalis*; *Blitopertha orientalis*)	KR, US (CABI, 2013)	Anonymous, 1990	No	N/A	N/A
Glycyphana fulvistemma Motschulsky	KR (KES, 1994)	Anonymous, 1990	Yes	I, L, R (Hill, 1987)	No

unlikely to be associated with harvestable fruit for consumption.

Pest Scientific Name	**Distribution**[1]	**Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis***	**Quaran-tine pest**[2]	**Plant part(s) affected**[3]	**Follow pathway**[2]
Holotrichia kiotoensis Brenske (Syn: *H. kiotonensis*)	KR (KES, 1994)	Anonymous, 1990	Yes	I, L, R (Anonymous, 1990)	No
Maladera orientalis Motschulsky	KR (KES, 1994; CABI, 2013)	Anonymous, 1990	Yes	I, L, R (Borror et al., 1989)	No
Mimela flavilabris Waterhouse	KR (KES, 1994)	Anonymous, 1990	Yes	F, L, R (Borror et al., 1989)	No[7]
Mimela splendens Gyllenhal	KR (NISA-KR, 2009)	NISA-KR, 2009	Yes	F, L, R (Borror et al., 1989)	No[7]
Mimela testaceipes (Motschulsky)	KR (KES, 1994; CABI, 2013)	Anonymous, 1990	Yes	F, L, R (Borror et al., 1989)	No[7]
Miridiva coreana Mijima & Kinoshita [possible *lapsus calami*]	KR (Anonymous, 1986b)	Anonymous, 1990	Yes	F, L, R (Borror et al., 1989)	No[7]
Nipponovalgus angusticollis Waterhouse	KR (KES, 1994)	Anonymous, 1990	Yes	I, R (Borror et al., 1989)	No
Oxycetonia jacunda Faldermann (Syn: *Gametis jucunda*); spelling *jucunda* lapsus calami?	KR (Lee et al., 1992)	Lee et al., 1992	Yes	I, L, R (Umeya and Okada, 2003)	No
Poecilophilides rusticola (Burmeister)	KR (KES, 1994; Lee et al., 1992)	Lee et al., 1992	Yes	I, R (Borror et al., 1989)	No
Protaetia brevitarsis Lewis	KR (KES, 1994; Anonymous, 1986b)	Anonymous, 1990	Yes	F, L, R (Gillott, 1995; Hill, 1987)	No[7]
Protaetia orientalis Gory & Percheron	KR (KES, 1994; Lee et al., 1992)	Anonymous, 1990; Lee et al., 1992	Yes	F, I, L, R (Anonymous, 1990; Lee et al., 1992; Wen et al., 2002)	No[7]

[7] Bright-colored adult shining leaf chafers (subfamily Rutelinae) frequently feed on foliage and fruits. Larvae feed on plant roots (Borror et al., 1989). Any adults present at harvest are unlikely to remain with the commodity. Furthermore, no records of interception of *Mimela* sp., *Miridiva* sp., or *Protaetia* sp. on any kind of permitted fruit for consumption have been recorded since 1985 (PestID, 2013).

Pest Scientific Name	**Distribution**[1]	**Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis***	**Quaran-tine pest**[2]	**Plant part(s) affected**[3]	**Follow pathway**[2]
Diptera: Cecidomyiidae					
Contarinia okadai (Miyoshi) (Mispelled: *Contarnia okadai*)	KR (NISA-KR, 2009)	Kato, 1984; NISA-KR, 2009	Yes	I, L (Kato, 1984)	No
Hemiptera: Aleyrodidae					
Aleurocanthus spiniferus (Quaintance)	KR (KES, 1994), US (HI) (CABI, 2013)	CABI, 2013; Lee et al., 1992	Yes	L, S (CABI, 2013)	No
Bemisia afer Priesner & Hosny	KR (Evans, 2008)	Evans, 2008	Yes	L (Hill, 1987; Hill, 2008)	No
Bemisia tabaci Gennadius	KR, US (CABI, 2013; Evans, 2008)	Anonymous, 2009a; Hamon and Hodges, 2006	No	N/A	N/A
Dialeurodes citri Ashmead	KR (KES, 1994), US (CABI, 2013)	CABI, 2013; Evans, 2008; Lee et al., 1992	No	N/A	N/A
Trialeurodes vaporariorum Westwood	KR, (KES, 1994), US (CABI, 2013; Evans, 2008)	Hamon and Hodges, 2006	No	N/A	N/A
Trialeurodes variabilis Quaintance	KR, US (Evans, 2008)	Evans, 2008	No	N/A	N/A
Hemiptera: Alydidae					
Megalotomus costalis Stal	KR (KES, 1994)	Anonymous, 1990	Yes	L (NPQS, 1998)	No
Hemiptera: Aphididae					
Aphis craccivora Koch	KR, US (CABI, 2013)	Anonymous, 1990; CABI, 2013	No	N/A	N/A
Aphis gossypii Glover	KR, US (CABI, 2013)	CABI, 2013; NPQS, 2000	No	N/A	N/A
Aphis spiraecola Patch (Syn: *A. citricola* van der Goot)	KR (KES, 1994), US (CABI, 2013)	CABI, 2013; Lee et al., 1992	No	N/A	N/A

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quaran-tine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Aulacorthum magnoliae Essig and Kuwana (Syn: *Acyrthosiphon magnoliae*)	KR (Anonymous, 1986b)	CABI, 2013	Yes	L (Anonymous, 1986b)	No
Aulacorthum solani (Kaltenbach)	KR (Lee et al., 1992), US (Miller and Stoetzel, 1997)	CABI, 2013; Lee et al., 1992	No	N/A	N/A
Macrosiphum euphorbiae (Thomas)	KR, US (CABI, 2013)	CABI, 2013; NPQS, 2000	No	N/A	N/A
Macrosiphum ibarae Matsumura	KR (Lee et al., 1992)	Lee et al., 1992	Yes	L (Hill, 1987)	No
Myzus persicae (Sulzer)	KR, US (CABI, 2013)	CABI, 2013; NPQS, 2000	No	N/A	N/A
Sarucallis kahawaluokalani (Kirkaldy) (Syn: *Tinocallis kahawaluckalani*)	KR (KES, 1994), US (CABI, 2013)	Anonymous, 1990	No	N/A	N/A
Sinomegoura citricola (van der Goot)	KR (NISA-KR, 2009)	NISA-KR, 2009	Yes	L, S (Borror et al., 1989)	No
Tinocallis zelkowae (Takahashi)	KR (KES, 1994)	Anonymous, 1990	Yes	L (Hill, 1987; Quednau, 2001)	No
Toxoptera aurantii (Boyer de Fonscolombe)	KR (KES, 1994), US (CABI, 2013)	CABI, 2013	No	N/A	N/A
Toxoptera citricidus Kirkaldy (Syn: *T. citricida)*	KR (KES, 1994), US (FL, HI, PR) (CABI, 2013; Michaud, 1999)	CABI, 2013; FFTC, 2003; Lee et al., 1992	[Yes]	L (CABI, 2013)	No
Hemiptera: Cercopidae					
Aphrophora intermedia Uhler	KR (KES, 1994)	Anonymous, 1994	Yes	L, S (Thompson, 1999)	No
Hemiptera: Cicadidae					
Cryptotympana atrata Fabricius (Syn: *C. dubia, C. coreana*)	KR (KES, 1994; Catling et al., 1977)	Anonymous, 1990; Catling et al., 1977	Yes	R, S (Borror et al., 1989)	No

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quaran-tine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Meimuna mongolica (Distant)	KR (KES, 1994; Lee, 2008)	Anonymous, 1990	Yes	R, S (Borror et al., 1989)	No
Meimuna opalifer (Walker) (Syn: *M. opalifera*)	KR (KES, 1994; An, 2000; Lee, 2008)	An, 2000	Yes	R, S (Borror et al., 1989)	No
Platypleura kaempferi (Fabricius)	KR (Anonymous, 1990, 1997)	(Anonymous, 1990, 1997)	Yes	R, S (Borror et al., 1989)	No
Hemiptera: Cicadellidae					
Bothrogonia japonica Ishihara	KR (KES, 1994)	Anonymous, 1990	Yes	L, S (Borror et al., 1989)	No
Cicadella viridis Linnaeus	KR (KES, 1994; CABI, 2013)	NPQS, 1998	Yes	L, S (Hill, 1987)	No
Empoasca arborescens Vilbaste	KR (KES, 1994)	Umeya and Okada, 2003	Yes	L, S (Borror et al., 1989)	No
Empoasca vitis (Gothe)	KR (CABI, 2013)	Anonymous, 1990	Yes	L (CABI, 2013)	No
Epiacanthus stramineus (Motschulsky) (Syn: *Epicanthus stramineus*)	KR (KES, 1994)	Anonymous, 1990	Yes	L, S (Borror et al., 1989)	No
Hishimonus sellatus Uhler	KR (KES, 1994)	Anonymous, 1990	Yes	L, S (Borror et al., 1989)	No
Kolla atramentaria (Motschulsky)	KR (KES, 1994)	Anonymous, 1990	Yes	L, S (NPQS, 1998)	No
Ledra auditura Walker	KR (KES, 1994; Anonymous, 1998a)	Anonymous, 1990	Yes	L, S (NPQS, 1998)	No
Nephotettix cincticeps (Uhler)	KR (CABI, 2013)	Anonymous, 1990	Yes	L, S (CABI, 2013)	No
Recilia dorsalis (Motschulsky)	KR (KES, 1994; CABI, 2013)	Anonymous, 1990	Yes	L (CABI, 2013)	No
Strongylocephalus agrestis (Fallen)	KR (KES, 1994)	Anonymous, 1990	Yes	L (Borror et al., 1989)	No
Hemiptera: Coccidae					
Ceroplastes ceriferus (Fabricius)	KR (KES, 1994), US (CABI, 2013)	CABI, 2013; Shiraki, 1952b	No	N/A	N/A

Pest Scientific Name	**Distribution**[1]	**Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis***	**Quarantine pest**[2]	**Plant part(s) affected**[3]	**Follow pathway**[2]
Ceroplastes floridensis (Comstock)	KR, US (CABI, 2013)	CABI, 2013	No	N/A	N/A
Ceroplastes japonicus Green	KR (CABI, 2013)	CABI, 2013	Yes	F, L, S (CABI, 2013)	No[8]
Ceroplastes pseudoceriferus Green	KR (CABI, 2013)	Anonymous, 1990	Yes	F, L, S (CABI, 2013)	No[8]
Ceroplastes rubens Maskell	KR (KES, 1994), US (FL, HI, TX) (Burke et al., 1994; CABI, 2013; von Ellenrieder, 2003)	Anonymous, 1990; CABI, 2013	[Yes]	F, L, S (CABI, 2013)	No[8]
Coccus hesperidum Linnaeus	KR (KES, 1994), US (CABI, 2013)	CABI, 2013; Lee et al., 1992	No	N/A	N/A
Coccus pseudomagnoliarum (Kuwana)	KR (KES, 1994), US (Ben-Dov et al., 2013)	Ben-Dov et al., 2013	No	N/A	N/A
Eucalymnatus tessellatus (Signoret)	KR, US (Ben-Dov, 1993)	Ben-Dov, 1993	No	N/A	N/A
Parasaissetia nigra (Neitner)	KR (KES, 1994), US (CABI, 2013)	CABI, 2013	No	N/A	N/A
Parthenolecanium corni (Bouché)	KR, US (CABI, 2013)	CABI, 2013	No	N/A	N/A
Pulvinaria sp.	KR (Catling et al., 1977)	Catling et al., 1977	Yes	L, S (CABI, 2013)	No
Saissetia coffeae Walker	KR, US (CABI, 2013)	Anonymous, 1990; CABI, 2013	No	N/A	N/A
Takahashia japonica Cockerell	KR (KES, 1994)	Anonymous, 1990, 1998a	Yes	S (NPQS, 1998)	No

[8] *Ceroplastes* species are surface feeders that are occasionally associated with fruit, but more frequently feed on leaves or stems (CABI, 2007). Those remaining on the fruit after harvest will be removed from the pathway by fruit immersion/wash/brush/pressure rinse. No *Ceroplastes* species have been intercepted on permitted *Citrus* fruit for consumption (PestID, 2013).

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quarantine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Hemiptera: Coreidae					
Anacanthocoris striicornis (Scott)	KR (KES, 1994)	Anonymous, 1994	Yes	F, S (NPQS, 1998)	No[9]
Leptocorisa chinensis Dallas	KR (KES, 1994)	Anonymous, 1990	Yes	L, Sd (CABI, 2013)	No
Hemiptera: Diaspididae					
Aonidiella aurantii Maskell	KR, US (Watson, 2005)	Umeya and Okada, 2003; Watson, 2005	No	N/A	N/A
Aonidiella citrina Craw	KR, US (CABI, 2013)	Anonymous, 1990; CABI, 2013	No	N/A	N/A
Aspidiotus destructor Signoret	KR, US (CABI, 2013)	Anonymous, 1990; CABI, 2013	No	N/A	N/A
Chrysomphalus aonidum Linnaeus	KR, US (CABI, 2013)	CABI, 2013;	No	N/A	N/A
Chrysomphalus bifasciculatus Ferris	KR (KES, 1994)	Anonymous, 1990	Yes	L, S (Anonymous, 1990; Anonymous, 1994)	No
Chrysomphalus dictyospermi (Morgan)	KR (KES, 1994), US (CABI, 2013)	CABI, 2013;	No	N/A	N/A
Diaspidiotus perniciosus (Comstock) (Syn: *Comstockaspis perniciosa*)	KR, US (Ben-Dov et al., 2013)	Ben-Dov et al., 2013	No	N/A	N/A
Hemiberlesia lataniae (Signoret)	KR (KES, 1994), US (CABI, 2013)	Anonymous, 1990; CABI, 2013	No	N/A	N/A
Lepidosaphes beckii Newman	KR (Catling et al., 1977), US (CABI, 2013)	CABI, 2013; Catling et al., 1977	No	N/A	N/A

[9] These are large-bodied true bugs with piercing/sucking mouthparts that feed on fruit. They are highly unlikely to be associated with fruit during harvest.

Pest Scientific Name	**Distribution[1]**	**Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis***	**Quarantine pest[2]**	**Plant part(s) affected[3]**	**Follow pathway[2]**
Lepidosaphes gloverii (Packard)	KR (KES, 1994), US (CABI, 2013)	Anonymous, 1990; CABI, 2013	No	N/A	N/A
Lepidosaphes ulmi (Linnaeus)	KR (KES, 1994, US (CABI, 2013)	Anonymous, 1990	No	N/A	N/A
Lopholeucaspis japonica Cockerell	KR (KES, 1994), US (CABI, 2013)	Anonymous, 1990; CABI, 2013	No	N/A	N/A
Octaspidiotus stauntoniae (Takahashi)	KR (KES, 1994), US (HI) (Ben-Dov et al., 2013)	Anonymous, 1994	Yes	L (Ben-Dov et al., 2013)	No
Parlatoria pergandii Comstock	KR (KES, 1994), US (CABI, 2013)	Anonymous, 1990; CABI, 2013	No	N/A	N/A
Parlatoria proteus (Curtis)	KR (KES, 1994), US (CABI, 2013; Ben-Dov et al., 2013)	Anonymous, 1990; CABI, 2013	No	N/A	N/A
Parlatoria theae Cockerell	KR, US (KES, 1994; Ben-Dov et al., 2013)	Anonymous, 1990	No	N/A	N/A
Parlatoria ziziphi Lucas	KR, US (FL, HI, MS) (CABI, 2013)	CABI, 2013	[Yes]	F, L, S (CABI, 2013)	Yes[10]
Pinnaspis aspidistrae Signoret	KR (KES, 1994), US (Ben-Dov et al., 2013)	Anonymous, 1990	No	N/A	N/A
Pinnaspis strachani (Cooley)	KR (KES, 1994), US (Ben-Dov et al., 2013)	Anonymous, 1990	No	N/A	N/A
Pseudaonidia duplex (Cockerell)	KR (KES, 1994), US (CABI, 2013; Lee et al., 1992; Ben-Dov et al., 2013)	CABI, 2013; Lee et al., 1992	No	N/A	N/A

[10] Armored scales may enter on commercial fruit for consumption, but are highly unlikely to become established via this pathway. Please see the discussion below Table 2 for a detailed explanation.

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quarantine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Pseudaulacaspis pentagona (Targioni & Tozzetti) (Syn: *Sasakiaspis pentagona*)	KR (KES, 1994), US (CABI, 2013)	Anonymous, 1990	No	N/A	N/A
Quadraspidiotus perniciosus Comstock	KR, US (CABI, 2013)	CABI, 2013	No	N/A	N/A
Unaspis euonymi Comstock (Syn: *Chionaspis euonymi*)	KR (KES, 1994), US (CABI, 2013)	Anonymous, 1990	No	N/A	N/A
Unaspis yanonensis Kuwana	KR (KES, 1994; Anonymous, 1997; CABI, 2013)	Anonymous, 1990; CABI, 2013	Yes	F, L, S (CABI, 2013)	Yes[11]
Hemiptera: Dictyopharidae					
Dictyophara patruelis (Stal)	KR (CABI, 2013; KES, 1994)	Anonymous, 1990	Yes	S (NPQS, 1998)	No
Hemiptera: Dinidoridae					
Megymenum gracilicorne Dallas	KR (KES, 1994; NISA-KR, 2009)	NISA-KR, 2009	Yes	F [cat-facing][11], L (Borror et al., 1989)	No
Hemiptera: Flatidae					
Geisha distinctissima Walker	KR (KES, 1994; Anonymous, 1998a)	Anonymous, 1990, 1998a	Yes	L, S (NPQS, 1998)	No
Hemiptera: Largidae					
Physopelta gutta (Burmeister)	KR (KES, 1994)	Anonymous, 1994	Yes	L (Montagnini and Jordan, 1983)	No
Hemiptera: Margarodidae					
Drosicha corpulenta (Kuwana)	KR (KES, 1994)	Anonymous, 1990	Yes	F, L (NPQS, 1998)	No[12]

[11] "Cat-facing" describes the results of feeding attempts by certain piercing/sucking insects. These insects leave blackened spots that may slightly sink into the fruit skin. They often make three feeding attempts, and someone called the resulting triangular sunken shape a "cat face." Cat-facing occurs most often on soft-skinned fruits such as peach.

[12] Scale insects (Hemiptera: Margarodidae and Diaspididae) are unlikely to follow the pathway of commercial export-quality

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quarantine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Drosicha howardii (Kuwana)	KR (KES, 1994)	Anonymous, 1990	Yes	S/Tr (NPQS, 1998)	No
Icerya purchasi Maskell	KR (KES, 1994), US (CABI, 2013)	CABI, 2013;	No	N/A	N/A
Hemiptera: Meenoplidae					
Nisia nervosa (Motschulsky) (Syn: *N. atrovenosa* Leithierry)	KR (KES, 1994)	Anonymous, 1990	Yes	L (NPQS, 1998)	No
Hemiptera: Membracidae					
Gargara genistae Fabricius	KR (KES, 1994), US (Syrett et al., 1999)	Anonymous, 1990	No	N/A	N/A
Machaerotypus sibiricus (Lethierry)	KR (KES, 1994)	Anonymous, 1990	Yes	L (Borror et al., 1989)	No
Orthobelus flavipes Uhler (Syn.: *Butragulus flavipes*)	KR (KES, 1994)	Anonymous, 1990	Yes	L, S (NPQS, 1998)	No
Hemiptera: Miridae					
Lygocoris lucorum (Meyer)	KR (KES, 1994; NISA-KR, 2009)	NISA-KR, 2009	Yes	L (Borror et al., 1989)	No
Hemiptera: Pentatomidae					
Carbula humerigera (Uhler)	KR (KES, 1994)	Anonymous, 1994	Yes	F [cat-facing][11], L (Borror et al., 1989)	No[13]
Dolycoris baccarum L.	KR (KES, 1994; NISA-KR, 2009)	NISA-KR, 2009	Yes	F [cat-facing], L (Borror et al., 1989)	No[13]
Eucorysses grandis Thunberg	KR (KES, 1994)	Anonymous, 1994	Yes	F [cat-facing], L (Borror et al., 1989)	No[13]

Citrus due to the washing and brushing as standard post-harvest treatment (7 CFR § 319, 2008). Furthermore, *Drosicha* sp. has not been intercepted with permitted *Citrus* in the United States (PestID, 2013).

[13] Stink bugs (Hemiptera: Pentatomidae) are large, active, winged insects that may feed on fruit for sap, causing cat-facing, but are highly unlikely to be associated with fruit at harvest. With the exception of *N. antennata* (see below), no interceptions of the quarantine Pentatomidae listed here have been recorded associated with permitted *Citrus* fruit for consumption in the United States since 1985 (PestID, 2013).

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quaran-tine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Glaucias subpunctatus Walker	KR (KES, 1994)	Anonymous, 1990, 1997	Yes	F [cat-facing] (NPQS, 1998), L (Borror et al., 1989)	No[13]
Halyomorpha halys (Stal)	KR (KES, 1994; Lee et al., 1992), US (CABI, 2013)	Lee et al., 1992	No	N/A	N/A
Homalogonia obtusa (Walker)	KR (KES, 1994; Lee et al., 1992)	Lee et al., 1992	Yes	F, L (Funayama, 2002)	No[13]
Nezara antennata Scott	KR (KES, 1994; CABI, 2013; Lee et al., 1992)	Lee et al., 1992	Yes	F [cat-facing], L (Borror et al., 1989)	No[14]
Nezara viridula Linnaeus	KR (KES, 1994), US (CABI, 2013)	CABI, 2013	No	N/A	N/A
Palomena angulosa (Motschulsky)	KR (KES, 1994; NISA-KR, 2009)	NISA-KR, 2009	Yes	F, L, S (Schaefer and Panizzi, 2000)	No[13]
Plautia stali Scott	KR (KES, 1994), US (HI) (Schaefer and Panizzi, 2000)	(Anonymous, 1994	Yes	F (NPQS, 1998; Schaefer and Panizzi, 2000)	No[13]
Hemiptera: Penthimiidae (recently elevated to family rank) (ZipCodeZoo, 2013)					
Penthimia nitida Lithierry	KR (KES, 1994)	Anonymous, 1990, 1998a	Yes	L (NPQS, 1998)	No
Hemiptera: Pseudococcidae					
Antonina crawii Cockerell	KR (KES, 1994)	Anonymous, 1990	Yes	L (Anonymous, 1990; Anonymous, 1994)	No
Nipaecoccus nipae (Maskell)	KR (KES, 1994), US (CABI, 2013)	CABI, 2013	No	N/A	N/A
Phenacoccus pergandei Cockerell	KR (KES, 1994; Lee et al., 1992)	Lee et al., 1992	Yes	L (Hill, 1987)	No

[14] A single *N. antennata* adult was intercepted with permitted *Citrus reticulata* from Korea in 1995 (PestID, 2013), but *N. antennata* is highly unlikely to follow the pathway. Mandatory inspection and brushing/washing is likely to remove any individuals from the fruit.

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quarantine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Planococcus citri (Risso)	KR (KES, 1994), US (CABI, 2013)	CABI, 2013; Lee et al., 1992	No	N/A	N/A
Planococcus kraunhiae (Kuwana)	KR (KES, 1994), US (CA) (Miller et al., 2005)	Anonymous, 1990; Anonymous, 1997	[Yes]	F, L, S (NPQS, 1998)	No[15]
Pseudococcus sp.	KR (PestID, 2013)	PestID, 2013	Yes	I, F, L, S (PestID, 2013)	No[15]
Pseudococcus comstocki Kuwana	KR (KES, 1994), US (CABI, 2013)	CABI, 2013; Catling et al., 1977	No	N/A	N/A
Pseudococcus cryptus Hempel	KR, US (HI) (Ben-Dov et al., 2013; Kwon et al., 2002)	Ben-Dov et al., 2013; Umeya and Okada, 2003	Yes	F, L, S (PestID, 2013)	No[15]
Pseudococcus longispinus (Targioni Tozzetti)	KR, US (Ben-Dov et al., 2013)	Ben-Dov et al., 2013	No	N/A	N/A
Pseudococcus viburni Signoret	KR, US Ben-Dov et al., 2013	Ben-Dov et al.., 2013; CABI, 2013	No	N/A	N/A
Hemiptera: Ricaniidae					
Ricania japonica Melichar	KR (Anonymous, 1986b)	Anonymous, 1990	Yes	S (NPQS, 1998)	No
Hymenoptera: Formicidae					
Formica japonica Motschulsky	KR (KES, 1994; CABI, 2013)	Anonymous, 1990	Yes	Predaceous on plant pests	No[16]
Hymenoptera: Vespidae					
Vespa crabro Linnaeus	KR (KES, 1994), US (Anonymous, 2009b)	Anonymous, 1990	No	N/A	N/A

[15] Mealybugs (Hemiptera: Pseudococcidae) are unlikely to remain with the commodity through standard pressure washing and brushing of the fruit. See text following the pest list for a detailed explanation.

[16] Formicidae are generalist predators and protectors of honeydew-secreting insects such as scales and aphids. Ants other than isolated (sterile) workers are not expected to be associated with fruit at harvest (Borror et al., 1989).

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quaran-tine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Vespa mandarina Smith	KR (KES, 1994)		Yes (as of 12/05/12)	F (Anonymous, 2009b), Predaceous (Borror et al., 1989)	No[17]
Lepidoptera: Arctiidae					
Amata germana (Felder & Felder)	KR (KES, 1994)	Anonymous, 1990	Yes	L (Sun et al., 2006)	No
Amsacta lactinea (Cramer)	KR (KES, 1994; CABI, 2013)	CABI, 2013	Yes	L (Hill, 1987; Hill, 2008)	No
Hyphantria cunea (Drury)	KR (KES, 1994), US (CABI, 2013)	Anonymous, 1990	No	N/A	N/A
Lepidoptera: Cossidae					
Cossus cossus Linnaeus	KR (Anonymous, 1986b; KES, 1994)	CABI, 2013; Robinson et al., 2001	Yes	R, S (CABI, 2013)	No
Lepidoptera: Crambidae					
Glyphodes pyloalis Walker (Syn.: *Diaphania pyloalis*)	KR (KES. 1994), US (MEM, 2012)	Anonymous 1990	No	N/A	N/A
Lepidoptera: Geometridae					
Apochima juglansiaria (Graeser)	KR (KES, 1994)	Anonymous, 1990	Yes	L (Borror et al., 1989)	No
Ascotis selenaria (Denis & Schiffermüller)	KR (Anonymous, 1990; CABI, 2013)	Anonymous, 1990, 1997	Yes	L (Borror et al., 1989; Choi et al., 2011)	No
Biston panterinaria (Bremer & Grey)	KR (Choi et al., 2011)	Choi et al., 2011	Yes	L (Choi et al., 2011)	No
Chariaspilates formosaria (Eversmann)	KR (KES, 1994)	Anonymous, 1990	Yes	L (Borror et al., 1989)	No

[17] *Vespa* species are large, externally-feeding wasps that are predaceous on other insects or animals (Borror et al., 1989). They are unlikely to remain with the commodity through standard post-harvest procedures.

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quaran-tine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Ectropis bistortata (Goetze)	KR (Anonymous, 1986b)	Anonymous, 1990	Yes	L (Borror et al., 1989)	No
Ectropis excellens (Butler)	KR (KES, 1994)	Anonymous, 1990; Shiraki, 1952d	Yes	L (Borror et al., 1989)	No
Hemithia aestivaria Hübner	KR (KES, 1994)	Anonymous, 1990	Yes	L (Borror et al., 1989)	No
Hypomecis punctinalis (Scopoli)	KR (Choi et al., 2011)	Choi et al., 2011	Yes	L (Choi et al., 2011)	No
Menophra senilis Butler	KR (Choi et al., 2011)	Choi et al., 2011	Yes	L (Choi et al., 2011)	No
Odontopera arida Butler	KR (Choi et al., 2011)	Choi et al., 2011	Yes	L (Choi et al., 2011)	No
Ophthalmitis irrorataria Bremer & Grey	KR (KES, 1994)	Anonymous, 1990	Yes	L (Borror et al., 1989)	No
Ourapteryx nivea Butler	KR (Choi et al., 2011)	Choi et al., 2011	Yes	L (Choi et al., 2011)	No
Pylargosceles steganioides (Butler) (Syn: *Pylarge steganioides*)	KR (KES, 1994)	Anonymous, 1990; Shiraki, 1952a	Yes	L (Borror et al., 1989)	No
Lepidoptera: Gracillariidae					
Phyllocnistis citrella Stainton	KR (KES, 1994), US (AL, CA, FL, LA, TX) (CABI, 2013; Guillen and Heraty, 2002; Lapointe and Leal, 2007)	CABI, 2013; Catling et al., 1977	[Yes]	L, F (CABI, 2013; Catling et al., 1977; Kim et al., 2000)	No
Lepidoptera: Hepialidae					
Endoclita excrescens Butler (Syn: *Endoclyta excrescens*)	KR (CABI, 2013; Lee et al., 1992)	Lee et al., 1992	Yes	L (Lee et al., 1992)	No

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quarantine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Lepidoptera: Hesperiidae					
Parnara guttatus Bremer & Grey (Syn: *P. guttata* Bremer & Grey)	KR (CABI, 2013; KES, 1994)	Anonymous, 1990	Yes	L (CABI, 2013)	No
Lepidoptera: Lasiocampidae					
Dendrolimus spectabilis (Butler)	KR (CABI, 2013; KES, 1994)	Anonymous, 1990	Yes	L (Borror et al., 1989)	No
Lepidoptera: Limacodidae					
Monema flavescens Walker (Syn: *Cnidocampa flavescens* Walker)	KR (KES, 1994; Lee et al., 1992), US (Lammers and Stigter, 2004)	Lee et al., 1992	No	N/A	N/A
Parasa consocia (Walker) (Syn: *Latoia consocia* (Walker)	KR (KES, 1994; Lee et al., 1992)	Lee et al., 1992	Yes	L (Lill et al., 2006)	No
Parasa sinica Moore (Syn: *Latoia sinica* Moore)	KR (CABI, 2013; Lee et al., 1992; Shiraki, 1952c)	Lee et al., 1992	Yes	L (Lill et al., 2006)	No
Thosea sinensis coreana Okano & Park	KR (KES, 1994)	Anonymous, 1990	Yes	L (Lill et al., 2006)	No
Lepidoptera: Lymantriidae					
Euproctis piperita Oberthür	KR (KES, 1994; Lee et al., 1992)	Lee et al., 1992	Yes	L (Borror et al., 1989)	No
Euproctis pseudoconspersa Strand	KR (KES, 1994; CABI, 2013)	Anonymous, 1990	Yes	L (CABI, 2013)	No
Euproctis pulverea (Leech)	KR (KES, 1994; Lee et al., 1992)	Lee et al., 1992	Yes	L (Anonymous, 1990, 1997**)**	No
Lymantria dispar Linnaeus	KR (KES, 1994), US (CABI, 2013)	Zhang, 1994	Yes[18]	S (CABI, 2013)	No

[18] Asian gypsy moth, *Lymantria dispar asiatica* Vnukovskij is reportable, according to PestID (2013). According to Program Manager A. Man-Song-Hing, Asian gypsy moth is not established anywhere in the United States and is under official

Pest Scientific Name	**Distribution**[1]	**Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis***	**Quaran-tine pest**[2]	**Plant part(s) affected**[3]	**Follow pathway**[2]
Sphrageidus similis Fuessly (Syn: *Euproctis similis* Fuessly)	KR (CABI, 2013; Lee et al., 1992)	Lee et al., 1992	Yes	L (Borror et al., 1989)	No
Lepidoptera: Noctuidae[19]					
Agrotis ipsilon (Hufnagel)	KR, US (CABI, 2013)	CABI, 2013	No	N/A	N/A
Anomis mesogona (Walker)	KR (KES, 1994; CABI, 2013)	Anonymous, 1990	Yes	L (Anonymous, 1990; Poole, 1989)	No
Apamea aquila Donzel	KR (KES, 1994)	Anonymous, 1990	Yes	L (Opler et al., 2009)	No
Arcte coerula (Guenée)	KR (CABI, 2013)	Anonymous, 1990	Yes	F, L (Anonymous, 1990; Poole, 1989)	No[19]
Artena dotata (Fabricius)	KR (KES, 1994)	Anonymous, 1990	Yes	L, S (Anonymous, 1990; Poole, 1989)	No
Bastilla maturata Walker (Syn.: *Dysgonia maturata* (Walker); *Parallelia maturata* (Walker))	KR (KES, 1994)	Anonymous, 1990	Yes	F, L (Anonymous, 1990; Poole, 1989)	No[19]
Calyptra lata (Butler) (Syn: *Calyptera lata*)	KR (KES, 1994)	Anonymous, 1990	Yes	F (CABI, 2013)	No[19]
Calyptra thalictri (Borkhousen) (Syn: *Calyptera thalictri*)	KR (KES, 1994)	Anonymous, 1990	Yes	F (CABI, 2013)	No[19]

control and would be eradicated if discovered.

[19] Fruit-piercing moths typically do not present a phytosanitary risk themselves but rather increase the risk of secondary invasions (CABI, 2013). Most Lepidoptera are generalist foliage feeders that are not associated with fruit at harvest, and would likely be removed through pressure washing and brushing of the fruit. Those that feed on or mine the fruit cause scarring that would cause the fruit to be culled during the inspection and packing process (Borror et al., 1989). Since 1985 none of the quarantine significant Noctuidae found associated with *Citrus* fruit and in Korea have been intercepted with permitted *Citrus* in the United States (PestID, 2013).

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quarantine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Chrysodeixis eriosoma Doubleday	KR, US (HI, CA) (CABI, 2013; Los Angeles County, 2005; CDFA, 2008)	Robinson et al., 2009	[Yes]	F, L (CABI, 2013)	No[19]
Dysgonia arctotaenia (Guenée) (Syn: *Ophiusa arctotaenia; Parallelia arctotaenia* (Guenée))	KR (KES, 1994)	Anonymous, 1990	Yes	L, S (Anonymous, 1990)	No
Eudocima fullonia (Clerck) (Syn: *Othreis fullonia*)	KR, US (HI) (CABI, 2013)	CABI, 2013;	Yes	F (CABI, 2013)	No[19]
Eudocima tyrannus Guenée (Syn: *Adrias tyrannus; Adris tyrannus*)	KR (KES, 1994)	Anonymous, 1990; Shiraki, 1952a	Yes	L, S (Anonymous, 1990; Poole, 1989)	No
Eudocima tyrannus amurensis Staudinger (Syn: *Adris tyrannus amurensis*)	KR (Anonymous, 1986b)	Anonymous, 1990	Yes	L, S (Anonymous, 1990)	No
Helicoverpa armigera (Hübner)	KR (KES, 1994; CABI, 2013)	CABI, 2013	Yes	F, I, L (CABI, 2013)	No[19]
Mocis undata (Fabricius)	KR (KES, 1994; Anonymous, 1986b)	Robinson et al., 2001	Yes	F, L (Holloway, n.d.)	No[19]
Ophiusa tirhaca Cramer	KR (KES, 1994)	CABI, 2013	Yes	F, L (Walker, 2007)	No[19]
Oraesia emarginata Fabricius	KR (KES, 1994; CABI, 2013)	CABI, 2013	Yes	F, L (Anonymous, 1990, 1997)	No[19]
Oraesia excavata (Butler)	KR (KES, 1994; CABI, 2013)	CABI, 2013	Yes	F, L (Anonymous, 1990, 1997)	No[19]

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quarantine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Peridroma saucia (Hübner)	KR (Kim et al., 2000), US (MEM, 2012)	Kim et al., 2000	No	N/A	N/A
Spodoptera exigua (Hübner)	KR, US (KES, 1994; CABI, 2013)	CABI, 2013	No	N/A	N/A
Spodoptera litura (Fabricius)	KR (KES, 1994), US (HI) (CABI, 2013)	CABI, 2013; NPQS, 2000	Yes	L (CABI, 2013)	No
Thyas juno (Dalman) (Syn: *Dermaleipa juno; Lagoptera juno*)	KR (KES, 1994; CABI, 2013)	Anonymous, 1990; Shiraki, 1952a	Yes	L (Anonymous, 1990)	No
Xestia c-nigrum (Linnaeus)	KR, US (CABI, 2013)	Anonymous, 1990; CABI, 2013	No	N/A	N/A
Xanthodes transversa Guenée	KR (KES, 1994; Anonymous, 1986b)	Robinson et al., 2001	Yes	L (Herbison-Evans and Crossley, 2006)	No
Xylena formosa Butler	KR (KES, 1994; NISA-KR, 2009)	NISA-KR, 2009	Yes	S, R (Borror et al., 1989)	No
Lepidoptera: Notodontidae					
Phalera assimilis Bremer & Grey	KR (KES, 1994; Lee et al., 1992)	Lee et al., 1992	Yes	L (EPPO, n.d.-b; Lee et al., 1992)	No
Lepidoptera: Nymphalidae					
Polygonia c-aureum Linnaeus	KR (KES, 1994; Anonymous, 1986b)	Robinson et al., 2001	Yes	L (Borror et al., 1989)	No
Lepidoptera: Oecophoridae					
Psorosticha melanocrepida Clarke	KR (KES, 1994)	Anonymous, 1990	Yes	L (Anonymous, 1986a)	No
Lepidoptera: Papilionidae					
Papilio bianor Cramer	KR (KES, 1994; Anonymous, 1986a; Shiraki, 1952c)	Robinson et al., 2001	Yes	L (Reuther, 1989)	No
Papilio helenus Linnaeus	KR (KES, 1994)	Anonymous, 1990, 1997	Yes	L (Anonymous, 1990, 1997; Reuther, 1989)	No

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quarantine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Papilio maackii Menetries	KR (Anonymous, 1990, 1997)	Robinson et al., 2001; Anonymous, 1990, 1997	Yes	L (Anonymous, 1990, 1997; Reuther, 1989)	No
Papilio macilentus Janson	KR (KES, 1994; Anonymous, 1986b)	Robinson et al., 2001	Yes	L (Reuther, 1989)	No
Papilio protenor (Cramer)	KR (KES, 1994; Shiraki, 1952c)	Robinson et al., 2001	Yes	L (Anonymous, 1990, 1997; Reuther, 1989	No
Papilio sp.	KR (KES, 1994; Catling et al., 1977)	Catling et al., 1977	Yes	L (Reuther, 1989)	No
Papilio xuthus Linnaeus	KR (KES, 1994; Lee et al., 1992), US (HI) (CABI, 2013)	CABI, 2013; Lee et al., 1992	Yes	L (Reuther, 1989)	No
Lepidoptera: Psychidae					
Bambalina sp.	KR (Lee et al., 1992)	Lee et al., 1992	Yes	L, S (Lee et al., 1992)	No
Eumeta minuscula Butler	KR (Kim et al., 2000)	Kim et al., 2000	Yes	L, F (Kim et al., 2000)	No[20]
Lepidoptera: Pyralidae					
Cadra cautella (Walker)	KR (KES, 1994), US (CABI, 2013)	Robinson et al., 2001	No	N/A	N/A
Conogethes punctiferalis (Guenée) (Syn: *Dichocrocis punctiferalis*)	KR (KES, 1994; CABI, 2013)	CABI, 2013	Yes	F, L, S (CABI, 2013)	No[21]

[20] *Eumeta minuscula* is a minor pest on *Citrus* (Kim et al., 2000). Larvae of Psychidae construct a case, which they carry with them as they feed. Females are wingless and generally do not leave the bag (Borror et al., 1989). Psychidae are primarily defoliators (Hill, 1994), but may feed externally on fruit (Kim et al., 2000). Such pests are likely to be removed during standard post-harvest washing and brushing of the fruit. Commercial fruit are highly unlikely to transport *E. minuscula.*

[21] *Conogethes punctiferalis* larvae bore into the fruit, leaves, and stem of the host plant, and its presence in fruit can easily be determined by these boreholes (CABI, 2013). Since 1985, *C. punctiferalis* has not been intercepted at U.S. ports-of-entry except in baggage or on plants for propagation (PestID, 2013).

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quarantine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Lepidoptera: Saturniidae					
Dictyoploca japonica (Moore)	KR (KES, 1994; Lee et al., 1992)	Lee et al., 1992	Yes	L (Lee et al., 1992)	No
Samia cynthia walkeri C & R Felder	KR (KES, 1994; Anonymous, 1986b)	Anonymous, 1990	Yes	L (Pittaway, 2009)	No
Lepidoptera: Sesiidae					
Synanthedon hector Butler	KR (KES, 1994; Lee et al., 1992)	Lee et al., 1992	Yes	Tr (EPPO, n.d.-b)	No
Lepidoptera: Tortricidae					
Adoxophyes orana Fischer von Röeslerstamm (Syn: *A. fasciata*)	KR (KES, 1994; CABI, 2013)	Anonymous, 1990; Robinson et al., 2001	Yes	F, I, L (CABI, 2013)	No[22]
Archips breviplicanus Walsingham (Syn: *A. breviplicana*; *Archippus breviplicanus*)	KR (KES, 1994; CABI, 2013)	Anonymous, 1990	Yes	I, F, L (NPQS, 1998)	No[23]
Archips crataeganus (Hübner)	KR (KES, 1994)	Anonymous, 1990	Yes	L (NPQS, 1998)	No
Archips fuscocupreanus Walsingham	KR (KES, 1994), US (CABI, 2013)	Umeya and Okada, 2003	No	N/A	N/A
Archips ingentana Christopher (Syn: *Archippus ingentanus*)	KR (KES, 1994)	Anonymous, 1990	Yes	L (NPQS, 1998)	No
Archips xylosteana Linnaeus	KR (KES, 1994; Meijerman and Ulenberg, 2004)	Meijerman and Ulenberg, 2004	Yes	L (Meijerman and Ulenberg, 2004)	No

[22] Most Lepidoptera are generalist foliage feeders and are not associated with fruit at harvest. Those that feed on or mine the fruit cause scarring that would cause the fruit to be culled during the inspection and packing process (Borror et al., 1989). Since 1985, none of the quarantine significant Tortricidae listed in this document have been intercepted in the United States associated with *Citrus* (PestID, 2013).

[23] The Asiatic leafroller, *A. breviplicanus*, is a minor pest of *Citrus* and is unlikely to be associated with fruit (NPQS, 1998). *Archips* sp. primarily affect leaves, but may feed externally on fruit (Hill, 1987). Such pests are likely to be removed during standard post-harvest washing and brushing of the fruit. Commercial fruit are highly unlikely to transport *A. breviplicanus* (CABI, 2013).

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quaran-tine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Homona magnanima Diakonoff	KR (KES, 1994; Lee et al., 1992)	CABI, 2013; Lee et al., 1992	Yes	L, S (CABI, 2013)	No
Orthoptera: Acrididae					
Chondracris rosea (De Geer)	KR (CABI, 2013)	CABI, 2013	Yes	L, S (CABI, 2013)	No
Oxya chinensis formosana Shiraki (Syn: ***O. c. chinensis; O. c. sinuosa***)	KR (KES, 1994; Anonymous, 1986b)	Anonymous, 1990	Yes	L (Hill, 1987)	No
Oxya yezoensis Shiraki (Syn: *O. japonica* Thunberg)	KR (CABI, 2013)	Anonymous, 1990	Yes	L (Hill, 1987)	No
Orthoptera: Pyrgomorphidae					
Atractomorpha lata Bolivar (Syn.: *Atractomorpha bedeli* Bolivar)	KR (Anonymous, 1990, 1997)	Anonymous, 1990	Yes	L (Borror et al., 1989)	No
Orthoptera: Tettigoniidae					
Gampsocleis sedakovi obscura Walker	KR (KES, 1994; Anonymous, 1990)	(Anonymous, 1990, 1997)	Yes	L, B (Borror et al., 1989; Kim et al., 2000)	No
Holochlora japonica Brunner von Watten	KR (KES, 1994)	(Anonymous, 1990, 1997)	Yes	L (Anonymous, 1990, 1997)	No
Thysanoptera: Phlaeothripidae					
Haplothrips chinensis Priesner	KR (KES, 1994)	NPQS, 1998	Yes	I (Ananthakrishnan, 1993)	No
Thysanoptera: Thripidae					
Frankliniella intonsa Trybom	KR (KES, 1994), US (CABI, 2013)	NPQS, 2000	No	N/A	N/A
Frankliniella occidentalis (Pergande)	KR (NISA-KR, 2009), US (CABI, 2013)	NISA-KR, 2009	No	N/A	N/A
Heliothrips haemorrhoidalis Bouché	KR (KES, 1994), US (CABI, 2013)	CABI, 2013; Hill, 1983	No	N/A	N/A
Megalurothrips distalis Karny	KR (KES, 1994; CABI, 2013)	Anonymous, 1997, 1998b	Yes	I, L (CABI, 2013)	No

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quarantine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Mycterothrips glycines (Okamoto)	KR (Kim et al., 2000)	Kim et al., 2000	Yes	F, L (Kim et al., 2000)	No[24]
Scirtothrips dorsalis Hood	KR (KES, 1994), US(FL, GA, HI) (CABI, 2013; Diffie et al., 2008)	CABI, 2013; FFTC, 2003	[Yes]	I, F, L (CABI, 2013)	No[24]
Thrips flavus Schrank	KR (Kim et al., 2000)	Kim et al., 2000	Yes	I, F, L (CABI, 2013)	No[24]
Thrips hawaiiensis (Morgan)	KR (KES, 1994), US (CABI, 2013)	CABI, 2013; NPQS, 2000	No	N/A	N/A
Thrips nigropilosus Uzel	KR (KES, 1994; NISA-KR, 2009), US (CABI, 2013)	NISA-KR, 2009	No	N/A	N/A
Thrips palmi Karny	KR, US (FL, GA, HI, PR) (CABI, 2013; Diffie et al, 2008)	CABI, 2013; NPQS, 2000	[Yes]	I, F, L, S (CABI, 2013)	No
Thrips tabaci Lindeman	KR (KES, 1994; Catling et al., 1977), US (CABI, 2013)	Catling et al., 1977	No	N/A	N/A
BACTERIA					
Agrobacterium tumefaciens (Smith & Town.) Conn (Syn.: *Rhizobium radiobacter* (Beij. & v. Deld.) Pribam [Alphaproteobacteria: Rhizobiales]	KR, US (CABI, 2013)	Bradbury, 1986; CABI, 2013	No	N/A	N/A

[24] Thrips are highly unlikely to remain with the fruit after harvest. Thrips typically attack growing points of plants, which include leaves, shoots, and young fruits. Given their mobility and lack of adhesion to the fruit surface, pressure washing and brushing of the fruit will remove active organisms. Since 1985, none of the quarantine significant thrips listed in this document have been intercepted at U.S ports-of-entry (PestID, 2009).

Pest Scientific Name	**Distribution**[1]	**Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis***	**Quaran-tine pest**[2]	**Plant part(s) affected**[3]	**Follow pathway**[2]
Pseudomonas syringae* pv. *syringae van Hall (Gammaproteobacteria: Pseudomoniales)	KR, US (Bradbury, 1986)	Bradbury, 1986	No	N/A	N/A
Xanthomonas citri* subsp. *citri [25] (ex Hasse 1915) Gabriel et al. 1989 [= *X. axonopodis* pv. *citri* (Vauterin et al.), *X. campestris* pv. *citri* (Hasse) Dye] (Citrus canker A) [Gammaproteobac-teria: Xanthomoniales]	KR (Bradbury, 1986), US (FL) (Citrus Canker; Movement of Fruit from Quarantined Areas, 2009)	Bradbury, 1986; CABI/EPPO, 2006	Yes[26]	F, L, S/Tr (CABI, 2013)	Yes
FUNGI					
Aithaloderma citri (Briosi & Pass) Woron 1926 (Syn.: ***Capnodium citri*** Berk. and Desm.) [Ascomycetes: Capnodiales]	KR, US (Farr and Rossman, 2013; Nisa-KR, 2009)	Farr and Rossman, 2013; Nisa-KR, 2009	No	N/A	N/A
Alternaria alternata Keisi [Ascomycetes: Pleosporales]	KR (CABI, 2013); US (da Silva and Singh, 2012)	Wang et al., 2010	No	N/A	N/A
Alternaria citri Ellis & N. Pierce (Fungi Imperfecti: Hyphomycetes)	KR (Young and Kim, 1996), US (Ellis and Holliday, 1970)	Ellis and Holliday, 1970	No	N/A	N/A

[25] The classification of Xanthomonads was revised in 2006. The proper taxonomic designation for the pathogen that causes citrus canker is now *Xanthomonas citri* subsp. *citri* (Euzeby, 2007; Schaad et al., 2006).
[26] This is a quarantine significant species with limited distribution in the United States and is under official control (NIS, 2006): § 301.75-1 through § 301.75-14.

Pest Scientific Name	**Distribution[1]**	**Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis***	**Quaran-tine pest[2]**	**Plant part(s) affected[3]**	**Follow pathway[2]**
***Alternaria* sp**. (Fungi Imperfecti: Hyphomycetes)	KR (CABI, 2013)	Anonymous, 1986, 1990; Knorr, 1973; Reuther et al., 1978; Timmer et al., 2000	Yes	F (Timmer et al., 2000)	Yes
Antennella citrina Hara (Loculoascomycetes: Dothideales)	KR (Anonymous, 1986b)	Anonymous, 1986b; WADAF, n.d.	Yes	L (Anonymous, 1986b)	No
Armillaria mellea (Vahl:FFr) P. Kumm	KR (Coetzee et al., 2001), US (Williams et al., 1989)	Smith et al., 1989 (citrus in general)	No	N/A	N/A
Ascochyta pisi Lib. (Syn.: *Ascochyta pisicola* (Berk.) Sacc. (Fungi Imperfecti: Coelomycetes)	KR, US (CABI, 2013)	CMI, 1985a; CABI, 2013	No	N/A	N/A
Aspergillus niger Tiegh. (Fungi Imperfecti: Hyphomycetes)	KR, US (CABI, 2013; Timmer et al., 2000)	Onions, 1966; Timmer et al., 2000	No	N/A	N/A
Botryosphaeria dothidea (Moug.:Fr.) Ces. & De Not. [Ascomycetes: Dothidiales]	KR, US (Farr and Rossman, 2013; Nisa-KR, 2009)	Farr and Rossman, 2013; Nisa-KR, 2009	No	N/A	N/A
Botryosphaeria rhodina (Cook) Arx (Syn.: *Diplodia natalensis;* ***Lasiodiplodia theobromae*** (Pat.) Griffiths & Maubl.) (Fungi Imperfecti: Hyphomycetes)	KR, US (Anonymous, 1998b; Farr and Rossman, 2013	Anonymous, 1998b; Farr and Rossman, 2013; Santacroce, 1993	No	N/A	N/A

Pest Scientific Name	**Distribution**[1]	**Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis***	**Quaran-tine pest**[2]	**Plant part(s) affected**[3]	**Follow pathway**[2]
Botryosphaeria ribis Grossenb. & Duggar (Syn.: ***Dothiorella gregaria*** Sacc.) [Ascomycetes: Dothidiales]	KR (CABI/EPPO, 2011); US (Anonymous, 1960)	Peregrine and Siddiqi, 1972	No[27]	N/A	N/A
Botryotinia fuckeliana (de Bary) Whetzel (Syn.: ***Botrytis cinerea*** Pers. *ex* Fr.) (Ascomycetes:Helotiales)	KR (Lee et al., 1991), US (Alfieri et al., 1984)	Alfieri et al., 1984	No	N/A	N/A
Capnodium tanakae Shirai & Hara (Syn.: *Neocapnodium tanakae* (Shirai & Hara) Yanamoto) [Loculoascomycetes: Dothideales]	KR (Cho and Shin, 2004)	Cho and Shin, 2004	No (PestID, 2013)	N/A	N/A
Capnophaeum fuliginodes (Rehm) Yamamoto (Loculoascomycetes: Dothideales)	KR (Anonymous, 1986b)	Anonymous, 1986b	No[28]	N/A	N/A
Chaetothyrium spinigerum (Hohnel) Yamamoto (Loculoascomycetes: Dothideales)	KR (Anonymous, 1986b, 1990)	Anonymous, 1986b, 1990	No[28]	N/A	N/A
Cladosporium herbarum (Pers.:Fr) Link. var. *citricola* Farl. (Fungi imperfecti)	KR, US (IA, WA) (CABI, 2013)	CABI, 2013	No[28]	N/A	N/A

[27] Actionable only if commodity is destined to Puerto Rico (PestID, 2013).
[28] This species is a non-pathogenic sooty mold fungus, which grows superficially on plant surfaces on the exudates of aphids or other sucking insect infestations (Crous et al., 2009). Since sooty molds do not infect plants (Nelson, 2008), quarantine action is not taken on these types of organisms, regardless of their absence in the United States. If the commodity is subject to routine washing as part of post-harvest processing, then this organism is highly unlikely to follow the pathway with commercial produce (Menge and Ploetz, 2003).

Pest Scientific Name	**Distribution**[1]	**Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis***	**Quarantine pest**[2]	**Plant part(s) affected**[3]	**Follow pathway**[2]
***Cladosporium* sp**. (Fungi Imperfecti: Hyphomycetes)	KR (PestID, 2013)	PestID, 2013	No[28]	N/A	N/A
Colletotrichum acutatum (Simmonds ex Simmonds) [Teleomorph**:** *Glomerella acutata* Guerber & J.C. Correll] [Ascomycetes: Incertae sedis]	KR, US (CABI, 2013)	CABI, 2013	No (PestID, 2013)	N/A	N/A
Colletotrichum coccodes (Wallr.) S. Hughes. [Syn.: *Gloeosporium foliicola* (Nishida) Sawada (as '*foliicolum*')] [Ascomycetes: Incertae sedis]	KR, US (CABI, 2013)	CABI, 2013; CMI, 1985a	No (PestID, 2013)	N/A	N/A
Colletotrichum gloeosporioides (Penz.) Penz. & Sacc. in Penz. (Fungi Imperfecti: Coelomycetes)	KR, US (CABI, 2013)	CABI, 2013)	No (PestID, 2013)	N/A	Yes
***Colletotrichum* sp.** (Fungi Imperfecti: Coelomycetes)	KR (PestID, 2013)	PestID, 2013	Yes	F (PestID, 2013)	Yes
Coprinus micaceous (Bull.: Fr.) FR. 1838	KR, US (Farr and Rossman, 2013; Nisa-KR, 2009)	Farr and Rossman, 2013; Nisa-KR, 2009	No	N/A	N/A
Corticium rolfsii Curzi (Syn.: ***Sclerotium rolfsii*** Sacc.) (Basidiomycetes: Corticiaceae)	KR, US (CABI, 2013)	CABI, 2013	No (PestID, 2013)	N/A	N/A

Pest Scientific Name	**Distribution**[1]	**Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis***	**Quaran-tine pest**[2]	**Plant part(s) affected**[3]	**Follow pathway**[2]
Diaporthe citri F. A. Wolf (Pyrenomycetes: Diaporthales)	KR, US (CABI, 2013)	CABI, 2013	No (PestID, 2013)	N/A	N/A
Diaporthe faginea (Curr.) Sacc. 1882 (Syn.: *Diaporthe medusaea* Nit.) [Ascomycetes: Diaportales]	KR, US (Farr and Rossman, 2013; Nisa-KR, 2009)	Farr and Rossman, 2013; Nisa-KR, 2009	No[29]	N/A	N/A
Elsinoë australis Bit. & Jenkins (Loculoascomycetes: Dothideales)	KR (Hyun et al., 2001; Hyun et al. 2007; Hyun et al., 2009)[30] US: transient, actionable, under surveillance (CABI, 2013)	Hyun et al., 2001; Hyun et al., 2007; Hyun et al., 2009)	Yes	F, L, S (PestID, 2013; Hyun et al., 2001; Hyun et al., 2007; Hyun et al., 2009)	Yes
Elsinoë fawcetti Bit. & Jenkins (Loculoascomycetes: Dothideales)	KR (Cho and Shin, 2004), US (Alfieri et al., 1984)	Alfieri et al., 1984	No	N/A	N/A
***Elsinoë* sp.** (Loculoascomycetes: Dothideales)	KR (Cho and Shin, 2004)	PestID, 2013	Yes	F, L, S (PestID, 2013)	Yes

[29] Only actionable if commodity is destined to Puerto Rico or the U.S. Virgin Islands (PestID, 2013).

[30] Hyun et al. (2009) confirmed the occurrence of the natsudaidai pathotype of *E. australis* in Korea but found no new pathotypes or regions of occurrence for this species. The host range of *E. australis* has not been thoroughly investigated on fruit. A preliminary host range of *E. australis* can be ascertained by molecular means only. However, fruit inoculations will have to be performed to confirm the susceptibility of different species of citrus. Consequently, we will analyze this fungus in this assessment.

Pest Scientific Name	**Distribution**[1]	**Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis***	**Quaran-tine pest**[2]	**Plant part(s) affected**[3]	**Follow pathway**[2]
Erythricium salmonicolor (Berk. & Broome) Burdsall (Syn.: ***Corticium salmonicolor*** Berk. & Broome; anamorph: *Necator decret* Massee) [Basidiomycetes: Polyporales]	KR, US (Farr and Rossman, 2013; Nisa-KR, 2009)	Farr and Rossman, 2013; Nisa-KR, 2009	No	N/A	N/A
Geotrichum citri-aurantii (Feiraris) E. E. Butler (Fungi Imperfecti: Hyphomycetes)	KR, US (Anonymous, 1986b; Farr and Rossman, 2013)	Anonymous, 1986b; Farr and Rossman, 2013	No (PestID, 2013)	N/A	N/A
Guignardia bidwellii (Ellis) Viala & Ravaz [Anamorph: *Phyllosticta ampelicida* (Engelm) Aa.] [Ascomycetes: Dothideales]	KR, US (CABI, 2013)	CABI, 2013; CMI, 1991	No (PestID, 2013)	N/A	N/A
Guignardia mangiferae (A. J. Roy) [Anamorph: *Phyllosticta capitalensis*; Syn.: *Phoma citricarpa* McAlpine var. *mikan* Hara] [Ascomycetes: Dothideales]	KR, US (CABI, 2013)	CABI, 2013	No (PestID, 2013)	N/A	N/A
Guignardia sp. (Fungi Imperfecti: Coelomycetes)	KR (Cho and Shin, 2004); US (CABI, 2013)	Simmonds, 1966	Yes	F, L, S (CABI, 2013)	Yes
Helicobasidium mompa Tanaka (Basidiomycetes: Ceratobasidiaceae)	KR (Anonymous, 1986b)	Anonymous, 1986b	Yes	R, S/Tr (Anonymous, 1986b)	No

Pest Scientific Name	**Distribution**[1]	**Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis***	**Quaran-tine pest**[2]	**Plant part(s) affected**[3]	**Follow pathway**[2]
Hypocrea lixii (Pat.) [Anamorph: ***Trichoderma harzianum*** Rifai] [Ascomycetes: Hypocreales]	KR, US (CABI, 2013)	CABI, 2013	No (PestID, 2013)	N/A	N/A
Limacinia japonica Hara [Loculoascomycetes: Dothideales]	KR (Anonymous, 1986b, 1990; PestID, 2013)	Anonymous, 1986b, 1990; PestID, 2013	Yes	F (Anonymous, 1986b, 1990; PestID, 2013)	No[31]
Macrophomina phaseolina (Tassi) Goidanich (Fungi Imperfecti: Coelomycetes)	KR, US (CABI, 2013)	CABI, 2013; Farr and Rossman, 2013	No (PestID, 2013)	N/A	N/A
***Microsphaeropsis* sp.** (Fungi Imperfecti: Coelomycetes)	KR (PestID, 2013)	PestID, 2013	Yes	F (PestID, 2013)	Yes
Mycosphaerella citri Whiteside [Ascomycetes: Mycosphaerellales]	KR, US (Farr and Rossman, 2013; Nisa-KR, 2009)	Farr and Rossman, 2013; Nisa-KR, 2009	No (PestID, 2013)	N/A	N/A
Nectria haematococca (Wollenw.) Gerlah (Syn.: ***Fusarium solani*** (Martius) Sacc.) [Ascomycetes: Hypocreales]	KR, US (CABI, 2013)	CABI, 2013	No (PestID, 2013)	N/A	N/A

[31] *Limacinia japonica* is a minor leaf pathogen known as a sooty mold fungus (Agrios, 1997). This non-pathogenic species grows superficially on plant surfaces on the exudates of aphids or other sucking insect infestations (Crous et al., 2009). Since sooty molds do not infect plants (Nelson, 2008), quarantine action is not taken on these types of organisms, regardless of their absence in the United States. If the commodity is subject to routine washing as part of the post-harvest processing, then this organism is highly unlikely to follow the pathway with commercial produce (Menge and Ploetz, 2003).

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quaran-tine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Nematospora coryli Peglion (Syn.: *Eremothecium coryli* (Peglion) Kurtzman) [Saccharomycetes: Saccharomycetales]	KR, US (CABI, 2013)	CABI, 2013	No (PestID, 2013)	N/A	N/A
Penicillium digitatum Sacc. (Ascomycetes: Eurotiales)	KR ,US (CABI, 2013)	(CABI, 2013)	No[32]	N/A	N/A
Penicillium italicum Wehmer (Ascomycetes: Eurotiales)	KR, US (CABI, 2013)	Anonymous, 1998a; Timmer et al., 2000; CABI, 2013	No[32]	N/A	N/A
Penicillium ulaiensi. [Ascomycetes: Eurotiales]	KR, US (Farr and Rossman, 2013; Nisa-KR, 2009)	Farr and Rossman, 2013; Nisa-KR, 2009	No[32]	N/A	N/A
Phaeopeltis japonica Yamamoto (Loculoascomycetes: Dothideales)	KR (Anonymous, 1986b, 1990)	Anonymous, 1986b, 1990	No[33] (PestID, 2013)	N/A	N/A
Phyllosticta beltranii Penzig (Fungi Imperfecti: Coelomycetes)	KR (Anonymous, 1986b, 1990, 1998b)	Anonymous, 1986b, 1990, 1998b	Yes	L (Anonymous, 1986b, 1990, 1998b)	No
Phyllosticta erratica Ellis & Everh. (Fungi Imperfecti: Coelomycetes)	KR, US (Anonymous, 1986b; Farr et al., 2008)	Anonymous, 1986b; Farr and Rossman, 2013	No	N/A	N/A

[32] Non-actionable at the level of order (Chaetothyriales)

[33] *Phaeopeltis japonica* is a minor leaf pathogen known as a sooty mold fungus (Agrios, 1997). This non-pathogenic species grows superficially on plant surfaces on the exudates of aphids or other sucking insect infestations (Crous et al., 2009). Since sooty molds do not infect plants (Nelson, 2008), quarantine action is not taken on these types of organisms, regardless of their absence in the United States. If the commodity is subject to routine washing as part of the post-harvest processing, then the pathogen is highly unlikely to follow the pathway with commercial produce (Menge and Ploetz, 2003)

Pest Scientific Name	**Distribution**[1]	**Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis***	**Quaran-tine pest**[2]	**Plant part(s) affected**[3]	**Follow pathway**[2]
Phytophthora boehmeriae (Sawada) [Oomycetes: Pythiales]	KR (Hong et al., 1999)	Ho and Lu, 1997[34]	Yes	L, S, R (CABI, 2013; Hong et al., 1999); Fruit (Ho and Lu, 1997)	Yes[34]
Phytophthora cactorum (Lebert & Cohn) Schröt. [Oomycetes: Pythiales]	KR, US (CABI, 2013)	CABI, 2013	No (PestID, 2013)	N/A	N/A
Phytophthora citrophthora (R.E. Sm. & E.H. Sm.) Leonian (Oomycetes: Pythiaceae)	KR, US (CABI, 2013)	CABI, 2013	No (PestID, 2013)	N/A	N/A
Phytophthora cryptogea (Pethybr. & Laff.) [Oomycetes: Pythiales]	KR (Jee et al., 1996); US (CMI, 1985b)	CABI, 2013	No	N/A	N/A
Phyophthota nicotianae Breda de Haan 1896 **[**Syn.: *Phytophthota parisitica* Dastur (1913)] [Oomycetes: Pythiales]	KR, US (Farr and Rossman, 2013; Nisa-KR, 2009)	Farr and Rossman, 2013; Nisa-KR, 2009	No	N/A	N/A
Pythium debaryanum (Auct. non.) R. Hesse [Oomycetes: Pythiales]	KR, US (CABI, 2013)	CABI, 2013	No (PestID, 2013)	N/A	N/A
Pythium ultimum (Trow) [Oomycetes: Pythiales]	KR, US (CABI, 2013)	CABI, 2013	No (PestID, 2013)	N/A	N/A
Rhizoctonia solani J. G. Kuhn [Teleomorph: *Thanatephorus cucumeris* (A.B. Frank) Donk [Basidiomycetes: Ceratobasidiales]	KR, US (CABI, 2013)	CABI, 2013	No (PestID, 2013)	N/A	N/A

[34] This pathogen is only reported on "*Citrus* spp."; it may or may not have a host association with *C. reticulata*. Symptoms are readily visible; post-harvest surface treatment of citrus is likely ro remove it from the pathway (CABI, 2013).

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quarantine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
Rosellinia necatrix Prill. (Ascomycetes: Xylariales)	KR, US (CMI, 1987)	CABI, 2013	No	N/A	No
Sclerotinia sclerotiorum (Lib.) deBary (Ascomycetes: Helotiales)	KR, US (CABI, 2013)	CABI, 2013	No (PestID, 2013)	N/A	N/A
NEMATODA					
Criconematidae					
Criconemoides informis (Micoltzdy)	KR (Anonymous, 1984, 1990)	Anonymous, 1984, 1990	No	N/A	N/A
Hemicriconemoides mangiferae Siddiqi	KR, US (CABI, 2013)	CABI, 2013	No[35]	N/A	N/A
Longidoridae					
Xiphinema americanum Cobb	KR, US (CABI, 2013)	Anonymous, 1984; CABI, 2013	No (PestID, 2013)	N/A	N/A
Xiphinema insigne Loos (Longidoridae)	KR (Park et al., 2002); US (Luc and Southey, 1980: *in* Robbins et al., 2000)	CABI, 2013	No	N/A	N/A
Pratylenchidae					
Pratylenchus penetrans (Cobb) Filipjev & Schuurmans Stekhoven	KR, US (CABI, 2013)	Anonymous, 1984; CABI, 2013	No (PestID, 2013)	N/A	N/A
Trichordoridae					
Paratrichodorus porosus (Allen) Siddiqi	KR, US (CABI, 2013)	CABI, 2013; Umeya and Okada, 2003	No (PestID, 2013)	N/A	N/A
Tylenchidae					
Tylenchulus semipenetrans Cobb	KR, US (CABI, 2013)	CABI, 2013	No (PestID, 2013)	N/A	N/A

[35] Non-actionable unless commodity is destined to Hawaii, Puerto Rico, or the U.S. Virgin Islands (PestID, 2013).

Pest Scientific Name	Distribution[1]	Reported on *C. reticulata, C. reticulata* ssp. *unshiu*, or *C.* × *sinensis*	Quarantine pest[2]	Plant part(s) affected[3]	Follow pathway[2]
VIRUSES					
Citrus tatter leaf virus (Capillovirus)	KR (CABI, 2013), US (CA, FL) (Garnsey, 1964)	Calavan et al., 1963	No	N/A	N/A
Citrus tristeza virus (Closteroviridae: Closterovirus)	KR (CABI/EPPO, 2010), US (Bar-Joseph et al., 1989)	Bar-Joseph et al., 1989	No	N/A	N/A
MOLLUSCA					
Bradybaenidae					
Acusta despecta (Grey)	KR (An, 2000)	An, 2000	Yes	L, S (An, 2000)	No

2.4.1. Pests that are candidates for mitigation

The two quarantine pests likely to follow the pathway that we analyzed further were *Elsinoë australis* (sweet orange scab) and *Xanthomonas citri* subsp. *citri* (citrus canker).

2.4.2. Pests that are not candidates for mitigation

Following, we discuss some pests that were not further analyzed.

Mealybugs. The mealybugs (Hemiptera: Pseudococcidae) are unlikely to be associated with commercial export-quality Unshu oranges due to pressure washing and brushing of the fruit that will occur before export to the United States. Any mealybugs on the fruit at harvest would likely be removed by this post-harvest practice, given their mobility and lack of adhesion to the fruit surface. Interception records for commercial shipments of *Citrus* fruit corroborate this.

Armored scales. We identified three species of armored scales (Hemiptera: Diaspididae), *Octaspidiotus stauntoniae, Parlatoria ziziphi,* and *Unaspis yanonensis,* as quarantine pests. We did not further analyze them because although armored scales may enter on commercial fruit for consumption, they are highly unlikely to become established via this pathway (Miller, 1985; PERAL, 2007b). A recent critical review of the literature, APHIS-PPQ operational data, and expert opinion concludes that, even assuming high quantities of imported fruit infested with armored scale species that could be parthenogenic, highly fecund, polyphagous, invasive, theoretically able to survive in most of the United States, and capable of causing high-level consequences, the specific pathway represented by commercially produced fruit shipped without leaves, stems or contaminants constitutes an extremely low risk (PERAL, 2007a). This low risk is explained by poor ability of armored scales to disperse to new host plants from fruits for consumption, and consequently, by their low probability of establishment. The following characteristics of armored scales contribute to their poor dispersal capabilities:

- Legs and wings are absent in females and in feeding immature forms. Males possess wings but are short-lived, do not feed, and tend to mate with nearby females.
- Self-dispersal of armored scales occurs by immature forms, or “crawlers.” They are the most vulnerable life stage; their survival decreases with long-distance wind dispersal. Crawlers can be passively dispersed by wind from one plant to another only during a period of approximately 24 hours. No further dispersal is possible after the crawlers start feeding as they lose their legs during the first molt and their mouthparts are deeply inserted in the host, anchoring them firmly to the substrate.
- Dispersal from fruit discarded in the environment is considered very unlikely because of low wind speeds at ground level and low survival rate of crawlers on the ground or on decaying fruit or fruit peel. Active dispersal of crawlers by walking from their natal host is highly unlikely since they are not capable of rapid movement over bare soil or rough surfaces.

Organisms removed from the pathway. Organisms removed from the Unshu oranges pathway during standard post-harvest processing do not require further analysis. The following quarantine significant species found associated with citrus and in Korea (Table 2) will be mitigated through culling, pressure washing, and brushing of the fruit: *Panonychus elongatus* (Acari: Tetranychidae), *Arcte coerula, Bastilla maturate, Calyptra lata, C. thalictri, Dysgonia stuposa, Eudocima fullonia , E. salaminia, Helicoverpa armigera, Ophiusa tirhaca, Oraesia emarginata, O. excavate, Serrodes campana* (Lepidoptera: Noctuidae), *Ceroplastes japonicus, C. pseudoceriferus, C. rubens* (Hemiptera: Coccidae), *Drosicha corpulenta* (Hemiptera: Margarodidae), *Nezara antennata* (Hemiptera: Pentatomidae), *Planococcus kraunhiae, Pseudococcus cryptus, Pseudococcus* sp. (Hemiptera: Pseudococcidae), *Scirtothrips dorsalis, Thrips coloratus, T. flavus,* and *T. palmi* (Thysanoptera: Thripidae).

Ascochyta citri. We did not list the fungus, *A. citri* Penz. (Ascomycetes: Dothideales), above for several reasons. First, the only evidence we found that it was present in Korea was a single interception at a U.S. port-of-entry in baggage (PestID, 2013), which may not mean the produce was from Korea. Second, although reported on oranges (Viégas, 1945) the genus and species was not given (in the abstract available to us). *Citrus reticulata* is not a reported host, despite being identified a single time on *C. reticulata* from Mexico (Farr and Rossman, 2013). Because we are uncertain about both presence in the exporting country, and a host association with oranges, we did not list *A. citri* above.

Guignardia citricarpa. This pathogen is the causal agent of citrus black spot disease (Sutton and Waterston, 1966), and is a quarantine pest (Sutton and Waterston, 1996). The pest risk assessment conducted by PPQ in 1994 noted that Korean officials were unable to detect citrus black spot disease during several years of survey in the citrus-growing areas in Korea. A list of citrus pests submitted by Korea (Anonymous, 1990) included *Phoma citricarpa* McAlpine var. *mikan* Hara as a causal agent of storage rot of citrus. *Phoma citricarpa* McAlpine is an anamorph of *G. citricarpa* (EPPO, 1997). The same situation was described in Japan, where a low percentage of stored Unshu fruit developed a decay caused by *G. citricarpa* var. *mikan* (anamorph: *P. citricarpa* var. *mikan*) (McOnie, 1967). McOnie (1967) concluded that *G. citricarpa* var. *mikan* was actually the nonpathogenic strain of *G. citricarpa*, that small irregular markings on fruit thought to be caused by *G. citricarpa* were due to mechanical or insect injury, and that the *G. citricarpa* isolated from those fruit was the nonpathogenic *Guignardia* sp. Based on this information, PPQ believes that the *Guignardia* present in Korea is nonpathogenic. This concurs with reports of *G. citricarpa* in Korea as being either doubtful or reports of the non-pathogenic *Guignardia* sp. (CABI, 2013). Baldassari et al. (2008) and Baayen et al. (2002) used symptomology, pathogen morphology, and molecular techniques to differentiate the non-pathogenic species from *G. citricarpa*. The "non-pathogenic strain" is now designated *G. mangiferae* and the citrus black spot pathogen is designated as *G. citricarpa* (Baayen et al., 2002; Baldassari et al., 2008). The non-pathogenic *Guignardia* was reported in Florida (Alfieri et al., 1994) and Texas (Okamura and Davis, 1987). Based on this information, we believe that the *Guignardia* present in Korea is *G. mangiferae*, which is not a quarantine pest. That is also why *G. citricarpa* does not appear above.

Satsuma dwarf virus. The Satsuma dwarf virus (Bromoviridae: Nepovirus) is present in Korea (CABI/EPPO, 2004), but we found no direct evidence for a host association with *C. reticulata*. Primarily it infects Satsuma (*Citrus unshiu*), and although most citrus varieties can be infected, *C. reticulata* × *C. paradisi* cv. Orlando is symptomlessly infected (EPPO/CABI, n.d.), and *C. reticulata* is not listed as a host. For this reason, we did not list this pathogen above.

2.6. Consequences of Introduction

The negative impacts resulting from the introduction and establishment of quarantine pests are considered in this assessment. The potential consequences of introduction are rated using five risk elements described in the Guidelines for the Pathway-Initiated Pest Risk Assessments Version 5.02 (PPQ, 2000).

For each risk element, we rated the pest Low (1 point), Medium (2 points), or High (3 points). We summed all the risk element values to calculate a cumulative risk rating score, which is a biological indicator of the potential of the pest to establish, spread, and cause economic and environmental impacts (PPQ, 2000). We summarized the ratings for the Consequences of Introduction in Table 3.

***Elsinoë australis*, sweet orange scab**	**Risk ratings**
Risk Element 1: Climate-Host Interaction Sweet orange scab occurs in Italy, India, Ethiopia, the Dominican Republic, Argentina, Bolivia, Brazil, Ecuador, Paraguay, Uruguay, the Cook Islands, Fiji, Niue, Samoa (CABI, 2013), and Korea (Hyun et al., 2001; Hyun et al., 2007; Hyun et al., 2009). Thayer et al. (2003) examined the likely areas that *Elsinoë australis* could establish in the United States. The pathogen requires moderately warm temperatures (4-25 °C) and a minimum wet period of 2.5-3.5 hours for infections to occur. The suitable climate for *E. australis* development is limited to the states of Arizona, Florida, Louisiana, Mississippi, and Texas, where there are suitable hosts. "On July 23, 2010, APHIS confirmed the first United States detection of the fungal pathogen Elsinoë australis, causal agent of SOS, in Texas. SOS was subsequently detected and confirmed in Louisiana, Mississippi, Florida, and Arizona in August 2010, October 2010, December 2010, and January 2011, respectively (APHIS, 2011)." "Federal Orders have been issued to establish SOS-quarantine areas for the entire States of Texas, Louisiana, Mississippi, Florida,	**Medium (2)**

***Elsinoë australis,* sweet orange scab**	**Risk ratings**
and Arizona" (APHIS, 2011). This area includes four plant hardiness zones. Therefore the rating for Climate-Host Interaction is **Medium.**	
Risk Element 2: Host Range *Elsinoë australis* infects many species of citrus, including sweet orange (*C.* × *sinensis*), lemon (*C. limon*), mandarin (*C. reticulata*), tangerine (*C. reticulata*), satsuma orange (*C. reticulata*), kumquat (*Fortunella margarita*), lime (*C. latifolia*), grapefruit (*C. paradisi*), and pointed leaf papeda (*C. hystrix*) (CMI, 1998). Sour orange, *C. aurantium,* is relatively resistant to *E. australis* (EPPO/CABI, 1997h). The host range of sweet orange scab includes multiple genera within a single family, so the rating for this element is **Medium**.	**Medium (2)**
Risk Element 3: Dispersal The primary window for infection is the early spring, when the tree puts out new shoot growth and "petal fall" commences (Timmer et al., 2000). Leaves are susceptible as they emerge from the bud; thereafter they become immune to infection (Timmer et al., 2000). However, when lesions develop on leaves, they typically remain small (2 mm diameter) (Bitancourt and Jenkins, 1937). During the six to eight weeks after "petal fall," fruits are highly susceptible to *E. australis* (Timmer et al., 2000). Conidia dispersal depends on rain and/or irrigation (CMI, 1998; EPPO/CABI, 1997h; Timmer et al., 2000), and may disperse in the air over short distances (Chung and Timmer, 2005). The dispersal gradient is short and the estimated spread rate in Florida groves ranged from 100 to 300 m per year (Whiteside, 1975). Because the period of infectivity is limited and the maximum annual dispersal distance is measured in meters, we rated sweet orange scab **Low** for Dispersal Potential.	**Low (1)**
Risk Element 4: Economic Impact *Elsinoë australis* disfigures fruit and reduces fresh market value (Bitancourt and Jenkins, 1937; EPPO/CABI, 1997h). Culling diseased fruit increases handling costs and decreases export volume. Most oranges in Florida are grown for processing; therefore finding sweet orange scab in an orange grove would likely not disrupt either the processed or fresh market. *Elsinoë australis* may also affect grapefruit, lime, or tangerine groves; a large portion of these crops goes to the fresh market (USDA, 2002). Expenses associated with sweet orange scab include field control (to reduce disease symptoms), post-harvest treatments, grove surveys, and the loss in export market of fresh citrus from all states. The estimated cost of its permanent establishment in Florida—not considering post-harvest treatment costs— about $55 million annually, which includes a loss in export revenue of $32 million annually (USDA, 2002). We rated *E. australis* **Medium** for this element.	**Med (2)**
Risk Element 5: Environmental Impact The introduction of *E. australis* into a new area may require specific chemical control programs, which can negatively impact non-target pests and the	**Low (1)**

***Elsinoë australis*, sweet orange scab**	**Risk ratings**
environment. Copper oxychloride sprays during new spring growth and flowering protect the young leaves and fruit by preventing the spores from germinating and causing infection (Timmer et al., 2000; Whiteside, 1975). Three sprays are recommended for areas highly infested with citrus scab (Timmer and Chung, 2007; Timmer et al., 2000). Growers in Florida are already employing these chemicals to control *E. fawcettii*; therefore there would be little additional environmental impacts for controlling *E. australis.* No threatened or endangered species of citrus in the United States would be impacted by the pathogen (USFWS, 2008). We rated the pathogen **Low** for this element.	

***Xanthomonas citri* subsp. *citri*, citrus canker**	**Risk ratings**
Risk Element 1: Climate-Host Interaction Citrus canker disease occurs in Asia, Africa, Central America, the Caribbean, South America, Oceania, and the United States (Florida). In Florida, citrus canker has successfully established several times. The last occurrence in Florida was in Miami in 1995. Citrus canker is now widespread throughout citrus-producing areas in Florida. To date, citrus canker has not spread from Florida to other U.S. citrus-producing areas. Citrus is grown in U.S. Plant Hardiness Zones 8-10 (Bright Leaf Citrus Nursery, 2008; Wright, 2001). Citrus canker could establish in three Plant Hardiness Zones (Magarey et al., 2008) (Figure 2). Thus, our rating for this element is **Medium**.	**Medium (2)**
Risk Element 2: Host Range *Citrus* spp. are the main hosts of economic importance. Natural infections only occur on *Citrus* spp., hybrids, and cultivars and on *Aegle marmelos* (golden apple), *Casimiroa edulis* (white sapote), *Citrus aurantiifolia* (lime), *C. aurantium* (sour orange), *C. hystrix* (mauritius bitter orange), *C. junos* (yuzu), *C. limetta* (sweet lemon tree), *C. limon* (lemon), *C. madurensis* (calamondin), *C. maxima* (pummelo), *C. medica* (citron), *C. natsudaidai* (natsudaidai), *C. reshni* (Cleopatra mandarin), *C. reticulata* (mandarin), *C. reticulata* × *Poncirus trifoliata* (citrumelo), *C.* × *sinensis* (navel orange), *C. sunki* (sour mandarin), *C. tankan* (tankan mandarin), *C. unshiu* (satsuma), *Citrus* × *paradisi* (grapefruit), *Eremocitrus glauca* (Australian desert lime), *Limonia acidissima* (elephant apple), *Poncirus trifoliata* (Trifoliate orange), *Fortunella japonica* (round kumquat), and *Fortunella margarita* (oval kumquat) (Pruvost et al., 2002; CABI, 2013). The degree of susceptibility of these citrus species to citrus canker varies. Most *C. reticulata* cultivars are moderately resistant to citrus canker (Gottwald et al., 1993; Graham et al., 1992; Canteros, 2004). The natural host range of citrus canker includes multiple species within one plant family, which means a risk rating of **Medium**.	**Medium (2)**
Risk Element 3: Dispersal *Xanthomonas citri* subsp. *citri* can survive in diseased plant tissues, as an epiphyte on host and non-host plants, and as a saprophyte on straw mulch or in soil (Goto, 1992). However, overwintering lesions, particularly those formed on angular shoots, are the most important source of inoculum for the following	**Medium (2)**

season (Pruvost et al., 2002). Bacteria produced in leaf and twig lesions are significant for secondary infections. The amount of citrus canker bacteria present within active lesions decreases as the lesions age, and stem lesions can act as reservoirs of inoculum for longer periods than fruits and leaves (Leite Jr. and Moham, 1990; Verniere et al., 2003). In the first 48 hours of wetting, laboratory studies demonstrated that 4-6 week-old lesions exuded 100 to 1000 times more cfu/ml (cfu = colony forming unit) than 4-6 month-old lesions (Timmer et al. 1991). Viable bacteria have been isolated from 5-7 year-old stem lesions (Schubert et al., 2001). Late-season lesions are capable of sustaining bacteria from one season into the next season, and asymptomatic citrus leaves still attached to the tree are believed to harbor citrus canker bacteria for several months.

Bacteria may also survive for a few weeks to several months on decomposing plant litter (fallen fruit, leaves, and limbs), on the soil surface (Civerolo, 1984; Gottwald et al., 2002; Graham et al., 1987; Leite Jr. and Moham, 1990; Schubert et al., 2001), or on plant material in the soil for as long as four years (Goto, 1992; Goto et al., 1975; Pereira et al., 1976). This allows citrus canker bacteria to persist, providing inoculum for further spread of the pathogen (Graham et al., 1987). Survival in decomposing leaves, both in and on the soil surface, depends on moisture and temperature (Goto, 1992). Citrus canker bacteria do not survive for long periods in the soil in the absence of host material (Graham et al., 1989; Graham et al., 1987; Leite Jr. and Moham, 1984).

In wind-driven rain, bacteria dispersal can occur within trees and from tree to tree (Bock, 2005; Gottwald and Graham, 2000). Pathogen spread has been recorded from 32 meters to several miles (Gottwald and Graham, 2000; Gottwald et al., 1988; Gottwald et al., 2002b; Stall et al., 1980). In Florida, pathogen spread was detected within 579 m (1900 ft) from the source 95 percent of the time (Compton and Fagan, 2000; Gottwald et al., 2002; Gottwald et al., 2001). Citrus canker spread from an initial 50 square miles to 1,265 square miles area in the first five years following detection in Florida.
Long-distance spread of the pathogen can also occur via the movement of infected planting and propagating material, such as budwood, rootstock seedlings, or budded trees from nurseries (Gottwald et al., 2002a; Graham et al., 2004; Smith et al., 1997; Timmer et al., 2005). There is no confirmed record of seed transmission (Smith et al., 1997). Contaminated personnel, clothing, equipment, tools, field boxes, and other items associated with harvesting and post-harvest handling of fruit may also provide a means of long-distance dissemination, especially when trees are wet (Civerolo, 1984; Timmer et al., 2005). Bacteria can survive in plant debris in the soil for long periods (Goto et al., 1978; Graham et al., 1987); thus, the removal of leaves, fruit, and limbs from the grove floor and the removal of infected trees, help reduce inoculum and diminish spread potential.

Xanthomonas citri subsp. *citri*, citrus canker	Risk ratings
The movement of diseased fruit has often been considered a potential means of long-distance pathogen spread, but despite a long global history of commercial trade in citrus fruit, no authenticated record exists of this (Smith et al., 1997). Likewise, infected culled fruit and processed fruit pulp possibly facilitate long-distance pathogen spread, but the likelihood of this is unknown (Smith et al., 1997). We do not know if asymptomatic fruit or fruit with lesions are epidemiologically significant with respect to the initiation of new infections (Canteros, 2004; Jetter et al., 2000). Based on the above, we rated citrus canker **Medium** for Dispersal Potential.	
Risk Element 4: Economic Impact Severe infections by citrus canker bacteria can result in dieback, defoliation, fruit deformation, and premature fruit drop (CABI, 2013; Civerolo, 1981; Gottwald and Graham, 2000; Stall and Seymour, 1983). When the fruits and leaves of young, susceptible trees are infected, the development and the achievement of full growth may be delayed by several years in severely infected young trees (CABI, 2013). The most significant effect of citrus canker is the loss of commercial markets due to unmarketable fruit. Blemished fruit are still suitable for the juice market (Stall and Seymour, 1983), but do not meet the market standard for fresh fruit (Gottwald et al., 2001; Muraro et al., 2001). We rated citrus canker **High** for Economic Impacts.	**High (3)**
Risk Element 5: Environmental Impact The introduction of citrus canker in a new area may require specific control programs that could negatively impact non-target pests and the environment. Prophylactic sprays of copper oxychloride or other copper-containing compounds are commonly used to provide protection against initial infection in canker-endemic areas during growth flushes and fruit development (2-6 cm diameter) (Das, 2003; Graham et al., 2004; Koizumi, 1977b; Kuhara, 1978; Leite Jr. and Moham, 1990; Medina-Urrutia and Stapleton, 1985; Muraro et al., 2001; Stall et al., 1980; Timmer, 1988). Additional copper fungicide sprays are often necessary to avoid symptoms in generally infected areas because the initial spray usually wears off, reducing its efficacy in limiting pathogen spread potential (Gottwald et al., 2002; Leite Jr. and Moham, 1990; Stall et al., 1980). In Japan, susceptible hosts are often sprayed 5 to 7 times, while moderately susceptible cultivars are only sprayed four times throughout the growing season. Five to six copper sprays during the susceptible rainy season in Brazil result in a decreased disease incidence of 90 percent in moderately susceptible cultivars (Leite Jr. et al., 1987). In addition, the age of the citrus tree, environmental conditions, and the application of other control methods may alter the effectiveness of copper sprays (Leite Jr., 2000). Graham and Gottwald (1991) stated that "in the absence of windbreaks, copper applied at 1-month intervals slightly reduced canker spread during wind-blown rain events." However, they found that copper applications did not affect disease incidence when used in conjunction with windbreaks and applied at one-month intervals (Graham and Gottwald, 1991). APHIS has considered the potential effects of citrus eradication program on endangered and threatened species and their habitats. Generally, the controlled nature of the citrus	**Medium (2)**

canker infestations and the program treatments preclude any effects on those species and their habitats (USDA, 1999). Overall, we rated citrus canker **Medium** for Environmental Impact.

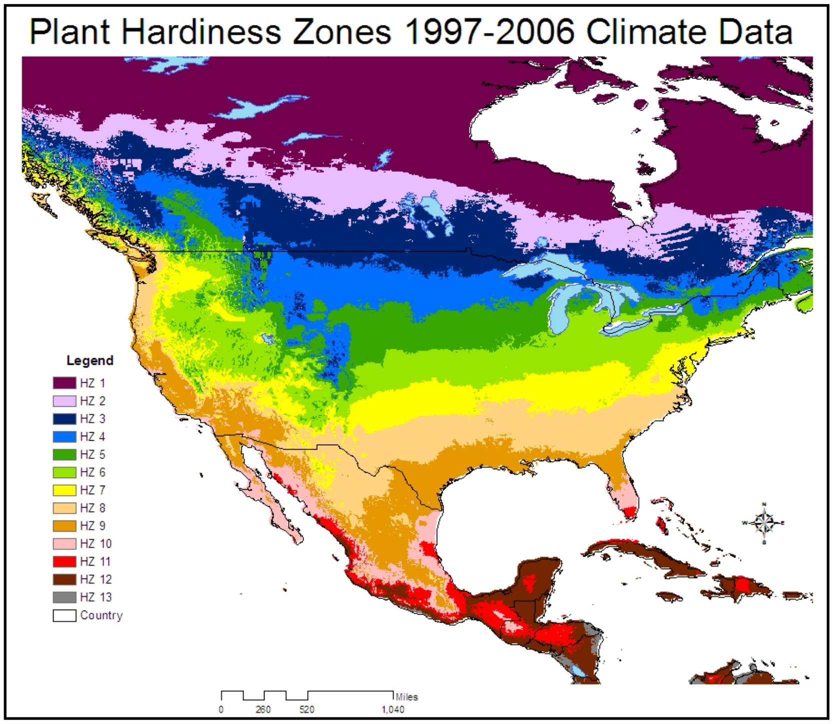

Figure 2. Plant hardiness zones for the continental United States (Magarey et al., 2008).

Table 3. Risk ratings for Consequences of Introduction.

Pest	Risk elements					Risk rating[a]
	Climate-Host Interaction	**Host Range**	**Dispersal Potential**	**Economic Impact**	**Environ-mental Impact**	
Elsinoë australis	Med (2)	Med (2)	Low (1)	Med (2)	Low (1)	Low (8)
Xanthomonas citri subsp. *citri*	Med (2)	Med (2)	Med (2)	High (3)	Med (2)	Medium (11)

[a] Low = 5-8, Medium = 9-12, High = 13-15

2.7. Likelihood of Introduction

This portion of the assessment considers two separate components. First, we estimate the amount of commodity likely to be imported, which is the same for all quarantine pests considered. Second, we consider five biological factors concerning the pest and its interactions with the commodity. The resulting risk ratings are specific to each pest. For each pest, the sum of the sub elements produces a cumulative risk rating for likelihood of introduction. The cumulative risk rating for introduction is considered to be an indicator of the likelihood that a particular pest would be introduced. These ratings and the value for the Likelihood of Introduction are summarized in Table 5.

2.7.1. Quantity imported annually

The likelihood that an exotic pest will be introduced depends on the amount of potentially infested commodity imported. For qualitative pest risk assessments, the amount of commodity imported is estimated in units of standard 40-foot shipping containers.

Korea began exporting Unshu oranges to the United States in 1995, and that ended in 2002 (Table 4) (NASS, 2005). The annual number of 40-foot shipping containers fell within the range of 10 to 100 containers. Given this, we assumed that less than 100 containers would be imported annually from Korea, so the rating was **Medium**.

Table 4. Shipping volumes of Korean Unshu fruit, in approximate number of 40-foot containers (NASS, 2005).

Year	Volume (metric tons)	Containers (no.)
1995	50	2.5
1996	220	11
1997	1,190	59.5
1998	40	2
1999	380	19
2000	240	12
2001	1,434	71.7
2002	1,601	80

2.7.2. Harvested fruit is infested/infected and survives post-harvest treatment

Citrus canker. Standard post-harvest treatments were summarized above (section 1.2). The presence of the organism on fruit may be associated with lesions, injuries, or blemishes, or it may be epiphytic (contamination). A ten-year research project in Argentina confirmed the very low susceptibility (zero percent) of Unshu mandarin fruit to citrus canker, especially in comparison to grapefruit (Canteros, 2004). Disease incidence on vegetative plant parts was slightly above zero on fruit, with the Unshu mandarin the least susceptible to citrus canker of all cultivars that were tested under high inoculum pressure (Canteros, 2004). Small fruit (<20 mm) are not susceptible to infection as the stomata are not fully open at this stage. Above this size susceptibility is inversely related to fruit age: younger fruit are more susceptible (Graham et al., 1992).

Epiphytic populations of citrus canker on citrus tissue drop three to five orders of magnitude in 24 hours in experiments (Timmer et al., 1996). In Brazil, asymptomatic fruit were sprayed with a bacterial suspension, but after five days at room temperature under laboratory conditions the bacteria could not be recovered (Belasque Jr. and Rodriguez Neto, 2000). Harsher environmental conditions outside the laboratory would likely further reduce the survival of epiphytic citrus canker populations on asymptomatic fruit.

This fruit will be washed, brushed, and dried as a normal part of the packing process (section 1.2). Brushing increases the exposure of citrus canker to toxicants (Brown and Schubert, 1987). Drying further reduces epiphytic citrus canker populations (Schubert et al., 1999). Disinfectants reduced populations of the closely related species, *Xanthomonas campestris* pv. *vesicatoria*, to undetectable levels (Brown and Schubert, 1987; Graham and Gottwald, 1991). Using 200 ppm chlorine for two minutes reduces natural bacterial populations on citrus fruits 77-99 percent (Stapleton, 1986). Similarly, exposing fruit from infected citrus trees to a prewash with SOPP detergent, followed by a chlorine wash reduced the survival of surface bacteria (Gottwald et al., 2009). A packinghouse wash with disinfectants can practically remove all epiphytic citrus canker from fruits without symptoms (Canteros, 2004.; Canteros et al., 2000). Post-harvest treatment in Uruguay reduced bacterial populations on inoculated fruit by 99.5 percent, and by 99.8 percent on naturally infested fruit (Verdier et al., 2005, 2006). Finally, two different chlorine-wash protocols reduced (by approximately 50 percent) the ability of lesions to produce viable bacteria (Gottwald et al., 2009).

If a small epiphytic population of citrus canker did survive post-harvest treatments, it would not survive long on the surface of the fruit (Goto, 1969; Timmer et al., 1991). Under natural conditions, epiphytic citrus canker survives on fruit surfaces for only about three days (Goto, 1962, 1969; Shiotani et al., 2009), and they do not multiply in water, on leaf surfaces, or on dry leaves (Timmer et al., 1991; Timmer et al., 1996). Because bacterial survival on non-attached citrus fruit is significantly reduced (Koizumi, 1972), the likelihood of citrus canker spread via commercial fruit is very low, but not zero (Golmohammadi et al., 2007).

We can conclude that symptomatic fruit are unlikely to pass through the standard packinghouse procedures and that the post-harvest treatments will likely remove and/or devitalize epiphytic populations of the pathogen to the extent that they become epidemiologically insignificant. For these reasons, we rated this risk element **Low** for citrus canker.

Sweet orange scab. Infection by *E. australis* can start in the early spring, when there is new shoot growth and "petal fall" commences (Timmer et al., 2000). Leaves are only susceptible as they emerge; thereafter they become immune to infection. Lesions on leaves typically remain small (2 mm diameter) (Bitancourt and Jenkins, 1937). Tissue susceptibility decreases as fruit mature. Fruits become susceptible to *E. australis* six to eight weeks after petal fall (Timmer et al., 2000). Rind symptoms of initial infections typically display slightly raised and pink to light brown scab prostulates. As the scab or prostulates develop they become warty and cracked, and yellowish brown to dark gray (Bitancourt and Jenkins, 1937; Timmer et al., 2000). Prophylactic sprays of copper oxychloride or other copper-containing compounds provided protection against initial infection in canker-endemic areas during growth flushes and fruit development (2-6 cm diameter) (Das, 2003; Graham et al., 2004; Muraro et al., 2001). Well-timed field treatments significantly reduce the incidence of disease, the level of inoculum, and the number of symptomatic fruit in the field. Combinations of prophylactic sprays and cultural control practices, such as windbreaks and pruning diseased shoots, further reduce disease incidence (Das, 2003; Kuhara, 1978; Leite Jr., 2000; Leite Jr. and Moham, 1990).

As with citrus canker, symptomatic oranges infected by sweet orange scab are unlikely to pass through the standard packinghouse procedures and the post-harvest treatments. Therefore, we rated this risk element **Low** for sweet orange scab.

2.7.3. Quarantine pests survive shipment

This sub-element evaluates the survival of inoculum in fruit during shipping. Shipments of Unshu oranges are likely to be refrigerated and spend several days in transit to the United States. Recommended shipping and storage temperatures for Unshu oranges are between 4 and 7°C for two to four weeks (Cantwell, 2002).

Citrus canker. Bacteria that survive the packing process on the surface of citrus fruit are unlikely to survive the shipping process. Bacterial populations in existing lesions decreased by several orders of magnitude when the average maximum temperature was below 20°C and average minimum temperature was below 10°C (Koizumi, 1977a). Stall et al. (1980) noted "the populations of viable cells in lesions decreased about 100-fold during the winter months." As mentioned above, under natural conditions epiphytic citrus canker survives on fruit surfaces only up to three days (Goto, 1962, 1969; Shiotani et al., 2009). Therefore, epiphytic populations pose an epidemiological threat for only a very limited window of time.

After processing, bacteria have not been shown to occur on the surface of citrus fruit or under the wax coating applied to the fruit, and are unlikely to cause disease development under these circumstances. Fruit-to-fruit post-harvest spread of bacteria has not been documented. Citrus canker latent populations do not produce symptoms in harvested fruit (Civerolo, 1997), and there is no evidence of epiphytic growth by citrus canker (Brunings and Gabriel, 2003). Our rating for *Xanthomonas citri* subsp. *citri* is **Low** for this risk element.

Sweet orange scab. Harvested fruit is visually inspected for sweet orange scab symptoms. Fruits are infected early in their development, grow misshapen, and can fall prematurely (EPPO/CABI, 1997h). Lesions on young fruit are round to irregular, 2 to 6 mm in diameter, raised and slightly convex (Bitancourt and Jenkins, 1937). Rind symptoms of older scabs are warty and cracked and yellowish brown to dark gray in color (Bitancourt and Jenkins, 1937; Timmer et al., 2000). Culling procedures used in Argentina to remove symptomatic Xcc fruit (Ploper et al., 2004) should effectively remove fruit symptomatic for *E. australis*.

Routine packinghouse treatments used to control citrus black spot (CBS) such as chlorine dip, warm water bath, or chemical tank dip (1000 μg ml^{-1} guazatine, 503 μg ml^{-1} imazalil sulphate, 500 μg ml^{-1} 2,4-D sodium salt) and combinations of these treatments (Korf et al., 2001), should reduce the viability of *E. australis*. Wax treatments used to reduce the viability of *Guignardia citricarpa* conidia (Korf et al., 2001; Seberry et al., 1967) should also reduce the viability of *E. australis* conidia. Due to the packing process, the rating is **Medium** for *E. australis* to survive packing and post-harvest treatment.

<u>2.7.4. Quarantine pest is not detected at port-of-entry</u>
In this sub-element we assess the likelihood of a pest not being detected during port inspections.

Citrus canker. Groves in infested areas may have citrus canker infected fruit at varying levels depending on the prevalence of inoculum, the susceptibility of the variety, and climatic, environmental, and cultural conditions. The presence of the organism on fruit may be associated with lesions, injuries, or blemishes, or it may be epiphytic (contamination). Epiphytic populations would be difficult to detect, but are much less likely to introduce the disease (above). Lesions on infected fruit are distinctive and have been detected at ports multiple times (PestID, 2013). Therefore, we rated this pest **Low** for this sub-element.

Sweet orange scab. We found no information about the ability of *E. australis* to survive shipping. The fungus overwinters in the tree canopy on limbs and fruit that had been infected during the previous season. The pathogen will survive if existing scab pustules retain the infectious conidia (propagules) (EPPO/CABI, 1997h). Citrus scab can generally survive for periods of time without susceptible tissue in pustules on old leaves and fruit (Timmer et al., 2000). Since *E. australis* can overwinter, it can likely survive low temperatures during shipment. Thus, we rated *E. australis* as **High** for this sub-element.

<u>2.7.5. Infested/infected fruit is moved to suitable habitat</u>
This sub-element involves shipment of infested/infected fruit to a suitable habitat for establishment/disease development; for this, we consider the geographic location of likely markets. Imported fruit normally arrive at multiple ports and are distributed according to market demand.

Three of the four most populous states in the United States (Florida, Texas, and California; US Census Bureau, 2000) are in the southern United States, where the climate best matches the native climates for citrus canker and sweet orange scab. Assuming that citrus is distributed across the United States proportional to population, then fruit is likely to be shipped to these states. Based on the above information, we rated this risk element **Medium** for both pests**.**

<u>2.7.6. Pests find suitable host and establish or incite disease</u>
This sub-element examines the risk that imported infested fruit will encounter a suitable host within the suitable habitat, and a viable reproductive unit of the insect pest or plant pathogen

associated with the fruit is able to complete its life cycle. The following events must occur for the disease to develop:

- A susceptible host must be available
- The host must be exposed when infection can occur (varies with cultivar)
- Free water must be available on the surface of the citrus plants from rain
- Sufficient force (i.e., wind) must be present to drive the bacteria into natural openings, or wounds must be present
- The causal organism must be in sufficient amount and at stage that can cause disease onset
- Enough time must elapse for key interactions to occur

Citrus canker. Viable bacteria from infected fruit are unlikely to encounter suitable hosts under the conditions required for disease development for several reasons. First, citrus canker has only fifteen known hosts in *Citrus* spp. (see above). Second, hosts must be susceptible; the susceptible period lasts 90-120 days after petal fall. Most leaf infections occur during enlargement (Civerolo, 1984), over a short interval, often within the first six weeks (Gottwald and Graham, 2000). Mature, unwounded fruit are not susceptible to infection (Civerolo, 1984; Gottwald and Graham, 2000), because they (and leaves) are protected by the buildup of a waxy cuticle (Albrigo, 1976; Gottwald and Graham, 2000; Graham et al., 1992; NPB, 2002). Third, infiltration of bacteria into stomata on unwounded fruit or leaves is aided by wind-driven rain, with wind speeds exceeding 8 m/s (Gottwald et al., 2002; Graham and Leite Jr., 2004). Such weather conditions will be relatively rare. Finally, diseased fruit have not been shown to affect epidemiology of citrus canker disease (Smith et al., 1997; Gottwald et al., 2009), whether with lesions or asymptomatic fruit (Anonymous, 2005; Canteros, 2004; Jetter et al., 2000; PERAL, 2007a; Verdier et al., 2005).

Gottwald et al. (2009) demonstrated that actively growing citrus plants exposed to infected, packinghouse treated fruit did not become infected. Discarded canker-infected fruit in cull piles were also not effective sources of inoculum for dispersal to nearby plants under natural conditions. Overall, citrus fruit with canker lesions are an unlikely pathway through which citrus canker inoculum might lead to infection and citrus canker establishment in new areas (Gottwald et al., 2009). We rated citrus canker **Low** for this sub-element.

Sweet orange scab. The suitable climate for *E. australis* development is limited to the states of Arizona, Florida, Mississippi, Louisiana, and Texas (Source: DA-2011-50 (Thayer, 2003; DA-2011-50), where hosts of *E. australis* are present. Infection only occurs when there is new shoot growth and “petal fall” commences (Timmer et al., 2000). Leaves are only susceptible as they emerge; thereafter they become immune to infection (Timmer et al., 2000). Tissue susceptibility decreases as fruit mature. Fruits are susceptible to *E. australis* six to eight weeks after petal fall (Timmer et al., 2000). The pathogen will survive if existing scab pustules retain the infectious conidia (propagules) (EPPO/CABI, 1997h). Conidia are formed abundantly on wet scabs (CABI, 2006). Germination of conidia and infection do not require rainfall, but a minimum wet period, via dew, fog, or other high moisture conditions of 2.5-3.5 hours, is necessary for conidial infection (CABI, 2006; EPPO/CABI, 1997h). When these favorable conditions are present, infection and further conidial production can occur within 4-6 hours (Whiteside, 1975). As the closely related species *E. fawcetti* is already established in Florida it is likely that *E. australis* encounter suitable conditions for disease development. The rating for sweet orange scab is **High** for this sub-element.

Table 5. Risk rating for Likelihood of Introduction.

Pest	Quantity imported annually	Harvested fruit is infected	Survive post-harvest treatment	Survive shipment	Fruit sent to suitable habitat	Find suitable host/incite disease	Cumulative risk ranking[1]
Elsinoë australis	Med (2)	Low (1)	Medium (2)	High (3)	Med (2)	High (3)	Medium (13)
Xanthomonas citri subsp. *citri*	Med (2)	Low (1)	Low (1)	Low (1)	Med (2)	Low (1)	Low (8)

[1]Low = 6-9, Medium = 10-14, High = 15-18

2.8. Pest Risk Potential / Conclusion

The sum of the values for the Consequences of Introduction and the Likelihood of Introduction equal the Pest Risk Potential (Table 6). Sweet orange scab and citrus canker had **Medium** Pest Risk Potentials (Table 6). A very low incidence of any symptomatic fruit infested with citrus canker may enter on occasion, but the pathogen is unlikely to establish in new areas via this fruit as a pathway. The same seems true for sweet orange scab.

Low risk pests typically do not require specific mitigations measures beyond port-of-entry inspection. For medium risk pests, specific phytosanitary measures may be necessary, and for high risk pests, specific phytosanitary measures are strongly recommended, and port-of-entry inspection is not considered sufficient to provide phytosanitary security. Identification and selection of appropriate sanitary and phytosanitary measures to mitigate risk for pests with particular Pest Risk Potential ratings is undertaken as part of the risk management phase is not discussed in this document. The appropriate risk management strategy for a particular pest depends on the risk posed by that pest.

Table 6. Pest Risk Potential.

Pest	Consequences of Introduction	Likelihood of Introduction	Pest Risk Potential[a]
Elsinoë australis	Low (8)	Medium (13)	Medium (21)
Xanthomonas citri subsp. *citri*	Medium (11)	Low (8)	Medium (19)

[a] Low = 11-18, Medium = 19-26, High = 27-33

3. Contributors & Reviewers

Barney Caton, Ecologist and Pest Risk Analyst[a]
James Smith, Entomologist and Pest Risk Analyst[a]
Kayimbi Tubajika, Plant Pathologist[a]
Ignacio Baez, Entomologist[a]

[a]USDA APHIS PPQ CPHST PERAL

4. Literature Cited

7 CFR § 301.75-11. 2008. Code of Federal Regulations. Agriculture. Title 7 part 301 and 305 (7 CFR § 301.75-11 Citrus Canker; Movement of Fruit From Quarantined Areas; Final Rule).

7 CFR § 319. 2008. U.S. Code of Federal Regulations, Title 7, Part 319 (7 CFR § 319 – Foreign Quarantine Notices).

7 CFR § 319.28. 2008. U.S. Code of Federal Regulations, Title 7, Part 319.28 (7 CFR § 319.28 – Notice of quarantine [Subpart—Citrus Fruit])

Agrios, G. N. 1997. Plant Pathology (Fourth Edition). Academic Press, London, UK. 635 pp.

Albrigo, L. G. 1976. Water relations and citrus quality. Pages 41-48 *in* Proceedings of the 2nd International Citrus short course, Gainesville, FL.

Alfieri, S. A., K. R. Langdon, J. W. Kimbrough, N. E. El-Gholl, and C. Wehlburg. 1994. Diseases and disorders of plants in Florida, Bull. No. 14. Dept. Agric. Consumer Serv., Florida.

Alfieri Jr., S.A., K.R. Langdon, C. Wehlburg, and J.W. Kimbrough. 1984. Index of Plant Diseases in Florida (Revised). Florida Dept. Agric. and Consumer Serv., Div. Plant Ind. Bull. 11: 1-389.

An, K. W. 2000. Letter from Kwang-Wook An to Rob Tamaka (on file with the USDA, APHIS, PPQ, subject: Survey Results, List of Citrus Insect Pests Found in 1996-1998 survey).

Ananthakrishnan, T. N. 1993. Bionomics of Thrips. Annual Review of Entomology 38:71-92.

Anonymous 1960. Index of Plant Diseases in the United States. USDA Agriculture Handbook 165: 1-531.

Anonymous. 1984. Distribution of plant parasitic nematode species in North America. Soc. Nematol.

Anonymous. 1986. A List of Plant Diseases, Insect Pests, and Weeds in Korea. The Korean Society of Plant Protection. 633 pp.

Anonymous. 1990. The list of major pests and diseases known to occur on citrus in Korea. Republic of Korea, The Ministry of Agriculture, Forestry & Fisheries, Seoul, Korea.

Anonymous. 1994. Check list of insects from Korea. Kon-Kuk University Press, The Entomological Society of Korea, Korean Society of Applied Entomology, Seoul, Korea. 744 pp.

Anonymous. 1997. Pests and organisms of concern. Korean mandarin work plan. Ministry of Agriculture and Forestry (MAF), National Plant Quarantine Service (NPQS), Republic of Korea; and United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service.

Anonymous. 1998a. Data sheet, Korean citrus pests. National. Plant Quarantine Service Korea.
Anonymous. 1998b. List of plant diseases in Korea, 3rd ed. Korean Soc. Plant Pathol.
Anonymous. 2005. Report of the second meeting of the expert working group on "The use of integrated measures in a systems approach for pest risk management, Buenos Aires, Argentina. 63 pp.
Anonymous. 2009a. *Bemisia tabaci* (Gennadius): Cotton whitefly, Tobacco whitefly. L'institute national de la recherche agronomique: HYPPZ Zoology. http://www.inra.fr/internet/Produits/HYPPZ/RAVAGEUR/6bemtab.htm.
Anonymous. 2009b. *Vespa crabro* (L.). L'institute national de la recherche agronomique: HYPPZ Zoology. http://www.inra.fr/hyppz/RAVAGEUR/6vescra.htm.
APHIS. 2007. Evaluation of asymptomatic citrus fruit (*Citrus* spp.) as a pathway for the introduction of citrus canker disease (*Xanthomonas axonopodis* pv. *citri*). United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS). 36 pp.
APHIS. 2008. An Updated Evaluation of citrus fruit (*Citrus* spp.) as a pathway for the Introduction of Citrus Canker Disease (*Xanthomonas citri* subsp. *citri)*. United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS). 9 pp.
APHIS. 2010. The significance of *Citrus* spp. fruit as a pathway for the introduction or spread of *Elsinoë australis,* the organism that causes Sweet orange scab disease. United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS). 15 pp.
APHIS. 2011. APHIS Revises Approved Packinghouse Procedures for Sweet Orange Scab (*Elsinoë australis*) DA-2011-50. United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS). http://www.aphis.usda.gov/plant_health/plant_pest_info/citrus/downloads/sweet_orange/2011-50.pdf
Baayen, R.P., P.J. M. Bonants, G. Verkley, G.C. Carroll, H.A. van der Aa, M. de Weerdt, I.R. van Brouwershaven, G.C. Schutte, W. Maccheroni Jr., C.G. de Blanco, and J.L. Azevedo. 2002. Nonpathogenic isolates of the citrus black spot fungus, *Guignardia ciricarpa*, identified as a cosmopolitan endophyte of woody plants, *G. mangiferae* (*Phyllosticta capitalensis*). Phytopathology 92(5):464-477.
Baldassari, R.B., E. Wickert, and A. de Goes. 2008. Pathogenicity, colony morphology and diversity of isolates of *Guignardia citricarpa* and *G. mangiferae* isolated from *Citrus* spp. Eur. J. Plant Pathol. 120:103-110.
Bar-Joseph, M., R. Marcus, R.F. Lee. 1989. The Continuous Challenge of Citrus Tristeza Virus Control. Annual Review of Phyropathology 27:291-316.
Belasque Jr., J., and J. Rodriguez Neto. 2000. Sobrevivencia da bacteria causadora do cancro cítrico (*Xanthomonas axonopodis* pv. *citri*) em frutos de laranja nao infectados com a doença. Summa Phytopathologica 26(1):128.
Ben-Dov, Y. 1993. A systematic catalogue of the soft scale insects of the world (Homoptera: Coccoidea: Coccidae): with data on geographical distribution, host plants, biology and economic importance. Sandhill Crane Press, Inc., Gainesville, Florida. 536 pp.
Ben-Dov, Y., D. R. Miller, and G. A. P. Gibson. 2013. ScaleNet. http://www.sel.barc.usda.gov/SCALENET/scalenet.htm. (Archived at PERAL).

Bitancourt, A. A., and A. E. Jenkins. 1937. Sweet orange scab caused by *Elsinoë australis*. J. Agric. Res. 54:1-18.

Bock, C. H. 2005. Effect of simulated wind-driven rain on duration and distance of dispersal of *Xanthomonas axonopodis* pv. *citri* from canker-infected citrus trees. Plant Disease 89:71-80.

Borror, D. J., C. A. Triplehorn, and N. F. Johnson. 1989. An Introduction to the Study of Insects. Saunders College Publishing. 875 pp.

Bradbury, J. F. 1986. Guide to Plant Pathogenic Bacteria. International Mycological Institute, Commonwealth Agricultural Bureaux, Kew, UK. 332 pp.

Bright Leaf Citrus Nursery. 2008. Planting guide. Last accessed 10/22/08, http://www.briteleaf.com/planting_guide.htm.

Brown, G. E., and T. S. Schubert. 1987. Use of *Xanthomonas campestris* pv. *vesicatoria* to evaluate surface disinfectants for canker quarantine treatment of citrus fruit. Plant Disease 71:319-323.

Brunings, A. M., and D. W. Gabriel. 2003. *Xanthomonas citri* : breaking the surface. Molecular Plant Pathology 4(3):141-157.

Burke, H. R., J. A. Jackman, and M. Rose. 1994. Insects associated with woody ornamental plants in Texas. Department of Entomology, Texas A&M University http://insects.tamu.edu/extension/publications/woody.html.

CABI. 2006. *Elsinoë australis.* Crop Protection Compendium. CAB International (CABI), Wallingford, UK.

CABI. 2007. Crop Protection Compendium. CAB International (CABI). http://www.cabicompendium.org/cpc/aclogin.asp?/cpc/findadatasheet.asp? (Archived at PERAL).

CABI. 2013. Crop Protection Compendium. CAB International (CABI). http://www.cabicompendium.org/cpc/aclogin.asp?/cpc/findadatasheet.asp? (Archived at PERAL).

CABI/EPPO. 2006. *Xanthomonas axonopodis* pv. *citri* Map 11 (Edition 7). Distribution Maps of Plant Diseases. CAB International (CABI) and European and Mediterranean Plant Protection Organization (EPPO). Wallingford, UK, and Paris, France.

CABI/EPPO. 2004. Satsuma dwarf virus Map No. 918 Edition 1. Distribution Maps of Plant Diseases. CAB International (CABI) and European and Mediterranean Plant Protection Organization (EPPO). Wallingford, UK, and Paris, France.

CABI/EPPO. 2010. Citrus tristeza virus Map No. 289 Edition 7. Distribution Maps of Plant Diseases. CAB International (CABI) and European and Mediterranean Plant Protection Organization (EPPO). Wallingford, UK, and Paris, France. Distribution Maps of Plant Diseases

CABI/EPPO. 2011. *Botryosphaeria ribis* Grossenb. & Duggar Map No. 1109 Edition 1. Distribution Maps of Plant Diseases. CAB International (CABI) and European and Mediterranean Plant Protection Organization (EPPO). Wallingford, UK, and Paris, France.

Calavan, E.C., D.W. Christiansen and C. N. Roistacher. 1963. Symptoms associated with tatter-leaf virus infection of Troyer citrange rootstocks. Plant Disease Reporter 47: 971-975.

Canteros, B. I. 2004. Management of citrus canker in Argentina: A review. Proceedings of the International Society of Citriculture.

Canteros, B. I., M. Naranjo, and M. Rybak. 2000. Production of fruits free of *Xanthomonas axonopodis* pv. *citri* in selected plots, in areas of endemic canker in Argentina. Pages 1136-1137 *in* Proceedings of the International Society of Citriculture. IX Congress 2000. International Society of Citriculture, Orlando, FL, USA.

Cantwell, M. 2002. Appendix: Summary table of optimal handling conditions for fresh produce. Pages 511-518 in A. A. Kader, (ed.). Postharvest Technology of Horticultural Crops. University of California Agriculture and Natural Resources Communication Services, Oakland, CA, USA.

Catling, H.D., S.C. Lee, D.K. Moon, and H.S. Kim. 1977. Towards the Integrated Control of Korean Citrus Pests. Entomophaga 22(4):335-343.

CDFA. 2008. California Plant Pest and Disease Report 2007, California Department of Food and Agriculture (CDFA), Sacramento, CA.

Cho, W.D., and H.D. Shin. 2004. List of Plant Diseases in Korea (4th edition). The Korean Society of Plant Pathology. 779 pp.

Choi, K-S., Y-M. Park, D-H. Kim, and D-S. Kim. 2011. Seasonal occurrence and damage of geometrid moths with particular emphasis of *Ascotis selenaria* (Geometridae: Lepidoptera) in citrus orchards in Jeju, Korea. Lorean Journal of Applied Entomology 50(3): 203-208.

Chung, K.R., and L.W. Timmer. 2005. Citrus diseases exotic to Florida: Sweet orange scab (SOS) (EDIS document PP-224). Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL, USA.

Citrus Canker; Movement of Fruit from Quarantined Areas. 2009. Federal Register 74(203): 54431-54445 (October 22, 2009).

Civerolo, E. L. 1981. Citrus bacterial canker disease: An overview. Pages 390-394 *in* Proceedings of the International Society of Citriculture, IV Congress International Society of Citriculture, Tokyo, Japan.

Civerolo, E. L. 1984. Bacterial canker disease of citrus. Journal of the Rio Grande Valley Horticultural Association 37:127-146.

Civerolo, E. L. 1997. Risk of transmission of *Xanthomonas campestris* (=*axonopodis*) pv. *citri* on commercial citrus fruit. Pages 28-41 *in in* Colloquium on Quarantine Security. XXI NAPPO Annual Meeting. North American Plant Protection Organization, Seattle, WA, USA.

CMI. 1985a. Distribution maps of plant diseases No. 273. *Ascochyta pisi*. Commonwealth Mycological Institute (CMI). CAB International, Wallingford U.K.

CMI. 1985b. Distribution maps of plant diseases *Phytophthora cryptogea* No. 99 Edition 5. Commonwealth Mycological Institute (CMI). CAB International, Wallingford U.K.

CMI. 1987. Distribution maps of plant diseases No. 306 Edition 4. *Rosellinia necatrix*. Commonwealth Mycological Institute (CMI). CAB International, Wallingford U.K.

CMI. 1991. Distribution maps of plant diseases 81. Edition 4. Commonwealth Mycological Institute (CMI). CAB International, Wallingford U.K.

CMI. 1998. *Elsinoë australis*. Description of Pathogenic Fungi and Bacteria (No. 440), Commonwealth Mycological Institute (CMI). CAB International, Wallingford, UK.

Coetzee, M.P.A., B.D. Wingfield, T.C. Harrington, J. Steimel, T.A. Coutinho, and M.J. Wingfield. 2001. The root rot fungus Armillaria mellea introduced into South Africa by early Dutch settlers. Molecular Ecology 10: 387–396.

Compton, L., and M. Fagan. 2000. Stepped-up canker eradication effort is launched (Press Release No. 2-23-2000). Florida Department of Agriculture, Tallahassee, FL, USA. 1 pp.

Crous, P.W., C.L. Schoch, K.D. Hyde, A.R. Wood, C. Gueidan, G.S. de Hoog, and J.Z. Groenewald. 2009. Phylogenetic lineages in the Capnodiales. Studies in Mycology 64:17-47.

Das, A. K. 2003. Citrus canker- a review. Journal of Applied Horticulture 5(1):52-60.

da Silva, W. L., and R. Singh. 2012. First Report of *Alternaria alternata* Causing Leaf Spot on Aloe vera in Louisiana. Plant Disease 96(9): 1379.

Diffie, S., G. B. Edwards, and L. A. Mound. 2008. Thysanoptera of Southeastern U. S. A.: A checklist for Florida and Georgia. Zootaxa 1787:45-62.

Duffy, E. A. J. 1960. A Monograph of the Immature Stages of Neotropical Timber Beetles (Cerambycidae). Commonwealth Institute of Entomology, British Museum of Natural History, London, UK. 327 pp.

Ellis, M.B., and P. Holliday. 1970. *Alternaria citri*. C.M.I. Descriptions of Pathogenic Fungi and Bacteria No. 242. 2 pp.

EPPO. 1997. Data Sheets on Quarantine Pests: *Spodoptera littoralis* and *Spodoptera litura*. European and Mediterranean Plant Protection Organization (EPPO). www.eppo.org/QUARANTINE/insects/Spodoptera_litura/PRODLI_ds.pdf

EPPO. n.d.-a. Data Sheets on Quarantine Pests: *Anoplophora malasiaca* and *Anoplophora chinensis*. European and Mediterranean Plant Protection Organization (EPPO). 4 pp.

EPPO. n.d.-b. Forest pests on the territories of the former USSR (05/12249). European and Mediterranean Plant Protection Organization (EPPO). 234 pp.

EPPO/CABI. 1997h. Data sheet on quarantine pests: *Elsinoë fawcettii* and *Elsinoë australis*. *in* I. M. Smith, D. G. McNamara, P. R. Scott, and M. Holderness, (eds.). Quarantine Pests for Europe. 2nd edition. CAB International, Wallingford, UK, and European and Mediterranean Plant Protection Organization (EPPO).

EPPO/CABI. No date. Data Sheets on Quarantine Pests: *Satsuma dwarf 'nepovirus'*. European and Mediterranean Plant Protection Organization (EPPO), and CAB International (CABI), Paris, France, and Wallingford, UK. 5 pp.

Euzéby, J. 2007. List of new names and new combinations previously effectively, but not validly, published. Validation list No115. International Journal of Systematic and Evolutionary Microbiology 57:893-897.

Evans, G. A. 2008. The Whiteflies (Hemiptera: Aleyrodidae) of the World and Their Host Plants and Natural Enemies (Version 2008-09-23). United States Department of Agriculture, Animal and Plant Health Inspection Service.

Ewing, C. P., and A. R. Cline. 2005. Key to the Adventive Sap Beetles (Coleoptera: Nitidulidae) in Hawaii, with Notes on Records and Habits. The Coleopterists Bulletin 59(2):167-183.

Farr, D. F. and A. Y. Rossman. 2013. Fungal Database. United States Deparment of Agriculture. http://nt.ars-grin.gov/fungaldatabases/. (Archived at PERAL).

FFTC. 2003. Important pests of citrus in Asia. Pages 39-55 Citrus Production: A Manual for Asian Farmers. Food and Fertilizer Technology Center (FFTC) for the Asian and Pacific Region.

Frye, M. J., J. Hough-Goldstein, and J.-H. Sun. 2007. Biology and Preliminary Host Range Assessment of Two Potential Kudzu Biological Control Agents. Environmental Entomology 36(6):1430-1440.

Funayama, K. 2002. Oviposition and Development of *Halyomorpha halys* (Stål) and *Homalogonia obtusa* (Walker) (Heteroptera: Pentatomidae) on Apple Trees. Japanese Journal of Applied Entomology 46:1-6.

Garnsey, S.M. 1964. Detection of Tatter Leaf Virus of Citrus in Florida. Proceedings of the Florida State Horticultural Society, 77: 106-109.

Gillott, C. 1995. Entomology (Second Edition). Plenum Press, New York. 798 pp.

Golmohammadi, M., J. Cubero, J. Peñalver, J. M. Quesada, M. M. López, and P. Llop. 2007. Diagnosis of *Xanthomonas axonopodis* pv. *citri,* causal agent of citrus canker, in commercial fruits by isolation and PCR-based methods. Journal of Applied Microbiology 103:2309-2315.

Goto, M. 1962. Studies on citrus canker. I. Bull. Fac. Agric. Shizuoka Univ., Iwata, Japan. 12:3-72.

Goto, M. 1969. Studies of citrus canker in Japan. Pages 1251-1252 *in* H. D. Chapman, (ed.). Proceedings of the First International Citrus Symposium. University of California, Riverside, CA.

Goto, M. 1992. Citrus canker. Pages 170-208 *in* J. Kumar, H. S. Chaube, U. S. Singh, and A. N. Mukhopadhyay, (eds.). Disease of fruit crops. Plant diseases of international importance. Prentice Hall, New Jersey.

Goto, M., A. Toyoshima, and S. Tanaka. 1978. Studies on saprophytic survival of Xanthomonas citri (Hasse) Dowson. III. Inoculum density of the bacterium surviving in saprophytic form. Annals of the Phytopathological Society of Japan. 44:197-201.

Goto, M., K. Ohta, and N. Okabe. 1975. Studies on the saprophytic survival of *Xanthomonas citri* (Hasse) Dowson. II. Longevity and survival density of the bacterium on artificially infested weeds, plant residues and soils. Annals of the Phytopathological Society of Japan. 41:141-147.

Gottwald, T. R., G. Hughes, J. H. Graham, X. Sun, and T. Riley. 2001. The citrus canker epidemic in Florida: The scientific basis of regulatory eradication policy for an invasive species. Phytopathology 91:30-34.

Gottwald, T. R., and J. H. Graham. 2000. Canker Pages 5-7 *in* L. W. Timmer, S. M. Garnsey, and J. H. Graham, (eds.). Compendioum of citrus diseases. APS Press.

Gottwald, T.R., J. Graham, C. Bock, G. Bonn, E. Civerolo, M. Irey, R. Leite, M. M. López, G. McCollum, P. Parker, J. Ramallo, T. Riley, T. Schubert, B. Stein, and Taylor.E. 2009. The epidemiological significance of post-packinghouse survival of *Xanthomonas citri* subsp. *citri* for dissemination of asiatic citrus canker via infected fruit. Crop Protection 28:508-524.

Gottwald, T. R., J. H. Graham, E. L. Civerolo, H. C. Barret, and C. J. Hearn. 1993. Differential Host Range Reaction of Citrus and Citrus Relatives to Citrus Canker and Citrus Bacterial Spot Determined by Leaf Mesophyll Susceptibility. Plant Disease. 77:1004-1009.

Gottwald, T. R., J. H. Graham, and T. S. Schubert. 2002. Citrus canker: The pathogen and its impact. Plant health Progress (doi:10.1094/PHP-2002-0812-01-RV.):34. Last accessed 08/12/02.

Gottwald, T. R., R. G. McGuire, and S. Garran. 1988. Asiatic citrus canker: Spatial and temporal spread in simulated new planting situations in Argentina. Phytopathology. 78:739-745.

Graham, J.H., R.G. McGuire, and J.W. Miller. 1987. Survival of *Xanthomonas campestris* pv. *citri* in citrus plant debris and soil in Florida and Argentina. Plant Disease 71:1094-1098.

Graham, J. H., and R. P. Leite Jr. 2004. Lack of control of citrus canker by induced systemic resistance compounds. Plant Disease 88:745-750.

Graham, J. H., and T. R. Gottwald. 1991. Research perspectives on eradication of citrus bacteiial diseases in Florida. Plant Disease 75:1193-1200.

Graham, J. H., T. R. Gottwall, E. L. Civerolo, and R. G. McGuire. 1989. Population dynamics and survival of *Xanthomonas campestris* in soil in citrus nurseries in Maryland and Argentina. Plant Disease 73:423-427.

Graham, J. H., T. R. Gottwald, J. Cubero, and D. S. Achor. 2004. *Xanthomonas axonopodis* pv. *citri* : factors affecting successful eradication of citrus canker. Molecular Plant Pathology 5:1-15.

Graham, J. H., T. R. Gottwald, T. D. Riley, and M. A. Bruce. 1992. Susceptibility of Citrus Fruit to Bacterial Spot and Citrus Canker. Phytopathology 82:452-457.

Guillen, M., and J. M. Heraty. 2002. Guillen, M. and J. M. Heraty. 2002 . Citrus leafminer, *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae), in California. Procceding of the Entomological Society of America.

Hamon, A. B., and G. Hodges. 2006. Key to whitefly of citrus in Florida (Homoptera: Aleyrodidae). Florida Department of Agriculture and Consumer Services, Division of Plant Industry. Last accessed May 13, 2009, http://www.doacs.state.fl.us/pi/enpp/ento/aleyrodi.html.

Herbison-Evans, D., and S. Crossley. 2006. Australian Caterpillars: *Xanthodes transversa* Guenee. Last accessed May 27, 2009, http://www-staff.it.uts.edu.au/~don/larvae/chlo/transve.html.

Hill, D. S. 1983. Agricultural Insect Pests of the Tropics and Their Control. Cambridge Univ. Press, United Kingdom. 516 pp.

Hill, D. S. 1987. Agricultural Insect Pests of Temperate Regions And Their Control. Cambridge University Press. 659 pp.

Hill, D. S. 1994. Agricultural Entomology. Timber Press, Inc. Portland, Oregon. 635 pp.

Hill, D. S. 2002. Pests of Stored Foodstuffs and Their Control. Springer. 496 pp.

Hill, D. S. 2008. Pests of crops in warmer climates and their control. Springer. New York. 704 pp.

Ho, H.H., and J.Y. Lu. 1997. A synopsis of the occurrence and pathogenicity of *Phytophthora* species in mainland China. Mycopathologia 138: 143–161

Holloway, J. D. n.d. The Moths of Borneo: *Mocis undata*. Southdene Sdn. Bhd. http://www.mothsofborneo.com/part-15-16/ophiusini/ophiusini_14_1.php. (Archived at PERAL).

Hong, S.-B., H.-J. Jee, S.-I. Lee, and S.-J. Go. 1999. Restriction fragment length polymorphism of PCR amplified ribosomal DNA among Korean isolates of *Phytophthora*. Plant Pathology Journal, 15(4): 228-235.

Hyun, J.-W., L.W. Timmer, S.-C. Lee, S.-H. Yun, S.-W. Ko, and K.-S. Kim. 2001. Pathological characterization and molecular analysis of *Elsinoë* isolates causing scab diseases of citrus in Jeju Island in Korea. Plant Disease 85:1013-1017.

Hyun, J. W., N.A. Peres, S.Y. Yi, L.W. Timmer, K.S. Kim, H.-M. Kwon, and H.C. Lim. 2007. Development of PCR assays for the identification of species and pathotypes of *Elsinoë* causing scab on citrus. Plant Disease 91:865-870.

Hyun, J.W., S.H. Yi, S.J. MacKenzie, L.W. Timmer, K.S. Kim, S.K. Kang, H.M. Kwon, and H.C. Lim. 2009. Pathotypes and genetic relationship of worldwide collections of *Elsinoë* spp. causing scab diseases of citrus. Phytopathology 99.:721-728.

IPPC. 2007. International Standard For Phytosanitary Measures No. 5: Glossary of Phytosanitary Terms. Food and Agriculture Organization of the United Nations, Secretariat of the International Plant Protection Convention (IPPC), Rome, Italy. 23 pp.

IPPC. 2011. International Standard For Phytosanitary Measures No. 11: Pest risk analysis for quarantine pests including analysis of environmental risks and living modified organisms. Food and Agriculture Organization of the United Nations, Secretariat of the International Plant Protection Convention (IPPC), Rome, Italy. 30 pp.

Jedlicka, P., and J. Frouz. 2007. Population dynamics of wireworms (Coleoptera, Elateridae) in arable land after abandonment. Biologia, Bratislava 62(1):103-111.

Jee, H.J., W.G. Kim, S.Y. Lu, and W.D. Cho. 1996. *Phytophthora cryptogea* causing the fruit rot of *Gerbera jamesonii* in Korea. Korean Journal of Plant Pathology, 12: 374-376.

Jetter, K. M., D. A. Summer, and E. L. Civerolo. 2000. Ex ante economics of exotic disease Policy: Citrus canker in California. Integrating Risk Assessment and Economics for Regulatory Decisions, Washington, DC. December 7, 2000.

Kato, T. 1984. Bionomics, ecology, and control of the Japanese citrus flower-bud midge, *Contarinia okadai* (Miyoshi) (Diptera, Cecidomyiidae). Special Bulletin of the Yamaguchi Agricultural Experiment Station (Japan) 28:86.

KES. 1994. Check list of insects from Korea. Kon-Kuk University Press, The Entomological Society of Korea, Korean Society of Applied Entomology, Seoul, Korea. 744 pp.

Kim, D-H., H-M. Kwon, and K-S. Kim. 2000. Current status of the occurrence of the insect pests in the citrus orchard in Cheju Island. Korean Journal of Applied Entomology 39: 267-274.

Knorr, L.C. 1973. Citrus Diseases and Disorders. University of Florida Press, Gainesville. 122 pp.

Koizumi, M., 1972. Studies on the symptoms of citrus canker formed on Satsuma mandarin fruit and existence of casual bacteria in the affected tissues. Bull. Hort. Res. Sta., Japan, Ser. B, No. 12: 229-244.

Koizumi, M. 1977a. Behavior of *Xanthomonas citri* (Hasse) Dowson and histological changes of diseased tissues in the process of lesion extension. . Annals of the Phytopathological Society of Japan. 43:129-136.

Koizumi, M. 1977b. Factors related to the occurrence of spring canker caused by *Xanthomonas citri* (Hasse) Dowson. Bulletin of the Fruit Trees Research Station. Series B: Okitsu (Japan) 4:115-129.

Korf, H. G., G. C. Schutte, and J. M. Kotzé. 2001. Effect of packhouse procedures on the viability of *Phyllosticta citricarpa*, anamorph of the citrus black spot pathogen. African Plant Protection 7(2):103-109.

Kuhara, S. 1978. Present epidemic status and control of the citrus canker disease (Xanthomonas citri (Hasse) Dowson) in Japan. 1. Review of Plant Protection Research 11:132-142.

Kwon, G. M., S. H. Lee, M. J. Han, and H. G. Goh. 2002. The genus *Pseudococcus* (Westwood) (Sternorrhyncha: Pseudococcidae) of Korea. Journal of Asia-Pacific Entomology 5(2):145-154.

Los Angeles County. 2005. Agricultural crop and livestock report 2005. County of Los Angeles, Department of Agricultural Commissioner/Weights and Measures. 20 pp. http://www.lacfb.org/CropReport_05.pdf

Lammers, J. W., and H. Stigter. 2004. Report of a Pest Risk Analysis: *Cnidocampa flavescens*. The Netherlands, Plant Protection Service. 18 pp.

Lapointe, S. L., and W. S. Leal. 2007. Describing seasonal phrenology of the leafminer Phyllocnistis citrella (Lepidoptera: Gracillaridae) with pheromones lures: controlling for lure degradation. Florida Entomologist 90(40) 710-714.

Lee, C., S. Kim, and D. Kim. 1992. Observation of Insect Pests on the Citron Trees in Southern Region of Korea. Korean Journal of Entomology 22(3):223-226.

Lee, Y.-H., W.-D. Cho, W.K. Kim, K.-S. Jin, and E.-J. Lee. 1991. Report on host-unrecorded diseases identified from economical crops in Korea. Res. Rep. Rural Developm. Admin. 33: 15-19.

Lee, Y. J. 2008. Revised synonymic list of Cicadidae (Insecta: Hemiptera) from the Korean Peninsula, with the description of a new species and some taxonomic remarks. Proceedings of the Biological Society of Washington 121(4):445-467.

Leite Jr., R. P. 2000. Surviving with Citrus Canker in Brazil. Pages 890-896 *in* Proceedings IX Congress of the International Society of Citriculture Orlando, Florida.

Leite Jr., R. P., and S. K. Moham. 1990. Integrated Management of the Citrus Bacterial Canker Disease Caused by *Xanthomonas campestris* pv. *citri* in the State of Paraná, Brazil. Crop Protection 9:3-7.

Leite Jr., R. P., and S. K. Moham. 1984. Evaluation of citrus cultivars for resistance to canker caused by *Xanthomonas campestris* pv. *citri* (Hasse) Dye in the state of Paraná, Brazil. Pages 385-389 *in* Proceedings of the International Society of Citriculture, São Paulo, Brazil.

Leite Jr., R. P., S. K. Moham, A. L. G. Pereira, and C. A. Campacci. 1987. Integrated control of citrus canker-effect of genetic resistance and bactericides applications. Fitopatología Brasileira 12:257-263.

Lill, J. T., R. J. Marquis, R. E. Forkner, J. Le Corff, N. Holmberg, and N. A. Barber. 2006. Leaf pubescence affects distribution and abundance of generalist slug caterpillars (Lepidoptera: Limacodidae) [Abstract]. Environmental Entomology 35(3):797-806.

Livia, C. 2006. Diversity and Economic Importance of the Leaf Beetles (Coleoptera, Chrysomelidae) in the Republic of Moldova. Buletin USAMV-CN 62:184-187.

Luc, M., and J. F. Southey. 1980. Study of biometrical variability in *Xiphinema insigne* Loos, 1949, and *X. elongatum* Schuurmans Stekhoven & Teunissen, 1938; description of *X. savanicola* n. sp. (Nematoda: Longidoridae) and comments on thelytokous species. Revue de Nematologie 3: 243–269.

Magarey, R. D., D. M. Borchert, and J. Schlegel. 2008. Global plant hardiness zones for phytosanitary risk analysis. Scientia Agricola 65:54-59.

Manson, D. C. M. 1968. *Panonychus elongatus* Manson (Acarina: Tetranychidae) - A Description and Comparison with *P. citri* (McG.). Journal of the Australian Entomological Society 7:6-10.

Mau, R. F. L., and J. L. M. Kessing. 1991. Crop Knowledge Master: *Adoretus sinicus*. University of Hawaii. Last accessed May 13, 2009, http://www.extento.hawaii.edu/kbase/crop/Type/adoretus.htm.

McOnie, K. C. 1967. Geographic Distribution of *Guignardia citricarpa* in Japan. Personal communication to D. E. C. Calavan.

Medina-Urrutia, V. M., and J. J. Stapleton. 1985. Control of Mexican lime bacteriosis with copper-based products. Proceedings of the Florida State Horticulture Society 98:22-25.

Meijerman, L., and S. A. Ulenberg. 2004. Arthropods of Economic Importance: Eurasian Tortricidae. University of Amsterdam, Zoological Museum. http://nlbif.eti.uva.nl/bis/tortricidae.php?menuentry=inleiding. (Archived at PERAL).

MEM. 2012. North American Moth Photographers Group: Digital guide to moth identification. Mississippi Entomological Museum (MEM), Mississippi State University http://mothphotographersgroup.msstate.edu/MainMenu.shtml. (Archived at PERAL).

Menge, J.A., and R.C. Ploetz. 2003. Diseases of Avocado, *In*: R.C. Ploetz (Ed.), Diseases of Tropical Fruit Crops, CABI Pub., Wallingford, UK. pp. 35-71.

Michaud, J. P. 1999. Sources of mortality in colonies of brown citrus aphid, *Toxoptera citricida*. BioControl 44: 347–367.

Migeon, A., and F. Dorkeld. 2013. Spider Mites Web. Last accessed February 14, 2013, http://www.montpellier.inra.fr/CBGP/spmweb/index.php.

Miller, D. R. 1985. Pest Risk Assessment of Armored Scales on Certain Fruit.

Miller, D. R., G. L. Miller, G. S. Hodges, and J. Davidson. 2005. Introduced scale insects (Hemiptera: Coccoidea) of the United States and their impact on U.S. Agriculture. Proc. Entomol. Soc. Wash. 107(1):123-158.

Miller, G. L., and M. B. Stoetzel. 1997. Aphids associated with Chrysanthemums in the United States. Florida Entomologist 80(2):218-239.

Mitsuhashi, J. 2003. A Continuous Cell Line from the Cupreous Chafer, Anomala cuprea Hope (Insecta, Coleoptera, Scarabaeidae). In Vitro Cell. Dev. Biol. - Animal 39:399-401.

Montagnini, F., and C. F. Jordan. 1983. The role of insects in the productivity decline of cassava (*Manihot esculenta* Crantz) on a slash and burn site in the amazon territory of Venezuela. Agriculture, Ecosystems & Environment 9(3):293-301.

Muraji, M., N. Arakaki, S. Ohno, and Y. Hirai. 2008. Genetic variation of the green chafer, Anomala albopilosa (Hope) (Coleoptera: Scarabaeidae), in the Ryukyu Islands of Japan detected by mitochondrial DNA sequences. Applied Entomology and Zoology 43(2):299-306.

Muraro, R., F. M. Roka, and T. H. Spreen. 2001. An Overview of Argentina's Citrus Canker Control Program (FE 285). Food and Resource Economics Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida.

NASS. 2005. Citrus Fruits, 2005 Summary, Fr Nt 3-1 (05). United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS).

Nelson, S. 2008. Sooty Mold, Plant Disease, Cooperative Extension, College of Tropical Agriculture and Human Resources, University of Hawai'i at Manoa, Manoa, Hawai'i.

NIS. 2006. Another Request for Quarantine Status Confirmations. Personal communication to L. C. Millar on October 12, 2006, from Paul Courneya, National Identification Services (NIS), United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (Archived at PERAL).

NISA-KR. 2009. List of tangerine pests. National Institute of Subtropical Agriculture, Korea (NISA-KR). http://www.nisa.go.kr/orange_bug_CD/sub_5.htm.

NPB. 2002. Preventing the introduction of plant pathogens into the United States: the role and application of the “Systems Approach” National Plant Board (NPB). 86 pp.

NPQS. 1998. Data Sheet: Korean Citrus Pests. National Plant Quarantine Service (NPQS) , Republic of Korea.

NPQS. 2000. Data Sheet: Insect Pests Associate with Hot-pepper, Dropwort, and Tomato in Korea. National Plant Quarantine Service (NPQS) , Republic of Korea.

NPQS. 2011. Request for importation of two Unshu hybrids by the Director, International Quarantine Cooperation Division. January 21, 2011. National Plant Quarantine Service (NPQS), Republic of Korea.

Okamura, J. K., and R. M. Davis. 1987. Latent and saprophytic fungal infections of grapefruit in south Texas. Texas J. Agric. Natural Res 1:19-20.

Onions, A. H. S. 1966. Descriptions of Pathogenic Fungi and Bacteria: *Aspergillus niger*, no. 94 Commonwealth Mycological Inst. United Kingdom.

Opler, P. A., K. Lotts, and T. Naberhaus. 2009. Butterflies and Moths of North America. NBII Mountain Prairie Information Node, Bozeman, MT. Last accessed May 26, 2009, http://www.butterfliesandmoths.org/taxonomy?f=34&sci=Noctuidae&com=Owlet%20Moths,%20Miller%20Moths.

Park, S.D., Z. Khan, I.K. Yeon, and Y.S. Shin. 2002. Plant parasitic nematodes associated with oriental melon (*Cucumis melo* L.) in Gyongbuk province of Korea. International Journal of Nematology 12(2): 155-158.

PERAL. 2007a. Evaluation of asymptomatic citrus fruit (Citrus spp.) as a pathway for the introduction of citrus canker disease (*Xanthomonas axonopodis* pv. *citri*). 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. 22 pp.

PERAL. 2007b. Phytosanitary Risks Associated with Armored Scales in Commercial Shipments of Fruit for Consumption to the United States. 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. 24 pp.

Pereira, A. L. G., K. Watanabe, A. G. Zagato, and P. L. Cianculli. 1976. Sobrevivência de *Xanthomonas citri* (Hasse) Dowson em capim amargoso (*Trichachne insularis* (L.) Nees) de pomares erradicados no Estado de São Paulo [Survival of *Xanthomonas citri* (Hasse) Dowson on capim amargoso (*Trichachne insularis* (L.) Nees) of uprooted orchards in Sao Paulo State]. Biológico 42(11/12):217-220.

Peregrine, W.T.H., and M.A. Siddiqi. 1972. A revised and annotated list of plant diseases in Malawi. Phytopathol. Pap. 16: 1-51.

PestID. 2009. Pest Identification Database (PestID). United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine. https://aqas.aphis.usda.gov/awas/ (Archived at PERAL).

PestID. 2013. Pest Identification Database (PestID). United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine. https://aqas.aphis.usda.gov/awas/ (Archived at PERAL).

Pittaway, A. R. 2009. Saturniidae of Europe: *Samia*. Last accessed May 27, 2009, http://tpittaway.tripod.com/silk/s_cyn.htm.

Ploper, L. D., C. J. Ramallo, and G. Fogliata. 2004. Technical Report: Proposal for monitoring citrus farms according to packing plant ability to remove fruit with quarantine disease symptoms. Estación Experimental Agroindustrial "Obispo Colombres" (EEAOC), National University of Tucumán, Las Talitas, Argentina. 7 pp.

Poole, R. W. 1989. *Lepidopterorum Catalogus*, Fascicle 118, Noctuidae (part 2). E. J. Brill/Flora Fauna Publications, NY.

PPQ. 1995. Importation of Japanese Unshu Orange Fruits (*Citrus reticulata* Blanco var. *unshu* Swingle) into Citrus Producing States. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (PPQ). 140 pp.

PPQ. 2000. Guidelines for pathway-initiated pest risk assessments (Version 5.02) (November 2, 2007). United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (PPQ), Riverdale, MD.

PPQ. 2008. Change in Action Status for Armored Scales (Hemiptera: Diaspididae) on Material for Consumption. United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ). Riverdale, MD. 2 pp.

PPQ. 2009. Importation of Unshu Orange Fruit, *Citrus reticulata* Blanco var. *unshiu* Swingle, from Korea into the Continental United States: A Qualitative, Pathway-Initiated Risk Analysis. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (PPQ), Riverdale, MD. 58 pp.

Pruvost, O., B. Boher, C. Brocherieux, M. Nicole, and F. Chiroleu. 2002. Survival of *Xanthomonas axonopodis* pv *citri* in leaf lesions under tropical environmental conditions and simulated splash dispersal of inoculum. Phytopathology 92:336-346.

Quednau, F. W. 2001. World review of the genus Tinocallis with description of new species. Canadian Entomologist 133(2): 197-213.

Remadevi, O. K., H. C. Nagaveni, and R. Muthukrishnan. 2005. Pests and diseases of sandalwood plants in nurseries and their management. Working Papers of the Finnish Forest Research Institute 11:69-76.

Reuther, W., E.C. Calavan, and G.E. Carman (eds.). 1978. The Citrus Industry Vol. IV. Crop Protection. University of California Agricultural Sciences Publication, Richmond, CA.

Reuther, W. (ed.). 1989. Citrus Industry: Crop Protection, Postharvest Technology and Early History of Citrus Research in California. Agriculture & Natural Resources.

Robbins, R.T., J.W. Zheng, and D.J.F. Brown. 2000. Observations on a *Xiphinema insigne* Population with Several Males from Hangzhou, China. Journal of Nematology 32(3): 253–257.

Robinson, G. S., P. R. Ackery, I. J. Kitching, G. W. Beccaloni, and L. M. Hernandez. 2001. Hostplants of the moth and butterfly caterpillars of the Oriental Region. Southdene Sdn Bhd & The Natural History Museum, Kuala Lumpur & London. 744 pp.

Robinson, G. S., P. R. Ackery, I. J. Kitching, G. W. Beccaloni, and L. M. Hernandez. 2009. HOSTS - A database of the world's Lepidopteran hostplants. Natural History Museum. http://www.nhm.ac.uk/research-curation/projects/hostplants/. (Archived at PERAL).

Santacroce, N. 1993. Korean Technical Packet-Preclearance inspection guide for the detection and quarantine action for important pests (part II: Citrus). United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine.

Schaad, N.W., E. Postnikova, G.H. Lacy, A. Sechler, I. Agarkova, P.E. Stromberg, V.K. Stromberg, and A.K. Vidaver. 2005. Reclassification of *Xanthomonas campestris* pv. *citri* (ex Hasse 1915) Dye 1978 forms A, B/C/D, and E as *X. smithii* subsp. *citri* (ex Hasse) sp. nov. nom. rev. comb. nov., *X. fuscans* subsp. *aurantifolii* (ex Gabriel 1989) sp. nov. nom. rev. comb. nov., and *X. alfalfae* subsp. *citrumelo* (ex Riker and Jones) Gabriel et al., 1989 sp. nov. nom. rev. comb. nov.; *X. campestris* pv. *Malvacearum* (ex Smith 1901) Dye 1978 as *X. smithii* subsp. *smithii* nov. comb. nov. nom. nov.; *X. campestris* pv. *alfalfae* (ex Riker and Jones, 1935) Dye 1978 as *X. alfalfae* subsp. *alfalfae* (ex Riker et al., 1935) sp. nov. nom. rev.; and ''var. *fuscans*'' of *X. campestris* pv. *phaseoli* (ex Smith, 1987) Dye 1978 as *X. fuscans* subsp. *fuscans* sp. nov. Syst. Appl. Microbiol. 28:494–518.

Schaefer, C. W., and A. R. Panizzi. 2000. Heteroptera of Economic Importance. CRC Press, Boca Raton. 828 pp.

Schubert, T. S., J. W. Miller, T. R. Gottwald, J. H. Graham, L. H. Hebb, and S. R. Poe. 1999. Bacterial citrus canker and commercial movement of fresh citrus fruit. An assessment of the risks of fresh citrus fruit movement relative to the spread of bacterial citrus canker (*Xanthomonas axonopodis* pv *citri*). A report prepared for the Citrus Canker Risk Assessment groups for Manatee, Collier, Miami/Dade, and Broward Counties. Florida Department of Agricultural and Consumer Services, Gainesville, FL, USA. 17 pp.

Schubert, T. S., S. Rizvi, X. Sun, T. Gottwald, J. Graham, and W. Dixon. 2001. Meeting the challenge of eradicating citrus canker in Florida-again. Plant Disease 85:340-345.

Seberry, J. A., D. Leggo, and T. B. Kiely. 1967. Effect of skin coatings on the development of black spot in stored Valencia oranges. Australian Journal of Experimental Agriculture and Animal Husbandry 7:593-600.

Shiotani, H., H. Uematsu, T. Tsukamoto, Y. Shimizu, K. Ueda, A. Mizuno, and S. Sato. 2009. Survival and dispersal of *Xanthomonas citri* pv. *citri* from infected Satsuma mandarin fruit. Crop Protection 28:19-23.

Shiraki, T. 1952a. Catalogue of Injurious Insect in Japan (Exclusive of Animal Parasites). General Headquarters, Supreme Commander for Allied Powers, Japan 7(71). .

Shiraki, T. 1952b. Catalogue of injurious insects in Japan (exclusive of animal parasites) Volume II. General Headquarters Supreme Commander for the Allied Powers - Economic and Scientific Section Natural Resources Division, Tokyo, Japan. 132 pp.

Shiraki, T. 1952c. Catalogue of injurious insects in Japan (exclusive of animal parasites) Volume III. General Headquarters Supreme Commander for the Allied Powers - Economic and Scientific Section Natural Resources Division, Tokyo, Japan. 166 pp.

Shiraki, T. 1952d. Catalogue of Injurious Insects in Japan (exclusive of animal parasites). Volume IV. General Headquarters Supreme Commander for the Allied Powers - Economic and Scientific Section Natural Resources Division, Tokyo, Japan. 170 pp.

Simmonds, J.H. 1966. Host index of plant diseases in Queensland. Queensland Department of Primary Industries, Brisbane : 111.

Smith, I. M., D. G. McNamara, P. R. Scott, and M. Holderness (eds.). 1997. *Xanthomonas axonopodi*s pv. *citri*. CABI/EPPO, Wallingford, UK. 1101-1008 pp.

Smith, G.S., S. Nemec, A.B. Gould and R.M. Sonoda. 1989. Effect of deep tillage and soil amendments on growth of rough lemon citrus and root and soil microflora population densities. Proceedings of the Florida Soil and Crop Science Society. 48: 165-172.

Stall, R. E., and C. P. Seymour. 1983. Canker, a threat to citrus in the Gulf-Coast states. Plant Disease 67(5):581-585.

Stall, R. E., J. W. Miller, G. M. Marco, and B. I. C. de Echenique. 1980. Population dynamic of *Xanthomonas citri* causing cancrosis of citrus in Argentina. Proceedings of the Florida State Horticultural Society 93:10-14.

Stapleton, J. J. 1986. Effects of postharvest chlorine and wax treatments on surface microflora of lime fruit in relation to citrus bacteriosis disease. Plant Disease 70:1046-1048.

Sun, J.-H., Z.-D. Liu, K. O. Britton, P. Cai, D. Orr, and J. Hough-Goldstein. 2006. Survey of phytophagous insects and foliar pathogens in China for a biocontrol perspective on kudzu, *Pueraria montana* var. lobata (Willd.) Maesen and S. Almeida (Fabaceae). Biological Control 36:22-31.

Sutton, B. C., and G. C. Waterston. 1966. Descriptions of Pathogenic Fungi and Bacteria, no. 85. *Guignardia citricarpa*. Commonwealth Mycol. Instit., United Kingdom.

Sutton, B. C., and J. M. Waterston. 1996. *Guignardia citricarpa*. Commonwealth Mycological Institute Description of Pathogenic Fungi and Bacteria (No. 85). Commonwealth Agricultural Bureaux, Wallingford, UK.

Syrett, P., S.V. Fowler, E.M. Coombs, J.R. Hosking, G.P. Markin, Q.E. Paynter, and A.W. Sheppard. 1999. The potential for biological control of Scotch broom (*Cytisus scoparius*) (Fabaceae) and related weedy species. Biocontrol News and Information 20(1):17N-34N.

Thayer, C., R. Magarey, and D. Borchert. 2003. Pest assessment: Sweet Orange Scab, *Elsinoe australis* (Bitancourt & Jenk), (Myriangiales: Elsinoaceae). 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); North Carolina State University, Center for Integrated Pest Management (CIPM). 5 pp.

Thompson, V. 1999. Spittlebugs associated with actinorhizal host plants. Canadian Journal of Botany 77:1387-1390.

Timmer, L. W. 1988. Evaluation of bactericides for control of citrus canker in Argentina. Proceedings of the Florida State Horticultural Society 101:6-9.

Timmer, L. W., J. H. Graham, H. L. Chamberlain, P. D. Roberts, K. R. Chung, and T. S. Schubert. 2005. 2006 Florida citrus pest management guide: Citrus canker (PP-182). Florida Cooperative Exension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL, USA.

Timmer, L. W., and K. R. Chung. 2007. 2007 Florida Citrus Pest Management Guide: Citrus Scab (EDIS document PP-146). Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL, USA.

Timmer, L. W., S. E. Zitko, and T. R. Gottwald. 1996. Populations dynamics of *Xanthomonas campestris* pv *citri* on symptomatic and asymptomatic citrus leaves under various environmental conditions. Pages 448-451 *in* Proceedings of theVIII Congress of the International Society of Citriculture. International Society of Citriculture, Sun City, South Africa.

Timmer, L. W., S. M. Garnsey, and J. Graham (eds.). 2000. Compendium of Citrus Diseases. 2nd Edition. American Phytopathological Society, St. Paul, MN, USA. 92 pp.

Timmer, L. W., T. R. Gottwald, and S. E. Zitko. 1991. Bacterial exudation from lesions of asiatic citrus canker and citrus bacterial spot. Plant Disease 75:192-195.

Umeya, K., and T. Okada (eds.). 2003. Agricultural Insect Pests in Japan, Zennoukyou, Tokyo. 1203 pp.

U.S. Census Bureau. 2000. 2000 Total population. U.S. Census Bureau, Washington DC, USA.

USDA. 1999. Citrus Canker Eradication Program-Enviroment Assessment. United States Department of Agriculture (USDA). 14 pp.

USDA. 2002. Consequences of introduction of pests associated with the importation of *Citrus* spp. from Argentina. United States Department of Agriculture (USDA).

USFWS. 2008. Threatened and endangered species system (TESS). United States Fish and Wildlife Service (USFWS). http://ecos.fws.gov/tess_public/TESSWebpage. (Archived at PERAL)

Verdier, E., E. Zefferino, and S. Méndez. 2005. Short Report: *Xanthomonas axonopodis* pv. *citri* survival in citrus fruit submitted to post harvest treatment using detecting by semi-selective culture media and bioassay. : In Anonymous. 2005. Report of the second meeting of the Expert Working Group on “The use of integrated measures in a systems approach for pest risk management”, , Buenos Aires, Argentina. 61 pp.

Verdier, E., E. Zefferino, and S. Méndez. 2006. Survival of *Xanthomonas axonopodis* pv. *citri* on the surface of citrus fruit treated with sodium hypochlorite and sodium ortho-pheylphenate.

Verniere, C. J., T. Gottwald, and O. Pruvost. 2003. Disease development and symptom expression of *Xanthomonas axonopodis* pv. *citri* in various citrus plant tissues. Phytopathology 93:832-843.

Viégas, A.P. 1945. Some fungi of Brazil. XI. Fungi Imperfecti (Sphaeropsidales) [Abstract]. Bragantia 5(12): 717-779.

Villanueva, R. T., and C. C. Childers. 2007. Development of *Iphiseiodes quadripilis* (Banks) (Acari: Phytoseiidae) on Pollen or Mite Diets and Predation on *Aculops pelekassi* (Keifer) (Acari: Eriophyidae) in the Laboratory. Environmental Entomology 36(1):9-14.

von Ellenrieder, N. 2003. Red wax scale (*Ceroplastes rubens*) California Department of Food and Agriculture.

Walker, K. 2007. Pest and Diseases Image Library: fruit-piercing moth (*Ophiusa tirhaca*). Last accessed May 27, 2009, http://www.padil.gov.au/viewPest.aspx?id=781.

Wang, X. F., K.Z. Tang, C.Y. Zhou, Z.A. Li, and L. Yi. 2010. First Report of Alternaria Brown Spot of Citrus Caused by Alternaria alternata in Yunnan Province, China. Plant Disease 94(3):375

Watson, G. W. 2005. Arthropods of Economic Importance: Diaspididae of the World. University of Amsterdam, Zoological Museum. Last accessed May 18, 2009, http://ip30.eti.uva.nl/BIS/diaspididae.php?menuentry=soorten&id=96.

Wen, H.-C., F.-M. Lu, H.-H. Hao, and T.-D. Liou. 2002. Insect Pests and Their Injuries and Control on Longan in Southern Taiwan. Journal of Agricultural Research, China 51(3):56-64.

WADAF. n.d. Submission to the Draft Import Risk Analysis for the Importation of Fresh Unshu Mandarin Fruit from Japan. Western Australia Department of Agriculture and Food. 17 pp.

Whiteside, J. O. 1975. Biological characteristics of Elsinoë fawcetti pertaining to the epidemiology of sour orange scab. Phytopathology 65:1170-1177.

Williams, R.E., C.G. Shaw III, P.M. Wargo, and W.H. Sites. 1989. *Armillaria* Root Disease. Forest Insect and Disease Leaflet 78. U.S. Department of Agriculture Forest Service.

Wright, G. C. 2001. Protecting citrus trees from cold. Cooperative Extension, The University of Arizona, Tucson, Arizona. 4 pp.

Young, H.K., and S.J. Kim. 1996. Collection and identification of molds from citrus oranges during post-harvest storage. Korean Journal of Food Science and Technology, 28(6):1142-1145.

Zhang, B. C. 1994. Index of economically important lepidoptera. CAB International, Wallingford, UK. 599 pp.

ZipCodeZoo. 2013. http://zipcodezoo.com/Key/Animalia/Penthimiidae_Family.asp (Accessed March 20, 2013).

5. Appendices

Appendix A. Pests Intercepted on *Citrus* spp. from Korea.

Pest	Type	Total
Acari, Species Of	Mite	1
Aleurolobus marlatti (Quaintance) (Aleyrodidae)	Insect	1
Aonidiella comperei Mckenzie (Diaspididae)	Insect	1
Aonidiella sp. (Diaspididae)	Insect	1
Archipini, Species Of (Tortricidae)	Insect	1
Bradybaenidae, Species Of	Mollusk	1
Chrysomphalus pinnulifer (Maskell) (Diaspididae)	Insect	1
Cladosporium sp. (Hyphomycetes)	Disease	1
Colletotrichum sp. (Coelomycetes)	Disease	1
Diaspididae, Species Of	Insect	1
Elsinoe australis Bitanc. & Jenkins (Elsinoaceae)	Disease	1
Elsinoe sp. (Elsinoaceae)	Disease	3
Guignardia citricarpa Kiely (Botryosphaeriaceae)	Disease	34
Insecta, Species Of	Insect	1
Longitarsus sp. (Chrysomelidae)	Insect	1
Meghimatium fruhstorferi (Collinge) (Philomycidae)	Mollusk	1
Microsphaeropsis sp. (Coelomycetes)	Disease	1
Nezara antennata Scott (Pentatomidae)	Insect	1
Parlatoria sp. (Diaspididae)	Insect	1
Parlatoria ziziphi (Lucas) (Diaspididae)	Insect	34
Phyllosticta citricarpa (Mcalpine) Aa (Coelomycetes)	Disease	13
Pseudococcidae, Species Of	Insect	6
Tarsonemus sp. (Tarsonemidae)	Mite	2
Unaspis yanonensis (Kuwana) (Diaspididae)	Insect	31
Utetheisa pulchella (Linnaeus) (Arctiidae)	Insect	1
Xanthomonas axonopodis pv. *citri* (Hasse) Vauterin, Hoste, Kersters & Swings (Xanthomonadaceae)	Disease	20
Xanthomonas campestris pv. *citri* (Hasse) Dye (Xanthomonadaceae)	Disease	98

Source: PestID, 2013. Pests intercepted from January, 1985, through December, 2012.

Appendix B. Reportable Pests Intercepted on *Citrus* × *sinensis* More Than Once from Anywhere in the World.

Pest	Type	Total
Elsinoe australis Bitanc. & Jenkins (Elsinoaceae)	Disease	8503
Parlatoria ziziphi (Lucas) (Diaspididae)	Insect	6224
Anastrepha sp. (Tephritidae)	Insect	5292
Guignardia citricarpa Kiely (Botryosphaeriaceae)	Disease	3011
Parlatoria cinerea Hadden (Diaspididae)	Insect	2649
Xanthomonas campestris pv. *citri* (Hasse) Dye (Xanthomonadaceae)	Disease	1811

Pest	**Type**	**Total**
Pseudococcidae, Species Of	Insect	470
Diaspididae, Species Of	Insect	422
Pseudaonidia trilobitiformis (Green) (Diaspididae)	Insect	372
Elsinoe sp. (Elsinoaceae)	Disease	367
Unaspis yanonensis (Kuwana) (Diaspididae)	Insect	288
Xanthomonas axonopodis pv. *citri* (Hasse) Vauterin, Hoste, Kersters & Swings (Xanthomonadaceae)	Disease	257
Phyllosticta citricarpa (Mcalpine) Aa (Coelomycetes)	Disease	235
Aleurocanthus woglumi Ashby (Aleyrodidae)	Insect	126
Tarsonemus sp. (Tarsonemidae)	Mite	102
Ceratitis capitata (Wiedemann) (Tephritidae)	Insect	98
Tephritidae, Species Of	Insect	70
Macchiademus diplopterus (Distant) (Blissidae)	Insect	62
Thaumatotibia leucotreta Meyrick (Tortricidae)	Insect	59
Tortricidae, Species Of	Insect	59
Cladosporium sp. (Hyphomycetes)	Disease	54
Parlatoria sp. (Diaspididae)	Insect	53
Aonidiella sp. (Diaspididae)	Insect	50
Gryllus sp. (Gryllidae)	Insect	49
Planococcus sp. (Pseudococcidae)	Insect	47
Blapstinus sp. (Tenebrionidae)	Insect	41
Coccidae, Species Of	Insect	39
Vinsonia stellifera (Westwood) (Coccidae)	Insect	39
Aonidiella inornata Mckenzie (Diaspididae)	Insect	36
Bactrocera dorsalis (Hendel) (Tephritidae)	Insect	33
Cryptoblabes gnidiella (Milliere) (Pyralidae)	Insect	33
Phoma sp. (Coelomycetes)	Disease	32
Apis mellifera (Linnaeus) (Apidae)	Insect	32
Colletotrichum sp. (Coelomycetes)	Disease	29
Aleurolobus marlatti (Quaintance) (Aleyrodidae)	Insect	26
Phlaeothripidae, Species Of	Insect	24
Anastrepha ludens (Loew) (Tephritidae)	Insect	23
Paracoccus burnerae (Brain) (Pseudococcidae)	Insect	23
Tetranychus sp. (Tetranychidae)	Mite	21
Aulacaspis tubercularis Newstead (Diaspididae)	Insect	20
Pseudaulacaspis sp. (Diaspididae)	Insect	20
Pseudococcus sp. (Pseudococcidae)	Insect	20
Brevipalpus sp. (Tenuipalpidae)	Mite	19
Bactrocera sp. (Tephritidae)	Insect	18
Tortricinae, Species Of (Tortricidae)	Insect	17
Homoptera, Species Of	Insect	16
Insecta, Species Of	Insect	16
Aleyrodidae, Species Of	Insect	15

Pest	**Type**	**Total**
Margarodidae, Species Of	Insect	15
Cryptophlebia sp. (Tortricidae)	Insect	14
Diptera, Species Of	Insect	13
Planococcus minor (Maskell) (Pseudococcidae)	Insect	13
Ascochyta citri Penz. (Coelomycetes)	Disease	12
Dacus dorsalis Hendel (Tephritidae)	Insect	12
Dysmicoccus sp. (Pseudococcidae)	Insect	11
Graphiola sp. (Graphiolaceae)	Disease	10
Acutaspis albopicta (Cockerell) (Diaspididae)	Insect	10
Aleurotrachelus sp. (Aleyrodidae)	Insect	10
Pyralidae, Species Of	Insect	10
Tetraleurodes sp. (Aleyrodidae)	Insect	10
Fusarium sp. (Hyphomycetes)	Disease	9
Cicadellidae, Species Of	Insect	9
Acari, Species Of	Mite	9
Ascochyta sp. (Coelomycetes)	Disease	8
Coniothyrium sp. (Coelomycetes)	Disease	8
Acutaspis sp. (Diaspididae)	Insect	8
Aleurocanthus husaini Corbett (Aleyrodidae)	Insect	8
Aphididae, Species Of	Insect	8
Cryptoblabes sp. (Pyralidae)	Insect	8
Ecdytolopha sp. (Tortricidae)	Insect	8
Gracillariidae, Species Of	Insect	8
Lepidosaphes sp. (Diaspididae)	Insect	8
Microsphaeropsis sp. (Coelomycetes)	Disease	7
Xanthomonas sp. (Xanthomonadaceae)	Disease	7
Archipini, Species Of (Tortricidae)	Insect	7
Chrysomphalus sp. (Diaspididae)	Insect	7
Diaphorina citri Kuwayama (Psyllidae)	Insect	7
Lepidoptera, Species Of	Insect	7
Psyllidae, Species Of	Insect	7
Microxeromagna lowei (Potiez & Michaud) (Hygromiidae)	Mollusk	7
Xerotricha conspurcata (Draparnaud) (Hygromiidae)	Mollusk	7
Amorbia sp. (Tortricidae)	Insect	6
Coleoptera, Species Of	Insect	6
Cryptophlebia leucotreta (Meyrick) (Tortricidae)	Insect	6
Curculionidae, Species Of	Insect	6
Phyllocnistis citrella Stainton (Gracillariidae)	Insect	6
Thripidae, Species Of	Insect	6
Toxoptera citricidus (Kirkaldy) (Aphididae)	Insect	6
Cilevirus Leprosis Virus Symptoms (Unassigned)	Disease	5
Phomopsis sp. (Coelomycetes)	Disease	5
Aleurocanthus spiniferus (Quaintance) (Aleyrodidae)	Insect	5

Pest	**Type**	**Total**
Ceroplastes sp. (Coccidae)	Insect	5
Frankliniella sp. (Thripidae)	Insect	5
Hesperiidae, Species Of	Insect	5
Hypothenemus sp. (Scolytidae)	Insect	5
Lonchaeidae, Species Of	Insect	5
Noctuidae, Species Of	Insect	5
Prays sp. (Plutellidae)	Insect	5
Protopulvinaria longivalvata Green (Coccidae)	Insect	5
Alternaria sp. (Hyphomycetes)	Disease	4
Araecerus sp. (Anthribidae)	Insect	4
Cecidomyiidae, Species Of	Insect	4
Ceratitini, Species Of (Tephritidae)	Insect	4
Crematogaster sp. (Formicidae)	Insect	4
Fiorinia sp. (Diaspididae)	Insect	4
Gelechiidae, Species Of	Insect	4
Heteroptera, Species Of	Insect	4
Nysius sp. (Lygaeidae)	Insect	4
Olethreutinae, Species Of (Tortricidae)	Insect	4
Paraleyrodes sp. (Aleyrodidae)	Insect	4
Pezothrips kellyanus (Bagnall) (Thripidae)	Insect	4
Pinnaspis sp. (Diaspididae)	Insect	4
Puto sp. (Pseudococcidae)	Insect	4
Microxeromagna vestita (Rambur) (Hygromiidae)	Mollusk	4
Camarosporium sp. (Coelomycetes)	Disease	3
Cercospora sp. (Hyphomycetes)	Disease	3
Fusicoccum sp. (Coelomycetes)	Disease	3
Mycosphaerella sp. (Mycosphaerellaceae)	Disease	3
Pleospora sp. (Pleosporaceae)	Disease	3
Pseudorobillarda sp. (Coelomycetes)	Disease	3
Septoria sp. (Coelomycetes)	Disease	3
Agromyzidae, Species Of	Insect	3
Altica sp. (Chrysomelidae)	Insect	3
Aspidiotini, Species Of (Diaspididae)	Insect	3
Dysmicoccus neobrevipes Beardsley (Pseudococcidae)	Insect	3
Hemiberlesia sp. (Diaspididae)	Insect	3
Hymenoptera, Species Of	Insect	3
Insect, Species Of	Insect	3
Lygaeidae, Species Of	Insect	3
Melanaspis sp. (Diaspididae)	Insect	3
Paratettix sp. (Tetrigidae)	Insect	3
Parlatoria citri Mckenzie (Diaspididae)	Insect	3
Pheidole sp. (Formicidae)	Insect	3
Saissetia sp. (Coccidae)	Insect	3

Pest	**Type**	**Total**
Thysanoptera, Species Of	Insect	3
Trialeurodes sp. (Aleyrodidae)	Insect	3
Trialeurodes vitrinellus Cockerell (Aleyrodidae)	Insect	3
Tarsonemidae, Species Of	Mite	3
Prietocella barbara (Linné) (Cochlicellidae)	Mollusk	3
Theba pisana (Müller) (Helicidae)	Mollusk	3
Aureobasidium sp. (Hyphomycetes)	Disease	2
Coccostroma sp. (Phyllachoraceae)	Disease	2
Guignardia sp. (Botryosphaeriaceae)	Disease	2
Pestalotiopsis psidii (Pat.) Mordue (Coelomycetes)	Disease	2
Acaudaleyrodes rachipora Singh (Aleyrodidae)	Insect	2
Acutaspis rhizophorae (Cockerell) (Diaspididae)	Insect	2
Acyrthosiphon sp. (Aphididae)	Insect	2
Aleurocanthus sp. (Aleyrodidae)	Insect	2
Aleuroplatus cococolus Quaintance & Baker (Aleyrodidae)	Insect	2
Aleurothrixus sp. (Aleyrodidae)	Insect	2
Aonidiella comperei Mckenzie (Diaspididae)	Insect	2
Arctiidae, Species Of	Insect	2
Arhyssus sp. (Rhopalidae)	Insect	2
Ceroplastes rubens Maskell (Coccidae)	Insect	2
Chloropidae, Species Of	Insect	2
Coccotrypes sp. (Scolytidae)	Insect	2
Conotrachelus sp. (Curculionidae)	Insect	2
Corythucha sp. (Tingidae)	Insect	2
Dialeurodes sp. (Aleyrodidae)	Insect	2
Diplotaxis sp. (Scarabaeidae)	Insect	2
Dirioxa pornia (Walker) (Tephritidae)	Insect	2
Dyscinetus sp. (Scarabaeidae)	Insect	2
Edessa sp. (Pentatomidae)	Insect	2
Icerya sp. (Margarodidae)	Insect	2
Lepidosaphes tokionis (Kuwana) (Diaspididae)	Insect	2
Metachroma sp. (Chrysomelidae)	Insect	2
Miridae, Species Of	Insect	2
Myochrous sp. (Chrysomelidae)	Insect	2
Parlatoria crypta Mckenzie (Diaspididae)	Insect	2
Phycitinae, Species Of (Pyralidae)	Insect	2
Phyllophaga sp. (Scarabaeidae)	Insect	2
Planococcus lilacinus (Cockerell) (Pseudococcidae)	Insect	2
Pseudaonidia sp. (Diaspididae)	Insect	2
Puto mexicanus (Cockerell) (Pseudococcidae)	Insect	2
Rhagoletis sp. (Tephritidae)	Insect	2
Scolytidae, Species Of	Insect	2
Solenopsis sp. (Formicidae)	Insect	2

Pest	**Type**	**Total**
Syrphidae, Species Of	Insect	2
Tetralicia sp. (Aleyrodidae)	Insect	2
Thrips sp. (Thripidae)	Insect	2
Helicidae, Species Of	Mollusk	2