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

Importation of cucumber (*Cucumis sativus* L.) from the Republic of Korea into the United States for consumption

A Qualitative, Pathway Initiated Pest Risk Assessment

Version 1

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Executive Summary

The purpose of this report is to assess the pest risks associated with importing commercially produced fresh fruit of cucumber, *Cucumis sativus* L. (Cucurbitaceae), from the Republic of Korea into the United States for consumption.

Based on the internal request submitted by Plant Protection and Quarantine (PPQ), we considered the pathway to include the fresh fruit, with a stem of one inch or less in length, of *Cucumis sativus* (cucumber) for consumption. The fruit will be free of soil and debris and fruit that is damaged or obviously infested will be culled. The pest risk ratings depend on the application of all conditions of the pathway as described in this document; fresh cucumber fruit produced under different conditions were not evaluated and may pose a different pest risk.

We used scientific literature, port-of-entry pest interception data, and information from the government of the Republic of Korea to develop a list of pests with quarantine significance for the United States. These are pests that occur in the Republic of Korea on any host and are associated with the commodity plant species anywhere in the world.

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

Pest type	Taxonomy	Scientific name	Likelihood of Introduction
Insect	Diptera: Tephritidae	*Bactrocera depressa* (Shiraki)	Medium
Insect	Diptera: Tephritidae	*Bactrocera scutellata* (Hendel)	Medium
Virus	Martellivirales: Virgaviridae	*Tobamovirus kyuri* (Kyuri green mottle mosaic virus)	Low
Virus	Martellivirales: Virgaviridae	*Tobamovirus viridimaculae* (cucumber green mottle mosaic virus)	Low

The detailed examination and choice of appropriate phytosanitary measures to mitigate pest risk are addressed in a separate document.

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1. Introduction

1.1. Background

The purpose of this report is to present PPQ's assessment of the pest risk associated with the importation of commercially produced fresh fruit of cucumber (*Cucumis sativus* L.) from the Republic of Korea (referred to as the export area) into the United States[1] (referred to as the pest risk analysis or PRA area) for consumption.

This is a qualitative risk assessment. The likelihood of pest introduction is expressed as a qualitative rating rather than using numerical terms. This methodology is consistent with guidelines provided by the International Plant Protection Convention (IPPC) in the International Standard for Phytosanitary Measures (ISPM) No. 11, "Pest Risk Analysis for Quarantine Pests" (IPPC, 2021). The use of biological and phytosanitary terms is consistent with ISPM No. 5, "Glossary of Phytosanitary Terms" (IPPC, 2024).

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

1.2. Initiating event

The importation of fruits and vegetables for consumption into the United States is regulated under Title 7 of the Code of Federal Regulations, Part 319.56 Subpart L – Fruits and Vegetables (7 CFR §319.56, 2025) and as described in the Agricultural Commodity Import Requirements. Under this regulation, the entry of cucumber from the Republic of Korea into the PRA area is only authorized from December 1 to April 30, and is not authorized at other times of the year (ACIR, 2025). This commodity risk assessment was initiated in response to a request by the Republic of Korea to change the federal regulation to allow entry year-round.

1.3. Potential weediness of the commodity

In some cases, an imported commodity could become invasive in the PRA area. If warranted, we analyze the commodity for weed risk.

A weed risk analysis is not required when (a) the commodity is already enterable into the PRA area from other countries, (b) the commodity plant species is widely established (native or naturalized) or cultivated in the PRA area, or (c) the imported plant part(s) cannot easily propagate on its own or be propagated. We determined that the weed risk of cucumber does not need to be analyzed because cucumber is already enterable into the PRA area from other countries (ACIR, 2025) and is widely cultivated (NASS, 2024).

1.4. Description of the pathway

A pathway is "any means that allows the entry or spread of a pest" (IPPC, 2024). In the context of this document, the pathway is the commodity to be imported. The following description includes those conditions and processes the commodity undergoes from production through

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

importation and distribution that may have an impact on pest risk and therefore were considered in our assessment. Commodities produced under different conditions were not considered.

1.4.1. Description of the commodity
The specific pathway of concern is the importation of fresh fruit of *Cucumis sativus* (cucumber), with a stem of one inch or less in length, for consumption.

1.4.2. Summary of the production, harvest, post-harvest, shipping, and storage conditions considered
The fruit will be imported year-round for consumption. The fruit may have a short stem of one inch or less and will be free of soil and debris. Fruit that is damaged or obviously infested will be culled. No other production, harvest, post-harvest, shipping, or storage conditions were considered during this assessment.

2. Pest List and Pest Categorization

The pest list is a compilation of plant pests of quarantine significance to the United States. This list includes pests that are present in the United States on any host and are known to be associated with *Cucumis sativus* anywhere in the world. Pests are considered quarantine significant if they (a) are not present in the PRA area, (b) are actionable at U.S. ports of entry, (c) are regulated non-quarantine pests, (d) are under federal official control, or (e) require evaluation for regulatory action. Consistent with ISPM No. 5, pests that meet any of these definitions are considered "quarantine pests" and are candidates for analysis. Species with a reasonable likelihood of following the pathway into the PRA area are analyzed to determine their pest risk potential.

2.1. Pest list

We developed the pest list based on scientific literature, port-of-entry pest interception data, and information provided by the government of the Republic of Korea. We listed the pests that are of quarantine significance to the PRA area in Table 1. For each pest, we provided evidence for the pest's presence in the United States and its association with *Cucumis sativus*. We indicated the plant parts with which the pest is generally associated and, if applicable, provided information about the pest's distribution in the United States. Pests that are likely to remain associated with the harvested commodity in a viable form are indicated by bolded text and are listed separately in Table 2.

Table 1. List of quarantine pests associated with *Cucumis sativus* anywhere in the world and present in the Republic of Korea on any host.

Pest name	Presence in the Republic of Korea	Host association	Plant part(s)[2]	Considered further?[3]
INSECT: Coleoptera: Chrysomelidae *Atrachya menetriesi* (Faldermann)	KNAM-IN, 2021	Umeya and Okada, 2003	Leaves (Umeya and Okada, 2003)	No.
INSECT: Coleoptera: Chrysomelidae *Aulacophora indica* (Gmelin)	KNAM-IN, 2021; Lee et al., 2005a	Hassan et al., 2022; Herlinda et al., 2021; Tiven and Ratna, 2013; Wang et al., 2020	Leaves (adult feeding; Herlinda et al., 2021; Tiven and Ratna, 2013)	No. Present in Guam (UGIC, 2023), the Northern Mariana Islands, and American Samoa (CABI, 2025).
INSECT: Coleoptera: Chrysomelidae *Monolepta dichroa* Harold	Cho et al., 2008	Umeya and Okada, 2003	Leaves (Umeya and Okada, 2003)	No. The genus *Monolepta* is quarantine for the continental United States, Hawaii, and Puerto Rico (ARM, 2025).
INSECT: Coleoptera: Coccinellidae *Epilachna vigintioctomaculata* Motschulsky; syn. *Henosepilachna vigintioctomaculata* (Motschulsky)	KNAM-IN, 2021	Umeya and Okada, 2003	Leaves (Umeya and Okada, 2003)	No. The genus *Epilachna* is quarantine for the continental United States, Hawaii, and Puerto Rico (ARM, 2025).
INSECT: Diptera: Agromyzidae *Liriomyza bryoniae* Kaltenbach	Goh et al., 2004; KNPQS, 2000	Dimić and Perić, 2003; Goh et al., 2004	Leaves (Dimić and Perić, 2003	No.
INSECT: Diptera: Agromyzidae *Liriomyza huidobrensis* (Blanchard)	Kwon et al., 2018; Maharjan and Jung, 2016	Civelek and Yoldaş, 2003; Mulholland et al., 2022	Leaves (Civelek and Yoldaş, 2003; Mulholland et al., 2022)	No. Present in Hawaii (Scheffer, 2000) and Guam (CABI, 2025).

[2] The plant part(s) listed are those for the plant species under analysis. If the information has been extrapolated, such as from plant part association on other plant species, we note that.
[3] "Yes" indicates simply that the pest has a reasonable likelihood of being associated with the harvested commodity; the level of pest prevalence on the harvested commodity (low, medium, or high) is qualitatively assessed as part of the Likelihood of Introduction assessment (section 3).

Pest name	Presence in the Republic of Korea	Host association	Plant part(s) [2]	Considered further?[3]
INSECT: Diptera: Agromyzidae *Phytomyza horticola* Goureau; syn. *Chromatomyia horticola* (Goureau)	ESK, 1994; Lim et al., 2012	Al-Fayyadh, 2023; Hazini et al., 2017	Leaves (Al-Fayyadh, 2023)	No. The genus *Phytomyza* is quarantine for the continental United States, Hawaii, and Puerto Rico (ARM, 2025).
INSECT: Diptera: Tephritidae *Bactrocera depressa* (Shiraki); syns. *Zeugodacus depressa* Shiraki, *Paradacus depressus* (Shiraki)	**Han et al., 1994; Mun et al., 2003**	**Han et al., 1994; Okadome, 1962; Robinson et al., 2023; Takamatsu, 1952**	**Fruit (Okadome, 1962; Takamatsu, 1952)**	**Yes, this fruit fly feeds internally in fruit (Han et al., 2017; Okadome, 1962).**
INSECT: Diptera: Tephritidae *Bactrocera scutellata* (Hendel); syn. *Dacus scutellatus* Hendel	**Al Baki et al., 2017; Jeon et al., 2012; Kim et al., 2010**	**Ohno et al., 2006**	**Fruit (Ohno et al., 2006)**	**Yes, this fruit fly feeds internally in cucumber (Ohno et al., 2006).** **The genus *Bactrocera* is quarantine for the continental United States, Hawaii and Puerto Rico (ARM, 2025).**
INSECT: Hemiptera: Aleyroidae *Aleyrodes lonicerae* Walker	Lee et al., 2005b	Shahbazvar et al., 2010	Leaves (based on general feeding behavior) (Byrne and Bellows, 1991)	No.
INSECT: Hemiptera: Miridae *Apolygus spinolae* (Meyer-Dür)	ESK, 1994	Umeya and Okada, 2003	Buds, developing fruit, leaves, shoots (Umeya and Okada, 2003)	No. The genus *Apolygus* is quarantine for the continental United States, Hawaii, and Puerto Rico (ARM, 2025).

Pest name	**Presence in the Republic of Korea**	**Host association**	**Plant part(s) [2]**	**Considered further?[3]**
INSECT: Hemiptera: Pentatomidae *Halyomorpha halys* (Stål)	Kho et al., 2024; Lee et al., 2013; Lim et al., 2023	Borisov et al., 2021; Göktürk, 2023; Schweiger et al., 2024	Buds, flowers, fruit (Schweiger et al., 2024)	No, eggs are laid on the leaves of host plants; late stage nymphs and adults feed on fruit of hosts causing external blemishes (Göktürk, 2023). This stink bug is a mobile external feeder (Göktürk, 2023) that would escape at harvest or when the fruit is cleaned of soil and debris. Present in the continental United States (Nielsen and Hamilton, 2009).
INSECT: Lepidoptera: Crambidae *Diaphania indica* (Saunders); syn. *Palpita indica* Saunders	ESK, 1994; Goh et al., 2004; Jeon et al., 2006	Bhat et al., 2022; Goh et al., 2004; Jeon et al., 2006; Moghbeli Gharaei et al., 2019; Nair and Sehgal, 2023; Robinson et al., 2023	Flowers, fruit, leaves, shoots, stems (Bhat et al, 2022; Jeon et al., 2006; Nair and Sehgal, 2023)	No, leaves are the preferred feeding site, but larvae can feed within the fruit and often pupate in the holes they produce. The damage produces visible holes and blemishes (Bhat et al., 2022); damaged fruit would be culled during harvest or post-harvest processing. Present in the continental United States, American Samoa, the Northern Mariana Islands (CABI, 2025), and Guam (Schreiner, 1991).
INSECT: Lepidoptera: Noctuidae *Anadevidia peponis* (Fabricius)	ESK, 1994	Bhat et al., 2022; Nair and Sehgal, 2023	Leaves (Bhat et al, 2022; Nair and Sehgal, 2023)	No.
INSECT: Lepidoptera: Noctuidae *Autographa gamma* (Linnaeus)	ESK, 1994; Ronkay, 1982	Robinson et al., 2023; Schwitulla, 1963; Szwejda, 2022	Leaves (based on general feeding behavior) (Schwitulla, 1963; Szwejda, 2022)	No, this cutworm generally feeds on stems of young plants and underground portions of hosts (Annecke and Moran, 1982).

Pest name	**Presence in the Republic of Korea**	**Host association**	**Plant part(s)** [2]	**Considered further?**[3]
INSECT: Lepidoptera: Noctuidae *Chrysodeixis eriosoma* (Doubleday)	ESK, 1994; Ronkay, 1982	Roberts, 1979; Robinson et al., 2023	Flowers, fruit, leaves (based on general feeding behavior; Roberts, 1979)	No, see notes in section 2.2. Present in Hawaii (UHIM, 2025) and Guam (Muniappan and Esguerra, 1999).
INSECT: Lepidoptera: Noctuidae *Helicoverpa armigera* (Hübner)	ESK, 1994; Kim et al., 2018b; KNPQS, 2000; Lim et al., 2012	Kulkarni et al., 2009	Leaves (Islam et al., 2020) Flowers, developing seeds, grain, or fruit (based on general feeding behavior) (Bharati et al., 2007; CABI, 2025; van den Berg et al., 2001)	No, see notes in section 2.2.
INSECT: Lepidoptera: Noctuidae *Mamestra brassicae* (Linnaeus)	ESK, 1994; KNPQS, 2000	Kozlova and Krasavina, 2020; Umeya and Okada, 2003	Leaves, stems (based on general feeding behavior) (Carter, 1984; KNPQS, 2000)	No.
INSECT: Lepidoptera: Noctuidae *Spodoptera litura* (Fabricius)	ESK, 1994; Goh et al., 2004; Kim et al., 2018; KNPQS, 2000	Bhat et al., 2022; Goh et al., 2004; Robinson et al., 2023	Leaves (of *Curcurbita* sp. and *Cucumis* sp.) (Carter, 1984; Umeya and Okada, 2003)	No. Present in Hawaii, American Samoa, Guam and the Northern Mariana Islands (CABI, 2025).
INSECT: Thysanoptera: Phlaeothripidae *Haplothrips chinensis* Priesner	ESK, 1994; Woo, 1988; Woo et al., 1991	Miyazaki and Kudo, 1988; Woo, 1988; Woo et al., 1991	Flowers, leaves (based on general feeding behavior) (Ulitzka, 2024)	No.

Pest name	Presence in the Republic of Korea	Host association	Plant part(s) [2]	Considered further?[3]
INSECT: Thysanoptera: Thripidae *Frankliniella intonsa* (Trybom)	Cho et al., 2001a; Goh et al., 2004; Jeong et al., 2018; KNPQS, 2000; Woo et al., 1991	Cho et al., 2001a; Li et al., 2019; Miyazaki and Kudo, 1988; Woo et al., 1991	Flowers, leaves (Cho et al., 2001; Umeya and Okada, 2003)	No.
INSECT: Thysanoptera: Thripidae *Thrips flavus* Schrank	Lee et al., 2001	Wen and Lee, 1982	Flowers, shoots (Wen and Lee, 1982)	No.
INSECT: Thysanoptera: Thripidae *Thrips hawaiiensis* (Morgan)	ESK, 1994; KNPQS, 2000; Woo et al., 1991	Miyazaki and Kudo, 1988; Woo et al., 1991	Flowers, fruit, leaves (based on general feeding behavior) (Cao et al., 2022; Umeya and Okada, 2003)	No, this species is found almost entirely on flowers and is not considered to be a significant species on cucurbits (Cao et al., 2022; Umeya and Okada, 2003). Present in the continental United States, Hawaii (Mound et al., 2016), and Guam (CABI, 2025; Sakimura, 1939).
INSECT: Thysanoptera: Thripidae *Thrips palmi* Karny	Cho et al., 2001a; Goh et al., 2004; Jeong et al., 2018; KNPQS, 2000	Cho et al., 2001a; Miyazaki and Kudo, 1988; Nair and Sehgal, 2023; Rosenheim et al., 1990	Fruit (Rosenheim et al., 1990), leaves (Bhat et al., 2022; Cho et al., 2001; Nair and Sehgal, 2023), young shoots (Bhat et al., 2022)	No, see notes in section 2.2. Present in the continental United States (Florida), American Samoa, Hawaii, Guam, and U.S. Virgin Islands (CABI, 2025).
MITE: Trombidiformes: Tetranychidae *Tetranychus truncatus* Ehara	Lee et al., 1999b	Gao et al., 2005; Sherief and Bhaskar, 2018	Leaves (Sherief and Bhaskar, 2018)	No.

Pest name	Presence in the Republic of Korea	Host association	Plant part(s) [2]	Considered further?[3]
MOLLUSK: Stylommatophora: Achatinidae *Lissachatina fulica* (Bowdich) syn. *Achatina fulica* Bowdich	Cho et al., 2019	Maheshini et al., 2019; Reddy and Sreedharan, 2006	Leaves (Maheshini et al., 2019)	No. Present in the United States in Hawaii (Heu, 2007), Guam, and the Northern Mariana (Lange, 1950).
MOLLUSK: Stylommatophora: Philomycidae *Meghimatium bilineatum* (Benson)	Park, 2021	Umeya and Okada, 2003	Fruit (Umeya and Okada, 2003)	No, this slug is an external feeder, and infested fruit would be culled during harvest or during post-harvest processing. Present in Hawaii (Christensen and Hadfield, 1984; Heu, 2007)
NEMATODE: *Meloidogyne mali* Itoh, Ohshima & Ichinoe	Kang et al., 2022b	Toida, 1979	Roots, soil (Eisenback et al., 2017)	No, fruit is expected to be free of soil. Quarantine at the genus level (ARM, 2025).
BACTERIUM: '*Candidatus* Phytoplasma trifolii' Hiruki & Wang (16SrVI)	Jung et al., 2012; Kim, 2007	Usta et al., 2017; Zibadoost et al., 2016	Whole plant (Firrao et al., 2004; Wheatley et al., 2022)	No, it is vectored by insects in the families Cicadellidae and Cixiidae, which feed on the phloem of plants, not fruit (Firrao et al., 2004). Reported in the continental United States (Jacobs et al., 2003; Lee et al., 2000; Munyaneza et al., 2006).
BACTERIUM: *Pectobacterium jejuense* Hong et al.	Hong et al., 2023b	Hong et al., 2023b	Stem, fruit, leaves (Hong et al., 2023b)	No, this bacterium causes a soft rot of cucumber tissues; therefore, fruit would be left unharvested or culled and would be unlikely to make it market. Discarded, latently infected fruit would be highly unlikely to contact potential hosts.

Pest name	Presence in the Republic of Korea	Host association	Plant part(s) [2]	Considered further?[3]
CHROMISTAN *Phytophthora melonis* Katsura	Noh et al., 2014	Banihashemi and Mirtalebi, 2008; Ho et al., 2007; LPDK, 2025	Crown, roots, soil, leaves, stems, fruit (Banihashemi and Mirtalebi, 2008; Hashemi et al., 2019; Ho et al., 2007)	No, fruit is expected to be free of soil. Additionally, rotting or damaged fruit would be left unharvested or culled and would be unlikely to make it to market. Discarded, latently infected fruit would be highly unlikely to contact potential hosts. Quarantine pest at the genus level (ARM, 2025).
FUNGUS: *Fusarium incarnatum* (Desm.) Sacc. syns.: *Fusarium pallidoroseum* (Cooke) Sacc., *Fusarium semitectum* Berk. & Ravenel)	Ha et al., 2023; Kim and Kim, 2004	Gao et al., 2020; García-Estrada et al., 2021; Mao et al., 2020	Crown, fruit, leaves (Gao et al., 2020; García-Estrada et al., 2021; Mao et al., 2020)	No, see note in section 2.2.
VIRUS: Crinivirus Cucurbit chlorotic yellows virus (CCYV)	Kwak et al., 2021	Chynoweth et al., 2021; Kwak et al., 2021; Mondal et al., 2022	Entire plant (Chynoweth et al., 2021; Kwak et al., 2021; Mondal et al., 2022)	No, criniviruses are whitefly-transmitted; whiteflies would feed on foliage, not fruit (Li et al., 2016; Palumbo, 2013). Reported in Alabama, California, Florida, Georgia, and Texas (Hernandez et al., 2021; Jailani et al., 2021; Kavalappara et al., 2021; Mondal et al., 2021; Wintermantel et al., 2019).
VIRUS: *Tobamovirus kyuri* (Kyuri green mottle mosaic virus)	**Jin et al., 2009; Ko et al., 2006**	**Ko et al., 2006**	**Whole plant, soil (Balsak, 2023a; Cho et al., 2007b; Ko et al., 2006)**	**Yes, it is present in cucumber fruit and is seed transmitted (Balsak, 2023a; Dombrovsky and Smith, 2017).** **Quarantine pest at the genus level (ARM, 2025).**

Pest name	Presence in the Republic of Korea	Host association	Plant part(s) [2]	Considered further?[3]
VIRUS: ***Tobamovirus virdimaculae*** **(cucumber green mottle mosaic virus)**	**Cho et al., 2015; Ko et al., 2006; Yoon et al., 2008b**	**Kim et al., 2003b; Ko et al., 2004; Liu et al., 2013**	**Entire plant [including seeds] (Cho et al., 2007b; Ko et al., 2006; Ko et al., 2004)**	**Yes. It is present in cucumber fruit (van Dorst, 1988b). It is seed transmitted in cucumber (Liu et al., 2013).** **CGMMV is considered transient and under official control in the United States (APHIS, 2024; Tian et al., 2014).**

2.2. Notes on pests identified in the pest list

Chrysodeixis eriosoma **Doubleday (Lepidoptera: Noctuidae):** This species is present in the Republic of Korea (ESK, 1994; Ronkay, 1982). *Chrysodeixis eriosoma* is a polyphagous species that feeds on leaves, flowers, and sometimes fruit of host plants (Roberts, 1979). It primarily feeds on plants in families Solanaceae and Asteraceae (Dugdale, 1998; Mau and Kessing, 1991). We only found evidence of *C. eriosoma* feeding on the fruit of watermelon (Schreiner et al., 1990), tomato, or pods of green bean (Dugdale, 1998). Larvae primarily feed on the underside of leaves, while later instar larvae feed from leaf margins and chew holes through leaves (Dugdale, 1998; Mau and Kessing, 1991). We found associations between this species and cucumber (Roberts, 1979), but no information on the plant part being infested. Additionally, the external feeding of larvae is highly visible; therefore, we do not expect the insect to be associated with marketable fruit of cucumber.

Helicoverpa armigera **(Hübner) (Lepidoptera: Noctuidae):** We were unable to find details on the specific cucumber plant parts damaged by the cotton bollworm. It was reported to be associated with cucumber plants (Kulkarni et al., 2009) and documented to feed on leaves of cucumber in a no-choice laboratory experiment (Islam et al., 2020), but we found no reports suggesting it is associated with the fruit. Due to the lack of information on cucumber, it is likely that cucumber is not a primary host of the cotton bollworm. The cotton bollworm larvae generally feed on flowers, leaves, and developing seeds, grain, or fruit of host plants (Bharati et al., 2007; CABI, 2025; van den Berg et al., 2001), but not on mature fruit. The cotton bollworm feeds internally in some fruits, such as pepper or tomato (CABI, 2025; Kay, 2007), but not others. In zucchini, *Cucurbita pepo*, larvae prefer to feed on flowers and not fruit (Kay, 2007). Any incidental feeding on the zucchini fruit occurs on very young fruit, resulting in bent fruit as it grows (Kay, 2007). Due to the lack of reports of the cotton bollworm on cucumber, and the general feeding behavior of the cotton bollworm on other hosts, we do not believe the cotton bollworm will be associated with mature cucumber fruit at harvest.

Thrips palmi **Karny (Thysanoptera: Thripidae):** The melon thrips is distributed throughout tropical regions in Asia, Africa, South America, Oceania, and the Caribbean, as well as Florida

(Seal, 2004), Hawaii (Hata et al., 1991), Guam (Schreiner and Nafus, 1986), American Samoa (Ali and Vargo, 1992), and Puerto Rico (Pantoja et al., 1988; Viteri et al., 2010). While melon thrips is an important greenhouse pest and may infest protected environments anywhere, researchers estimate that the outdoor establishment of permanent populations would be restricted to tropical regions (Capinera, 2023). Permanent populations have only been documented south of Orlando, Florida (Capinera, 2023). Initially detected in 1990 (Capinera, 2023), melon thrips are not under official control. Surveys conducted over the last thirty years indicate that melon thrips is likely established throughout the climate zones suitable for population development.

Further, although it has been reported from cucumber fruit (Rosenheim et al., 1990), we only found three records of interceptions associated with cucumber fruit (AQAS, 2025).

***Fusarium incarnatum* (Desm.) Sacc.:** This fungus (syns. *Fusarium pallidoroseum* (Cooke) Sacc., *Fusarium semitectum* Berk. & Ravenel) is associated with *C. sativus* (Farr and Rossman, 2025) and is present in the Republic of Korea (Ha et al., 2023) and widespread in the continental United States (Elmer and Marra, 2011), Puerto Rico (Farr and Rossman, 2025; UGA, 2025), and Hawaii (Dudley et al., 2006). While this fungus is a quarantine pest for the continental United States (ARM, 2025) , it has been in the United States since as early as 1878 and was reported from multiple states prior to 1960 (Farr and Rossman, 2025). This pathogen only affects damaged fruit (Wonglom and Sunpapao, 2020), which would be excluded from the pathway.

2.3. Pests considered but not included on the pest list

2.3.1. Organisms with non-quarantine status

We found evidence of organisms that are associated with cucumber and are present in the export area; however, they are not of quarantine significance for the PRA area (see Appendix).

Armored scales (Hemiptera: Diaspididae): These insects are highly unlikely to establish via the fruits or vegetables for consumption pathway due to their very limited ability to disperse to new host plants (Miller et al., 1985; PERAL, 2007). Also, diaspidids on fruits and vegetables for consumption are considered non-actionable at U.S. ports of entry (NIS, 2008). For these reasons, armored scales are included in the Appendix rather than Table 1, even if they are not present in the PRA area.

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

***Agrotis segetum* (Denis & Schiffermüller) (Lepidoptera: Noctuidae):** This moth is present in the Republic of Korea (Lim et al., 2012). It has been associated with cucumber (Kozlova and Krasavina, 2020), however, we found no further evidence that this species infests cucumber; therefore, we did not include it on the pest list.

***Haplothrips aculeatus* (Fabricius) (Thysanoptera: Phlaeothripidae):** This thrips is present in the Republic of Korea (ESK, 1994; Woo, 1988; Woo et al., 1991). It has been associated with cucumber (Miyazaki and Kudo, 1988); however, we found no further evidence that this species infests cucumber; therefore, we did not include it on the pest list.

***Sminthurus viridis* (Linnaeus) (Collembola: Symphypleona):** This is a quarantine pest (ARM, 2025) that is present in the Republic of Korea (ESK, 1994; Yosii and Lee, 1963). It is listed by CABI (2025) as a pest of cucumber; however, we found no further evidence that this species infests cucumber; therefore, we did not include it on the pest list.

***Acidovorax valerianellae* Gardan et al.:** This bacterium is present in the Republic of Korea and has been reported to naturally infect watermelon (Han et al., 2012b). *Cucumis sativus* is an experimental host (Kim et al., 2017), and we found no evidence of natural infection. Therefore, we did not consider it further.

***Fusarium oxysporum* Schltdl.: Fr.**: This fungus is present in the Republic of Korea (Choi et al., 2015a; Kwon et al., 2013; Lee, 1983) and is associated with *C. sativus* (Muradov et al., 2019; Hatami et al., 2012; Lee, 1983; Quesada-Ocampo, 2018). Reports of *F. oxysporum* in the Republic of Korea associated with disease in *Cucumis sativus* are likely *forma specialis cucumerinum* (Lee et al., 2014b; LPDK, 2025; Choo et al., 1990) or f. sp. *niveum* (Amaradasa et al., 2018; Jo et al., 2015), which are not quarantine pathogens (see Appendix).

***Orthotospovirus* Chrysanthemum stem necrosis virus:** This virus occurs in the Republic of Korea (Yoon et al., 2016) and can infect *C. sativus* (Bezerra et al., 1999; Momonoi et al., 2011; Verhoeven et al., 1996). However, *C. sativus* appears to be solely an experimental host, and natural infections have not been reported.

***Tobamovirus cucurbitae* (zucchini green mottle mosaic virus):** This tobamovirus is present in Korea and has been successfully artificially inoculated into *C. sativus* plants (Cho et al., 2007a); however, we could not find evidence of natural infection in *C. sativus* and therefore, we do not expect this virus to be present in commercial production of cucumber.

2.4. Pests selected for further analysis

We identified four quarantine pests for further analysis (Table 2).

Table 2. Pests selected for further analysis

Pest type	Taxonomy	Species names
Insect	Diptera:Tephritidae	*Bactrocera depressa* (Shiraki)
Insect	Diptera: Tephritidae	*Bactrocera scutellata* (Hendel)
Virus	Martellivirales: Virgaviridae	*Tobamovirus kyuri* (Kyuri green mottle mosaic virus)
Virus	Martellivirales: Virgaviridae	*Tobamovirus virdimaculae* (cucumber green mottle mosaic virus)

3. Assessing Pest Risk Potential

3.1. Introduction

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

The likelihood of introduction is based on the potential entry and establishment of a pest. We qualitatively assessed this using the ratings: Low, Medium, and High. The elements comprising the likelihood of introduction are interdependent; therefore, the model is multiplicative rather than additive. We defined the ratings as follows:

> **High**: This outcome is highly likely to occur because the events required occur frequently.
> **Medium**: This outcome can occur; however, the combination of required events occurs only occasionally.
> **Low**: This outcome is less likely because the exact combination of required events seldom occurs or rarely aligns properly in time and space.

We addressed uncertainty associated with each element as follows:

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

3.2. Assessment

3.2.1. *Bactrocera depressa* (Diptera: Tephritidae)
The pumpkin fruit fly infests the pulp of fruit of Cucurbitaceae, particularly pumpkin (Han et al., 2017; Han et al., 1994). Larval development leads to the rotting of fruit (Kang et al., 2008). Oviposition begins in the summer months and continues into the fall (Kang et al., 2008; Takamatsu, 1952). Nearly 30 eggs are laid per fruit at a depth of 4 to 10 mm (Kang et al., 2008; Takamatsu, 1952). Oviposition symptoms are difficult to detect, so infested fruit may be sold to customers at the market. Customers later find the fruit is rotting and are disgusted to find numerous larvae within the fruit (Kang et al., 2008). The pumpkin fruit fly overwinters as pupae and adults begin appearing again in May (Kang et al., 2008).

The endangered area for *Bactrocera depressa* within the United States
Geographic potential: *Bactrocera depressa* is present in **Asia:** China, Japan (Han et al., 2017), South Korea (Han et al., 1994), and Taiwan (Han et al., 2017).

The pumpkin fruit fly is primarily found at higher elevations (Han et al., 2017; Han et al., 1994; Takamatsu, 1952). The fruit fly is generally found at elevations over 200 meters (Han et al., 1994; Kang et al., 2008), although it has been found at an elevation as low as 157 meters (Kang et al., 2008). One author states the fruit fly is most abundant between 300 to 399 meters (Han et al., 1994), while another author states it is most abundant between 600 to 1020 meters

(Takamatsu, 1952). It has been collected in mountains numerous times (Han et al., 2017; Takamatsu, 1952), even at peaks up to 1240 meters (Han et al., 2017). Therefore, the fruit fly may be limited to areas of the United States at higher elevations.

These areas encompass Plant Hardiness Zones 5 to 10 (Takeuchi et al., 2018) that are of higher elevations.

<u>*Hosts in United States:*</u> The pumpkin fruit fly primarily infests fruit in the family **Cucurbitaceae**; however, tomato, in the family **Solanaceae**, may also be affected.

Cucurbitaceae: *Citrullus lanatus* (watermelon) (Han et al., 1994; Okadome, 1962; Takamatsu, 1952), *Cucumis sativus* (cucumber) (Okadome, 1962; Takamatsu, 1952), *Cucurbita moschata* (squash) (Han et al., 1994; Okadome, 1962; Takamatsu, 1952), *Cucurbita pepo* (acorn squash, pumpkin, and zucchini) (Han et al., 1994; Kang et al., 2008), *Lagenaria siceraria* (bottle gourd) (Okadome, 1962; Takamatsu, 1952), *Luffa aegyptiaca* (sponge gourd) (Takamatsu, 1952); and **Solanaceae:** *Solanum lycopersicum* (tomato) (Han et al., 1994; Okadome, 1962; Takamatsu, 1952)

<u>*Economically important hosts[4]:*</u> Cucumber, pumpkin, squash, tomato, and watermelon (NASS, 2024).

<u>*Potential consequences on economically important hosts at risk:*</u> This pest is likely to cause unacceptable consequences because the larvae infest the pulp of host fruits, leading to the fruit rotting (Han et al., 2017; Han et al., 1994; Kang et al., 2008). High infestation rates, up to 43.5% of fruit, have been reported in pumpkin (Han et al., 1994). High numbers of larvae have been reported per pumpkin fruit, with averages ranging from 46 to 168 larvae per fruit (Han et al., 1994).

<u>***Endangered area:***</u> The endangered area includes Plant Hardiness Zones 5 to 10 of higher elevations where host plants are present.

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

The likelihood of entry of *Bactrocera depressa* into the endangered area via cucumber imported from the Republic of Korea

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Pest prevalence on the harvested commodity	Low	Low	*Bactrocera depressa* larvae infest cucurbit fruit (Okadome, 1962), though we found little information about cucumber fruit being infested (Okadome, 1962; Takamatsu, 1952). The fruit fly also seems to only infest fruit at higher elevations in the mountains (Han et al., 1994; Takamatsu, 1952). We have chosen Low as the risk rating because the pest is rarely reported attacking the commodity species in the export area.
Likelihood of surviving post-harvest processing before shipment	Low	Low	Eggs are oviposited into fruit at a depth of 4 to 10 mm (Kang et al., 2008; Takamatsu, 1952) and oviposition symptoms are difficult to detect (Kang et al., 2008). Removal of dirt, debris, and culling will not reduce the presence of fruit fly eggs oviposited within the fruit; therefore, we maintain a risk rating of Low.
Likelihood of surviving transport and storage conditions of the consignment	Low	n/a	Transport and storage conditions were not considered; therefore, we maintain a risk rating of Low.
Overall Likelihood of Entry	Low	n/a	n/a

The likelihood of establishment of *Bactrocera depressa* into the endangered area via watermelon imported from the Republic of Korea

Risk Element	**Risk Rating**	**Uncertainty Rating**	**Evidence for rating (and other notes as necessary)**
Likelihood of Establishment	Medium	Moderate	The pumpkin fruit fly is primarily found at higher elevations (Han et al., 2017; Han et al., 1994; Takamatsu, 1952). It has been collected in mountains numerous times (Han et al., 2017; Takamatsu, 1952). Therefore, the fruit fly may be limited to areas of the United States at higher elevations. Additionally, the pumpkin fruit fly has a narrow host range, limited primarily to Cucurbitaceae (Han et al., 2017; Han et al., 1994; Takamatsu, 1952); therefore, adult fruit flies may have difficulty in locating a new host to reproduce on. However, adult fruit flies are highly mobile (Takamatsu, 1952), enabling them to disperse easily and locate a new host. Additionally, tens of larvae develop within a single fruit (Han et al., 1994; Takamatsu, 1952), although several hundred have been reported in a single fruit (Han et al., 1994). The high number of larvae per fruit would enable the fruit fly to reproduce at a rapid rate once a host is found. Therefore, we chose a risk rating of Medium.
Overall Likelihood of Establishment	Medium	n/a	n/a

The likelihood of introduction (combined likelihoods of entry and establishment) of *Bactrocera depressa* into the endangered area via cucumber imported from the Republic of Korea is Medium.

3.2.2. *Bactrocera scutellata* (Hendel) (Diptera: Tephritidae).

Bactrocera scutellata has a limited host range and feeds primarily on the male flowers of Cucurbitaceae (Jeon et al., 2012; Kim et al., 2010; Ohno et al., 2006). It has also been reported on the female flowers and stems of pumpkin in Korea (Jeon et al., 2012; Kim et al., 2010) and in the fruit of *Cucumis sativus* in Japan (Ohno et al., 2006). It occurs throughout Korea (Jeon et al., 2012) and has two generations per year (Kim et al., 2010) and overwinters in the pupal stage (Mun et al., 2000).

The endangered area for *Bactrocera scutellata* within the United States

Geographic potential: *Bactrocera scutellata* is distributed in **Asia**: Bhutan (Drew et al., 2007), China (Li et al., 2024), Japan (Ohno et al., 2006), Malaysia (Chua, 2010), South Korea (Al Baki et al., 2017; Jeon et al., 2012; Kim et al., 2010), and Taiwan (Han et al., 2017). These areas include Plant Hardiness Zone 6 to 10 (Takeuchi et al., 2018).

Hosts in PRA area: *Bactrocera scutellata* is reported from the following hosts that are present in the United States: *Cucumis sativus* (cucumber) (Ohno et al., 2006) and *Cucurbita* sp. (pumpkin) (Kim et al., 2010).

Economically important hosts[5]: Economically important hosts include cucumber and pumpkin (NASS, 2024).

Potential consequences on economically important hosts at risk: This pest is likely to cause unacceptable consequences because large populations can cause up to 70 percent damage to pumpkin flowers (Kim et al., 2010), therefore limiting fruit production. Additionally, the larvae can infest the fruit of cucumber (Ohno et al., 2006), which could reduce marketability of fresh fruit.

Endangered area: The endangered area includes Plant Hardiness Zone 6 to 10 where host plants are present.

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

The likelihood of entry of *Bactrocera scutellata* into the endangered area via cucumber imported from the Republic of Korea

Risk Element	**Risk Rating**	**Uncertainty Rating**	**Evidence for rating (and other notes as necessary)**
Pest prevalence on the harvested commodity	Low	Moderate	*Bactrocera scutellata* feeds primarily on the flowers of Cucurbitaceae (Jeon et al., 2012; Kim et al., 2010; Ohno et al., 2006) and the stems of pumpkin in Korea (Jeon et al., 2012). It has also been found infesting the fruit of *Cucumis sativus* in Japan (Ohno et al., 2006). However, we only found one source detailing cucumber fruit infestation, where the fruit fly was described as an “occasional” pest. Therefore, we have chosen a risk rating of Low.
Likelihood of surviving post-harvest processing before shipment	Low	Low	Removal of dirt, debris, and culling will likely not reduce the presence of fruit fly eggs or potential larvae within the fruit; therefore, we maintain a risk rating of Low.
Likelihood of surviving transport and storage conditions of the consignment	Low	n/a	Transport and storage conditions were not considered; therefore, we maintain a risk rating of Low.
Overall Likelihood of Entry	Low,	n/a	n/a

The likelihood of establishment of *Bactrocera scutellata* into the endangered area via cucumber imported from the Republic of Korea

Risk Element	**Risk Rating**	**Uncertainty Rating**	**Evidence for rating (and other notes as necessary)**
Likelihood of Establishment	Medium	Moderate	Larvae have been occasionally found in cucumber fruit (Ohno et al., 2006), though no details were given to describe how many larvae can infest one fruit and therefore how many may be able to emerge and reproduce. *Bactrocera* spp. fruit flies are highly mobile (Balagawi et al., 2012; Noda et al., 2015; Takamatsu, 1952), enabling them to disperse easily and locate a new host. However, this fly has a narrow host range in the United States (cucumber, pumpkin), and therefore, adult fruit flies may have difficulty in locating a new host on which they can reproduce.
Overall Likelihood of Establishment	Medium	n/a	n/a

The likelihood of introduction (combined likelihoods of entry and establishment) of *Bactrocera scutellata* into the endangered area via cucumber imported from the Republic of Korea is Medium.

<u>3.2.3. *Tobamovirus kyuri*: Kyuri green mottle mosaic virus (Martellivirales: Virgaviridae)</u>

Kyuri green mottle mosaic virus (KGMMV) is a virus in the genus *Tobamovirus* that causes a mosaic on leaves and distortion of fruit on infected cucumber, melon, and zucchini (Daryono et al., 2016; Daryono et al., 2005; Park et al., 1999; Yoon et al., 2001) and, like other tobamoviruses, has very stable viral particles (Balsak, 2023b; Daryono et al., 2006). KGMMV is found in cucumber, zucchini, and melon fruits and seeds (Balsak, 2023b; Kwon et al., 2014b); The virus systemically infects cucurbit hosts and is seed-borne and likely seed-transmitted in several cucurbit species (Balsak, 2023b; Kwon et al., 2014b).

The endangered area for Kyuri green mottle mosaic virus (KGMMV) within the United States

<u>*Geographic potential*</u>: KGMMV was reported in **Asia**: Indonesia, Japan, South Korea, and Turkey (Adachi-fukunaga and Tomitaka, 2025; Balsak, 2023b; Daryono et al., 2005; Kim et al., 2009).

Comparing the plant hardiness zones with known geographic distribution, we predict that the pest could establish in areas corresponding to Plant Hardiness Zones 3 to 14 (Takeuchi and Fowler, 2018).

<u>*Hosts in PRA area*</u>: The main hosts in the PRA area are **Cucurbitaceae:** *Cucumis melo* (melon, cantaloupe), *Cucumis sativus* (garden cucumber), *Cucurbita pepo* (field pumpkin, zucchini), and *Luffa acutangula* (angled loofah) (Cheon et al., 2000; Daryono et al., 2006; Kim et al., 2009; Lee et al., 1999a; NRCS, 2025).

<u>*Economically important hosts*[6]:</u> Economically important hosts at risk include cucumber, melon, and zucchini.

<u>*Potential consequences on economically important hosts at risk*</u>: This pest is likely to cause unacceptable consequences because it can significantly reduce yield on infected plants (Daryono et al., 2016; Daryono et al., 2005; Yoon et al., 2001). On zucchini and melon, infection causes chlorotic spots and mosaic of leaves and malformed fruit (Daryono et al., 2005; Park et al., 1999). In cucumber, KGMMV causes severe leaf mosaic and fruit distortion (Yoon et al., 2001).

<u>***Endangered area*****:**</u> The area endangered by KGMMV includes areas in the United States within PHZ 3 to 14 where cucurbits are grown (NRCS, 2025; Takeuchi and Fowler, 2018)

The likelihood of entry of Kyuri green mottle mosaic virus (KGMMV) into the endangered area via cucumber fruit imported from the Republic of Korea

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

Risk Element	**Risk Rating**	**Uncertainty Rating**	**Evidence for rating (and other notes as necessary)**
Pest prevalence on the harvested commodity	Low	High	Cucumber infected by KGMMV in Jeonnam Province (from 2000-2002) in South Korea have been detected in 3.8% of virus-infected cucumber samples, a lower level of infection than CGMMV detected in the same survey (48.7%) (Ko et al., 2006). KGMMV was first found in cucumber plants in Japan and described as causing more severe symptoms than CGMMV (Tan et al., 2000). Asymptomatic fruit has not been specifically reported in KGMMV infections; however, asymptomatic fruit has been reported in the closely-related Cucumber green mottle mosaic virus (Dombrovsky et al., 2017). Therefore, occasional latent infections are likely, particularly in plants initially infected at maturity. Reduced yields and unharvested, unmarketable fruit (Daryono et al., 2016; Daryono et al., 2005), along with no clear evidence of latently infected fruit, lead to a risk rating of KGMMV in harvested exported fruit of Low with high uncertainty.
Likelihood of surviving post-harvest processing before shipment	Low	Medium	Some mildly symptomatic cucumber fruits are likely to be harvested and later culled, leading to a slight reduction in uncertainty of a Low risk rating. However, culling post-harvest would likely not significantly reduce the risk rating, especially with asymptomatic fruit still present in the pathway.
Likelihood of surviving transport and storage conditions of the consignment	Low	Medium	Transport and storage conditions were not considered in this analysis; therefore, we did not change the previous risk rating.
Overall Likelihood of Entry	Low	n/a	n/a

The likelihood of establishment of Kyuri green mottle mosaic virus (KGMMV) into the endangered area via cucumber fruit imported from the Republic of Korea

Risk Element	**Risk Rating**	**Uncertainty Rating**	**Evidence for rating (and other notes as necessary)**
Likelihood of Establishment	Low	Moderate	KGMMV is physically very stable and can remain infectious for several months; however, seed transmission rates are low (0.5 to 1.1%) (Balsak, 2023b). Fruit is intended for consumption and is likely to be eaten or disposed of through normal disposal channels, limiting the opportunities for the infected fruit and seeds to contact hosts. KGMMV has a very low chance of being introduced into agricultural settings and is unlikely to establish from the fruit for consumption pathway. Based on this evidence, we rated this risk element "Low" with a "Moderate" uncertainty because of its ability to survive outside of its host.
Overall Likelihood of Establishment	Low	n/a	n/a

The likelihood of introduction (combined likelihoods of entry and establishment) of Kyuri green mottle mosaic virus (KGMMV) into the endangered area via cucumber fruit imported from the Republic of Korea is Low.

<u>3.2.4. *Tobamovirus viridimaculae*: Cucumber green mottle mosaic virus (Martellivirales: Virgaviridae)</u>

Cucumber green mottle mosaic virus (CGMMV) is a virus in the genus *Tobamovirus* that causes a severe mosaic symptom on infected watermelon and cucumber (Yoon et al., 2008) and, like other tobamoviruses, has very stable viral particles (Dombrovsky et al., 2017). CGMMV is found in cucumber and squash fruits (Al-Tamimi et al., 2009; Van Dorst, 1988a). The virus systemically infects cucurbit hosts (Moreno et al., 2004) and is seed-borne and seed-transmitted in several cucurbit species (Al-Tamimi et al., 2009; Liu et al., 2014; Yoon et al., 2008a). The association of CGMMV with seed is likely to have contributed to its spread worldwide (Dombrovsky et al., 2017).

The endangered area for cucumber green mottle mosaic virus within the United States

<u>*Geographic potential:*</u> It was reported in **Africa**: Nigeria; **Asia**: China, Georgia, India, Iran, Israel, Japan, Jordan, Lebanon, Myanmar, Pakistan, Saudi Arabia, South Korea, Sri Lanka, Syria, Taiwan, Thailand, Turkey; **Europe**: Austria, Belgium, Bulgaria, Denmark, Finland, France, Germany, Greece, Hungary, Latvia, Lithuania, Moldova, Norway, Poland, Romania, Russia, Spain, Sweden, the Netherlands, the United Kingdom, Ukraine, Yugoslavia (former); **North America**: Canada; **Oceania**: Australia (CABI, 2025). CGMMV is considered transient and under official control in California (USDA APHIS, 2025).

Comparing the plant hardiness zones with known geographic distribution, we predict that the pest could establish in areas corresponding to Plant Hardiness Zones 3 to 14 (Takeuchi and Fowler, 2018).

<u>*Hosts in PRA area:*</u> CGMMV infects hosts in the Cucurbitaceae and Euphorbiaceae families (Dombrovsky et al., 2017). The main hosts in the PRA area are **Cucurbitaceae:** *Citrullus lanatus* (watermelon), *Cucumis melo* (melon, cantaloupe), *Cucumis sativus* (garden cucumber), *Cucurbita maxima* (turban squash, pumpkin), *Cucurbita maxima* x *moschata*, *Cucurbita moschata* (crookneck squash), *Cucurbita pepo* (field pumpkin, zucchini), *Lagenaria siceraria* (bottle gourd) and *Trichosanthes cucumerina* (snake gourd) (CABI, 2025; Dombrovsky and Smith, 2017; Formiga et al., 2019; NRCS, 2025; Shargil et al., 2017).

<u>*Economically important hosts[7]:*</u> Economically important hosts at risk include cucumber, melon, squash, pumpkin, watermelon (Dombrovsky et al., 2017; Lecoq and Desbiez, 2012).

<u>*Potential consequences on economically important hosts at risk:*</u> This pest is likely to cause unacceptable consequences because it can affect the yield on infected plants (Liu et al., 2014; Reingold et al., 2015). Cucumber plants can be stunted, show mottling and mosaic on leaves and fruit distortions; early infections cause yield losses between 10 to 33 percent (Fletcher et al., 1969; Ling et al., 2014; Nilsson, 1977). In melon mosaic symptoms present in young leaves can disappear from mature foliage; fruits show malformations and netting (Dombrovsky et al., 2017). Some melon cultivars are asymptomatic (Rajamony et al., 1990; Sugiyama et al., 2006). Watermelon fruits show deformity, spongy flesh and yield losses can reach 48 percent (Dombrovsky et al., 2017; Zhou et al., 2008).

<u>***Endangered area:***</u> The area endangered by CGMMV includes areas in the United States within PHZ 3 to 14 where cucurbits are grown (NRCS, 2025; Takeuchi and Fowler, 2018).

The likelihood of entry of cucumber green mottle mosaic virus into the endangered area via cucumber fruit imported from the Republic of Korea

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

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Pest prevalence on the harvested commodity	Medium	Moderate	Incidence of CGMMV in Jeonnam Province in South Korean cucumber production was 48.7% in one survey from 2000-2002 (Kim et al., 2008). All fruit and most seeds produced by infected plants will be infected (Dombrovsky et al., 2017; Pitman, 2015; Wu et al., 2011). CGMMV infection can produce asymptomatic fruit, but reduced yields and unharvested, unmarketable fruit (Dombrovsky et al., 2017; Kim et al., 2008) will likely keep the prevalence of CGMMV at Medium with some uncertainty.
Likelihood of surviving post-harvest processing before shipment	Medium	Low	Some mildly symptomatic melon fruits are likely to be harvested and later culled, leading to a reduction in uncertainty. However, culling post-harvest would likely not significantly reduce the risk rating, especially with asymptomatic fruit still present in the pathway.
Likelihood of surviving transport and storage conditions of the consignment	Medium	Low	Transport and storage conditions were not considered in this analysis; therefore, we did not change the previous risk rating.
Overall Likelihood of Entry	Medium	n/a	n/a

The likelihood of establishment of Cucumber green mottle mosaic virus into the endangered area via cucumber fruit imported from the Republic of Korea

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Establishment	Low	Moderate	CGMMV is physically very stable and can remain infectious for several months; however, seed transmission rates are low (0.1% to 2.83%) (Dombrovsky et al., 2017; Wu et al., 2011). Fruit is intended for consumption and is likely to be eaten or disposed of through normal disposal channels, limiting the opportunities for the infected fruit and seeds to contact hosts. CGMMV has a very low chance of being introduced into agricultural settings and is unlikely to establish from the fruit for consumption pathway. Based on this evidence, we rated this risk element "Low" with a "Moderate" uncertainty because of its ability to survive outside of its host.
Overall Likelihood of Establishment	Low	n/a	n/a

The likelihood of introduction (combined likelihoods of entry and establishment) of Cucumber green mottle mosaic virus into the United States via cucumber fruit imported from the Republic of Korea is Low.

4. Summary

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

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

Pest type	Taxonomy	Scientific name	Likelihood of Introduction
Insect	Diptera: Tephritidae	*Bactrocera depressa* (Shiraki)	Medium
Insect	Diptera: Tephritidae	*Bactrocera scutellata* (Hendel)	Medium
Virus	Martellivirales: Virgaviridae	*Tobamovirus kyuri* (Kyuri green mottle mosaic virus)	Low
Virus	Martellivirales: Virgaviridae	*Tobamovirus viridimaculae* (cucumber green mottle mosaic virus)	Low

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

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6. Appendix: Pests with non-quarantine status

We found evidence that the organisms listed below are associated with *Cucumis sativus* (cucumber) and are present in the Republic of Korea; however, none are of quarantine significance for the United States (ARM, 2025, or as defined by ISPM No. 5 (IPPC, 2024). Although we did not intensively evaluate the evidence, we provide references supporting each pest's potential presence in the Republic of Korea, presence in the United States (if applicable), and association with *Cucumis sativus*. If any of the organisms are **not** present in the United States, we also provided justification for their non-quarantine status. Unless otherwise noted, these organisms are non-actionable at U.S. ports of entry (ARM, 2025).

Organism	In the Republic of Korea	In U.S.	Host Association	Notes
COLLEMBOLA: Symphypleona: Bourletiellidae *Bourletiella hortensis* Fitch	ESK, 1994	Priestley and Brownbridge, 2009	Umeya and Okada, 2003	n/a
MALACOSTRACA: Isopoda: Armadillidiidae *Armadillidium vulgare* (Latreille)	Cha and Oh, 2023	Alhajouj and Starkey, 2023	Umeya and Okada, 2003	n/a
INSECT: Coleoptera: Curculionidae *Hypera postica* (Gyllenhal)	NSMK, 2022	CABI, 2025	Umeya and Okada, 2003	n/a
INSECT: Coleoptera: Curculionidae *Listroderes costirostris* Schoenherr	KNAM-IN, 2021	CABI, 2025	Umeya and Okada, 2003	n/a
INSECT: Diptera: Agromyzidae *Liriomyza sativae* Blanchard	iBOL, 2024	CABI, 2025	Basij et al., 2011	n/a
INSECT: Diptera: Agromyzidae *Liriomyza trifolii* Burgess	CABI, 2025; Kim et al., 2000	CABI, 2025	Bhat et al., 2022; CABI, 2025; Kim et al., 2000; Sappanukhro et al., 2010	n/a
INSECT: Diptera: Anthomyiidae *Delia platura* (Meigen)	Paik et al., 2007	Griffiths, 1997; Reid Jr, 1940	ACIR, 2025; Umeya and Okada, 2003	n/a
INSECT: Diptera: Sciaridae *Bradysia impatiens* (Johannsen); syn. *Bradysia agrestis* Sasakawa	Kim et al., 2000	iBOL, 2024	Kim et al., 2000	n/a
INSECT: Hemiptera: Aleyroidae *Bemisia tabaci* (Gennadius)	CABI, 2025; Goh et al., 2004	CABI, 2025	Bhat et al., 2022; Goh et al., 2004	No Action Required except when on tomato from the Dominican Republic (ARM, 2025).

Organism	In the Republic of Korea	In U.S.	Host Association	Notes
INSECT: Hemiptera: Aleyroidae *Trialeurodes vaporariorum* (Westwood) syn. *Trialeurodes sonchi* (Kotinsky)	Evans, 2008; Goh et al., 2004; Jeon et al., 2009; Kim et al., 2000	CABI, 2025; Evans, 2008	Evans, 2008; Goh et al., 2004; Jeon et al., 2009; Kim et al., 2000	n/a
INSECT: Hemiptera: Aphididae *Acyrthosiphon pisum* (Harris)	CABI, 2025	CABI, 2025	CABI, 2025	n/a
INSECT: Hemiptera: Aphididae *Aphis gossypii* Glover	Goh et al., 2004; KNPQS, 2000; Lim et al., 2012	CABI, 2025	Ali and Vargo, 1992; Goh et al., 2004; Kim et al., 2000	n/a
INSECT: Hemiptera: Aphididae *Aphis spiraecola* Patch	CABI, 2025	CABI, 2025	CABI, 2025	n/a
INSECT: Hemiptera: Aphididae *Aulacorthum solani* (Kaltenbach)	CABI, 2025	CABI, 2025	CABI, 2025	n/a
INSECT: Hemiptera: Aphididae *Myzus persicae* (Sulzer)	CABI, 2025	CABI, 2025	CABI, 2025	n/a
INSECT: Hemiptera: Aphididae *Rhopalosiphum maidis* (Fitch)	CABI, 2025	CABI, 2025	Hegab, 2017	n/a
INSECT: Hemiptera: Coccidae *Parasaissetia nigra* (Nietner)	ESK, 1994; Kwon et al., 2005	Garcia Morales et al., 2016	Varshney, 1992	n/a
INSECT: Hemiptera: Diaspididae *Aspidiotus destructor* Signoret	ESK, 1994; Kwon et al., 2005	Garcia Morales et al., 2016	Williams and Watson, 1988	n/a
INSECT: Hemiptera: Diaspididae *Pinnaspis strachani* (Cooley)	ESK, 1994	Garcia Morales et al., 2016	Williams and Watson, 1988	n/a
INSECT: Hemiptera: Pentatomidae *Nezara viridula* (Linnaeus)	CABI, 2025; ESK, 1994	CABI, 2025	CABI, 2025; Dieckhoff et al., 2021	n/a
INSECT: Hemiptera: Pseudococcidae *Planococcus citri* (Risso)	ESK, 1994; Kwon et al., 2003a	Garcia Morales et al., 2016	Jansen and Alferink, 2023	n/a

Organism	In the Republic of Korea	In U.S.	Host Association	Notes
INSECT: Lepidoptera: Erebidae *Arctia caja* (Linnaeus)	ESK, 1994; Lim et al., 2023	Dubatolov and Philip, 2013	Robinson et al., 2023	n/a
INSECT: Lepidoptera: Erebidae *Hyphantria cunea* (Drury)	ESK, 1994; Kim and Kil, 2012; Lim et al., 2023	CABI, 2025	Kim and Kil, 2012	n/a
INSECT: Lepidoptera: Noctuidae *Agrotis ipsilon* (Hufnagel)	CABI, 2025	CABI, 2025	CABI, 2025	n/a
INSECT: Lepidoptera: Noctuidae *Peridroma saucia* Hübner	CABI, 2025	CABI, 2025	CABI, 2025	n/a
INSECT: Lepidoptera: Noctuidae *Spodoptera exigua* (Hübner)	CABI, 2025; Goh et al., 2004; Kim et al., 2018a	CABI, 2025	Goh et al., 2004; Robinson et al., 2023	n/a
INSECT: Lepidoptera: Noctuidae *Spodoptera frugiperda* (J.E. Smith)	Under Eradication (CABI, 2025)	CABI, 2025	CABI, 2025	n/a
INSECT: Lepidoptera: Noctuidae *Trichoplusia ni* (Hübner)	CABI, 2025	CABI, 2025	CABI, 2025	n/a
INSECT: Thysanoptera: Thripidae *Frankliniella occidentalis* (Pergande)	Goh et al., 2004; Jeong et al., 2018; KNPQS, 2000	CABI, 2025	CABI, 2025; Cho et al., 2001b; Goh et al., 2004; Kim et al., 2000	n/a
INSECT: Thysanoptera: Thripidae *Microcephalothrips abdominalis* (Crawford)	ESK, 1994; Jeong et al., 2018; Woo et al., 1991	CABI, 2025; Mound et al., 2016	CABI, 2025; Miyazaki and Kudo, 1988	n/a
INSECT: Thysanoptera: Thripidae *Scirtothrips dorsalis* Hood	ESK, 1994; Jeong et al., 2018	CABI, 2025	CABI, 2025	n/a

Organism	In the Republic of Korea	In U.S.	Host Association	Notes
INSECT: Thysanoptera: Thripidae *Thrips nigropilosus* Uzel	ESK, 1994; Jeong et al., 2018; Woo et al., 1991	CABI, 2025; Mound et al., 2016	Cho et al., 2001b	n/a
INSECT: Thysanoptera: Thripidae *Thrips setosus* Moulton	CABI, 2025; ESK, 1994; Woo, 1988; Woo et al., 1991	CABI, 2025	CABI, 2025; Miyazaki and Kudo, 1988; Woo, 1988; Woo et al., 1991	n/a
INSECT: Thysanoptera: Thripidae *Thrips tabaci* Lindeman	ESK, 1994; Woo, 1988; Woo et al., 1991	CABI, 2025	CABI, 2025; Cho et al., 2001b; Miyazaki and Kudo, 1988; Woo, 1988; Woo et al., 1991	n/a
MITE: Trombidiformes: Tarsonemidae *Polyphagotarsonemus latus* Banks	CABI, 2025; Cho et al., 1996	CABI, 2025	CABI, 2025; Umeya and Okada, 2003	n/a
MITE: Trombidiformes: Tarsonemidae *Tarsonemus bilobatus* Suski	Zhang, 2003	Akyazi et al., 2021	Umeya and Okada, 2003; Zhang, 2003	n/a
MITE: Sarcoptiformes: Acaridae *Tyrophagus neiswanderi* Johnston & Bruce	Hwan Kim et al., 2014	Johnston and Bruce, 1965	Hwan Kim et al., 2014; Johnston and Bruce, 1965	n/a
MITE: Sarcoptiformes: Acaridae *Tyrophagus putrescentiae* (Schrank)	CABI, 2025	CABI, 2025	Umeya and Okada, 2003	n/a
MITE: Trombidiformes: Tetranychidae *Panonychus citri* (Mcgregor)	CABI, 2025	CABI, 2025	Umeya and Okada, 2003	n/a
MITE: Trombidiformes: Tetranychidae *Petrobia latens* (O.F. Müller)	CABI, 2025; Kim et al., 1988	CABI, 2025; Dibble, 1979	CABI, 2025	n/a

Organism	In the Republic of Korea	In U.S.	Host Association	Notes
MITE: Trombidiformes: Tetranychidae *Tetranychus kanzawai* Kishida	CABI, 2025; Goh et al., 2004; Kim et al., 2000	CABI, 2025	Goh et al., 2004; Kim et al., 2000; Umeya and Okada, 2003	n/a
MITE: Trombidiformes: Tetranychidae *Tetranychus urticae* Koch; syn. *Tetranychus cinnabarinus* (Boisduval)	CABI, 2025; Goh et al., 2004; Shim et al., 2016	CABI, 2025	Goh et al., 2004; Kim et al., 2000; Umeya and Okada, 2003	n/a
MOLLUSK: Stylommatophora: Limacidae *Limacus flavus* (Linnaeus); syn. *Limax flavus* Linnaeus	Lee et al., 2010	FMNH, 2025	Umeya and Okada, 2003	n/a
NEMATODE: *Aphelenchus avenae* Bastian	Jun and Kim, 2004	Barnes et al., 1981	Eshova et al., 2024	n/a
NEMATODE: *Ditylenchus destructor* Thorne	Young Ho Kim and Seung Hwan Ohh, 1995	CABI, 2025	Sturhan and Brzeski, 1991	n/a
NEMATODE: *Ditylenchus dipsaci* (Kühn) Filipjev	Park et al., 2005	CABI, 2025	Hesling, 1972	n/a
NEMATODE: *Helicotylenchus dihystera* (Cobb) Sher	Mwamula and Lee, 2021	CABI, 2025	Patil et al., 2017	n/a
NEMATODE: *Meloidogyne arenaria* (Neal) Chitwood	Choi, 1963; Choi and Choo, 1978; Choo et al., 1990	CABI, 2025	Brito et al., 2008; López-Pérez et al., 2011; Quénéhervé et al., 2011; Tariq-Khan et al., 2020	n/a
NEMATODE: *Meloidogyne hapla* Chitwood	Choi and Choo, 1978; Choo et al., 1990	Walters and Barker, 1994	Bui and Desaeger, 2022	n/a
NEMATODE: *Meloidogyne incognita* (Kofoid & White) Chitwood	Choi and Choo, 1978; Choo et al., 1990	Faske et al., 2023	Choo et al., 1990	n/a

Organism	In the Republic of Korea	In U.S.	Host Association	Notes
NEMATODE: *Meloidogyne javanica* (Treub) Chitwood	Choi and Choo, 1978; Choo et al., 1990	Walters and Barker, 1994	Tariq-Khan et al., 2020	n/a
NEMATODE: *Paratrichodorus minor* (Colbran) Siddiqi	Park et al., 2008	CABI, 2025	Almohithef et al., 2020	n/a
NEMATODE: *Pratylenchus brachyurus* (Godfrey) Filipjev & Schuurmans-Stekhoven	Han et al., 2006	CABI, 2025	Machado and Inomoto, 2001	n/a
NEMATODE: *Pratylenchus penetrans* (Cobb) Filipjev and Schuurmans-Stekhoven	Kang et al., 2022a	Wheeler et al., 1994	Miller, 1978	n/a
NEMATODE: *Pratylenchus thornei* Sher & Allen	Huh et al., 2023	CABI, 2025	Kepenekci et al., 2020	n/a
BACTERIUM: *Acidovorax citrulli* Schaad syn. *Acidovorax avenae* subsp. *citrulli* Willems	Islam et al., 2019; Rahimi-Midani et al., 2018	Islam et al., 2019	Rahimi-Midani et al., 2018	n/a
BACTERIUM: *Acidovorax konjaci* (Goto) Willems et al.	Back et al., 2016	Creswell, 2014	Back et al., 2016	n/a
BACTERIUM: *Agrobacterium radiobacter* Beijerinck & van Delden (Conn) syn. *Rhizobium radiobacter* (Beijerinck & van Delden) Young et al.	Jang et al., 2009	CABI, 2025	Ignatov et al., 2016	n/a
BACTERIUM: *Agrobacterium rhizogenes* (Riker et al.) Conn syn. *Rhizobium rhizogenes* (Riker et al.) Young et al.	Vargas et al., 2020	CABI, 2025	Geng et al., 2022	n/a
BACTERIUM: *Erwinia tracheiphila* (Smith) Bergey et al.	LPDK, 2025	Rojas et al., 2015; Sanogo et al., 2011; Zehnder et al., 2000	LPDK, 2025; Shapiro et al., 2018	n/a

Organism	In the Republic of Korea	In U.S.	Host Association	Notes
BACTERIUM: *Pectobacterium brasiliense* Portier et al. syn. *Pectobacterium carotovorum* subsp. *brasiliensis* El Tassa and Duarte)	Hong et al., 2023a; Lee et al., 2014a	CABI, 2025; McNally et al., 2017; Rosskopf and Hong, 2016	Hong et al., 2023a; Oulghazi et al., 2021	n/a
BACTERIUM: *Pectobacterium carotovorum* Portier et al. syn. *Pectobacterium carotovorum* subsp. *carotovorum* (Jones) Hauben et al.)	Jee et al., 2020	Osdaghi, 2022	Nazerian et al., 2011	n/a
BACTERIUM: *Pseudomonas corrugata* Roberts	Sang and Kim, 2014	CABI, 2025; Powell et al., 2013	Catara et al., 2002	n/a
BACTERIUM: *Pseudomonas marginalis* pv. *marginalis* (Brown) Stevens	Choi and Han, 1990	CABI, 2025	Amanifar, 2019	n/a
BACTERIUM: *Pseudomonas syringae* pv. *lachrymans* (Smith & Bryan) Young et al.	LPDK, 2025	Newberry et al., 2016; Scheck, 2020	LPDK, 2025; Mortensen and Fatmi, 2017	n/a
BACTERIUM: *Pseudomonas syringae* pv. *syringae* van Hall	Lee et al., 2015	CABI, 2025	Keinath et al. 2017	n/a
BACTERIUM: *Pseudomonas viridiflava* (Burkholder) Dowson	Myung et al., 2010; Seo et al., 2018	CABI, 2025; Lipps et al., 2019	Seo et al., 2018	n/a
BACTERIUM: *Ralstonia pseudosolanacearum* Safni	Lee et al., 2020	Chiu et al., 2024	Le et al., 2023	n/a
BACTERIUM: *Ralstonia solanacearum* (Smith) Yabuuchi et al. Race 2	Kim et al., 2019	Yu et al., 2003	Le et al., 2023; Wicker et al., 2002	n/a
CHROMISTAN: *Globisporangium debaryanum* (R. Hesse) Uzuhashi, Tojo & Kakish. syn. *Pythium debaryanum* R. Hesse	Ki and Kim, 1985	Hendrix and Campbell, 1970	Muradov et al., 2019	n/a
CHROMISTAN: *Globisporangium ultimum* (Trow) Uzuhashi, Tojo & Kakishima syn. *Pythium ultimum* Trow	LPDK, 2025	CABI, 2025	LPDK, 2025	n/a

Organism	**In the Republic of Korea**	**In U.S.**	**Host Association**	**Notes**
CHROMISTAN: *Phytophthora capsici* Leonian	Hwang and Kim, 1995	CABI, 2025; Cline et al., 2008	Herrero et al., 2008	n/a
CHROMISTAN: *Phytophthora cryptogea* Pethybr. & Laff.	Hong et al., 1999; Jee et al., 1996)	CABI, 2025; Cline et al., 2008	Farr and Rossman, 2025	n/a
CHROMISTAN: *Phytophthora drechsleri* Tucker	LPDK, 2025	CABI, 2025; Cline et al., 2008	LPDK, 2025; Mansoori and Banihashemi, 1982	n/a
CHROMISTAN: *Phytophthora nicotianae* Breda de Haan	Hyun and Choi, 2014	CABI, 2025	Erwin and Ribeiro, 1996	n/a
CHROMISTAN: *Pythium aphanidermatum* (Edson) Fitzp. syn. *Pythium butleri* Subraman.	LPDK, 2025	CABI, 2025	LPDK, 2025	n/a
FUNGUS: *Alternaria alternata* (Fr.) Keissl.	Kwon et al., 2021; Lee et al., 2013	CABI, 2025	Vakalounakis and Malathrakis, 1988	n/a
FUNGUS: *Alternaria atra* (Preuss) Woudenb. & Crous, syn. *Ulocladium atrum* Preuss	Yu, 2015	CABI, 2025	Jones and Baker, 2007	n/a
FUNGUS: *Alternaria brassicae* (Berk.) Sacc.	Cho et al., 2001a	CABI, 2025	Nishikawa and Nakashima, 2020	n/a
FUNGUS: *Alternaria cucumerina* Ellis & Everh. J.A., Elliott	Kim et al., 1994b; Kwon et al., 2021	Daley et al., 2017	Atia et al., 2012	n/a
FUNGUS: *Alternaria dauci* (J.G. Kühn) J.W. Groves & Skolko	Do and Kim, 2024	CABI, 2025	Kwon et al., 2021	n/a
FUNGUS: *Aspergillus flavus* Link	Choi et al., 2021	Farr and Rossman, 2025	Ahmed et al., 2017	n/a
FUNGUS: *Aspergillus fumigatus* Fresen.	Hong et al., 2010	Farr and Rossman, 2025	Ahmed et al., 2017	n/a
FUNGUS: *Aspergillus niger* Tiegh.	Hong et al., 2013	Farr and Rossman, 2025	Ahmed et al., 2017	n/a

Organism	In the Republic of Korea	In U.S.	Host Association	Notes
FUNGUS: *Athelia rolfsii* (Curzi) C.C. Tu & Kimbr. syn. *Sclerotium rolfsii* Sacc.	Kwon et al., 2014a	CABI, 2025	LPDK, 2025; Kumar et al., 2018	n/a
FUNGUS: *Botrytis cinerea* Pers. syn. *Botryotinia fuckeliana*	Aktaruzzaman et al., 2018	CABI, 2025	Al-Sadi et al., 2011; LPDK, 2025	n/a
FUNGUS: *Cladosporium cladosporioides* (Fresen.) de Vr.	Nam et al., 2015	Raymond et al., 1959	Raymond et al., 1959	n/a
FUNGUS: *Cladosporium cucumerinum* Ellis & Arthur	Lee et al., 1997	CABI, 2025	Lee et al., 1997	n/a
FUNGUS: *Cladosporium tenuissimum* Cooke	Jo et al., 2018; Nam et al., 2015	Bensch et al., 2010	Al-Sadi et al., 2011	n/a
FUNGUS: *Colletotrichum coccodes* (Wallr.) Hughes	Kim et al., 2003a	Jenkins and Averre, 1983	Jenkins and Averre, 1983	n/a
FUNGUS: *Colletotrichum orbiculare* (Berk.) Arx syns.: *Colletotrichum lagenarium* (Pass.) Ellis & Halst., *Gloeosporium orbiculare* (Berk.) Berk.	Lee, 1983; LPDK, 2025	CABI, 2025	Lee, 1983; LPDK, 2025	n/a
FUNGUS: *Corynespora cassiicola* (Berk. & M.A. Curtis) C.T. Wei syn. *Corynespora melonis* (Cooke) Sacc.	Kwon et al., 2003b	CABI, 2025	Kwon et al., 2003b	n/a
FUNGUS: *Didymella bryoniae* (Auersw.) Rehm syns.: *Mycosphaerella melonis* (Pass.) Chiu & Walker, *Stagonosporopsis cucurbitacearum* (Fr.) Aveskamp, Gruyter & Verkley	Lee, 1983	CABI, 2025; Olsen and Stangellini, 1981; Stevenson et al., 2004	Lee, 1983	n/a
FUNGUS: *Fusarium acuminatum* Ellis & Everh. syn. *Gibberella acuminata* Wollenw.	Park et al., 2021	CABI, 2025	García-Estrada et al., 2021; Keinath et al., 2017	n/a
FUNGUS: *Fusarium avenaceum* (Corda: Fr.) Sacc. syn. *Gibberella avenacea* R. J. Cook	Ha et al., 2023	CABI, 2025	Keinath et al., 2017	n/a

Organism	In the Republic of Korea	In U.S.	Host Association	Notes
FUNGUS: *Fusarium culmorum* (W.G. Smith) Sacc.	Kim et al., 2016	CABI, 2025	Hatami et al., 2012; Keinath et al., 2017	n/a
FUNGUS: *Fusarium equiseti* (Corda) Sacc. syn. *Gibberella intricans* Wollenw.	Ha et al., 2023	CABI, 2025	Keinath et al., 2017	n/a
FUNGUS: *Fusarium fujikuroi* Nirenberg syn. *Gibberella fujikuori* Sawada S. Ito	An et al., 2023	Farr and Rossman, 2025	Hatami et al., 2012	n/a
FUNGUS: *Fusarium moniliforme* J. Sheld.	Kim and Kim, 2004	Farr and Rossman, 2025	Hatami et al., 2012	n/a
FUNGUS: *Fusarium oxysporum* f. sp. *cucumerinum* J.H. Owen	Choo et al., 1990; Lee et al., 2014b	Jenkins Jr. and Wehner, 1983	Choo et al., 1990; Lee et al., 2014b	n/a
FUNGUS: *Fusarium oxysporum* f. sp. *niveum* (E.F. Sm.) W.C. Snyder & H.N. Hansen	Jo et al., 2015	CABI, 2025; Norton et al., 1995	Amaradasa et al., 2018	n/a
FUNGUS: *Fusarium sambucinum* Fuckel syn. *Gibberella pulicaris* (Fr.) Sacc.	Choi et al., 2023	CABI, 2025	Hatami et al., 2012	n/a
FUNGUS: *Fusarium solani* f.sp. *cucurbitae* Snyder & Hansen	Han et al., 2012; LPDK, 2025	Elmer et al., 2007	LPDK, 2025; Mehl and Epstein, 2007	n/a
FUNGUS: *Fusarium subglutinans* (Wollenw. & Reinking) P.E. Nelson, Toussoun & Marasas	Han et al., 2015	Farr and Rossman, 2025	Hatami et al., 2012	n/a
FUNGUS: *Geotrichum candidum* Link	Kim et al., 2011	Bourret et al., 2013; Holmes and Clark, 2002	Kim et al., 2011	n/a
FUNGUS: *Golovinomyces cichoracearum* (DC.) V.P. Heluta syn. *Erysiphe cichoracearum* DC.	LPDK, 2025	CABI, 2025	LPDK, 2025	n/a
FUNGUS: *Golovinomyces orontii* (Castagne) V.P. Heluta	Choi et al., 2018	CABI, 2025	Muradov et al., 2019	n/a

Organism	In the Republic of Korea	In U.S.	Host Association	Notes
FUNGUS: *Leveillula taurica* (Lév.) G. Arnaud	Choi et al., 2018	CABI, 2025	El-Ammari and Khan, 1983; Forster, 1989; Vakalounakis et al., 1994	n/a
FUNGUS: *Macrophomina phaseolina* (Tassi) Goid	Yum and Park, 1989	Egel et al., 2020	Egel et al., 2020	n/a
FUNGUS: *Monosporascus cannonballus* Pollacci & Uecker	Heo et al., 2001	Bruton et al., 1995	Heo et al., 2001	n/a
FUNGUS: *Neocosmospora solani* (Mart.) L. Lombard & Crous syn. *Fusarium solani* (Mart.) Sacc.	Lee, 1983; Yang et al., 2018	Aegerter et al., 2000; Raymond et al., 1959	Hatami et al., 2012; Lee, 1983	n/a
FUNGUS: *Podosphaera fuliginea* (Schltdl.) U. Braun & S. Takam. syn. *Sphaerotheca fuliginea* (Schltdl.) Pollacci)	Park et al., 2024	Grand, 1987	Grand, 1987	n/a
FUNGUS: *Podosphaera fusca* (Fr.) U. Braun & Shishkoff syn. *Podosphaera xanthii* (Castagne) U. Braun & Shishkoff	Cho et al., 2013; Hong et al., 2018; Shin, 1994	CABI, 2025; Kousik et al., 2011; Kousik and Ikerd, 2025	Lebeda and Sedláková, 2006; Shin, 1994	n/a
FUNGUS: *Podosphaera macularis* (Wallr.) U. Braun & S. Takam.	Park et al., 2010	Gent et al., 2020	Havill et al., 2023	n/a
FUNGUS: *Pseudoperonospora cubensis* (Berk. & M.A. Curtis) Rostovzev	LPDK, 2025	CABI, 2025; Thomas et al., 2017	LPDK, 2025; Thomas et al., 2017	n/a
FUNGUS: *Rhizopus oryzae* Went & Prins. Geerl. syn. *Rhizopus arrhizus* A. Fisch	Kwon et al., 2015	Raymond et al., 1959	Kwon et al., 2015	n/a
FUNGUS: *Rhizopus stolonifer* (Ehrenb.) Vuill.	Park et al., 2010	Sonoda, 1980	Sonoda, 1980	n/a

Organism	In the Republic of Korea	In U.S.	Host Association	Notes
FUNGUS: *Sclerotinia sclerotiorum* (Lib.) de Bary	Kim et al., 2005; Kim et al., 1999; Lee, 1983	CABI, 2025; Ferreira and Boley, 1992	Kim et al., 2005; Kim et al., 1999; Lee, 1983	n/a
FUNGUS: *Stemphylium solani* Weber	Dumin et al., 2021a	Vakalounakis and Markakis, 2013	Vakalounakis and Markakis, 2013	n/a
FUNGUS: *Stemphylium vesicarium* (Wallr.) E.G. Simmons	Cho and Yu, 1998	Hay, 2025	Yu et al., 2023	n/a
FUNGUS: *Thanatephorus cucumeris* (A. B. Frank) Donk syn. *Rhizoctonia solani* J.G. Kühn	Jeon et al., 2010; Kim et al., 1994a	Akber et al., 2022	Bolkan and Riberio, 1985; Kim et al., 2005; Kim et al., 1999; Lee, 1983	n/a
FUNGUS: *Verticillium albo-atrum* Reinke & Berthold	Kim et al., 2001	CABI, 2025	Radisek et al., 2004; Smith, 1965	n/a
FUNGUS: *Verticillium dahliae* Kleb.	Dumin et al., 2021b	CABI, 2025	Muradov et al., 2019	n/a
FUNGUS: *Waitea circinata* Warcup & P. H. B. Talbot syn. *Rhizoctonia oryzae* Ryker & Gooch	Chang and Lee, 2016	CABI, 2025	Vojvodić et al., 2021	n/a
VIROID: *Hostuviroid impedihumuli* (hop stunt viroid) syn. cucumber pale fruit viroid	Jo et al., 2016)	CABI, 2025	Lemmetty et al., 2011; Puchta et al., 1988	n/a
VIROID: *Pospiviroid exocortiscitri* (citrus exocortis viroid)	Kim et al., 2024	CABI, 2025	Fagoaga and Duran-Vila, 1996	n/a
VIRUS: *Begomovirus coheni* (tomato yellow leaf curl virus)	Kil et al., 2016; Kil et al., 2015; Kil et al., 2014	CABI, 2025; Marchant et al., 2020	Al-Ali et al., 2016; Anfoka et al., 2009	n/a
VIRUS: *Crinivirus pseudobetae* (beet pseudoyellows virus)	Choi and Choi, 2016	Tzanetakis and Martin, 2014	Boubourakas et al., 2006	n/a

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VIRUS: *Crinivirus tomatichlorosis* (tomato chlorosis virus)	Abdel-Salam et al., 2019	CABI, 2025	Abdel-Salam et al., 2019; Lee et al., 2018	n/a
VIRUS: *Cucumovirus CMV* (cucumber mosaic virus)	Ko et al., 2006; Lee et al., 1978; Yoon, 1987	CABI, 2025	Valachas et al., 2021	n/a
VIRUS: *Curtovirus betae* (beet curly top virus)	Park et al., 2002	CABI, 2025; Thomas et al., 2017	Desbiez, 2019	n/a
VIRUS: *Gammacarmovirus melonis* (melon necrotic spot virus)	Cho et al., 2021a; Kwak et al., 2015; Lim, 2022a	Lim, 2022b	Ling et al., 2014	n/a
VIRUS: *Orthotospovirus tomatomaculae* (tomato spotted wilt virus)	Kil et al., 2020	CABI, 2025	Kil et al., 2020	n/a
VIRUS: *Polerovirus CABYV* (cucurbit aphid-borne yellows virus)	Choi et al., 2015	Khanal and Ali, 2018; Mondal et al., 2021	Choi et al., 2015	n/a
VIRUS: *Potyvirus citrulli* (watermelon mosaic virus)	Kim et al., 2018b; Ko et al., 2006	CABI, 2025; Cespedes et al., 2023; Rajbanshi and Ali, 2016	Abu-Samah, 1985; Kim et al., 2018b; Ko et al., 2006	n/a
VIRUS: *Potyvirus cucurbitaflavitesselati* (zucchini yellow mosaic virus)	Jin et al., 2009; Ko et al., 2006; Lee et al., 2022	Emerging viruses in cucurbits working group, 2024	Gal-On, 2007; Ko et al., 2006	n/a
VIRUS: *Potyvirus papayanuli* (papaya ringspot virus)	Jin et al., 2009	CABI, 2025	Jin et al., 2009	n/a

Organism	In the Republic of Korea	In U.S.	Host Association	Notes
VIRUS: *Tobamovirus tabaci* (tobacco mosaic virus)	Cho et al., 2021b	CABI, 2025	Hajiabadi et al., 2012	n/a