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

Importation of fresh oregano (*Origanum vulgare*) shoots (stems and leaves) for consumption from Kenya into the United States

A Qualitative, Pathway-Initiated Pest Risk Assessment

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Executive Summary

The Animal and Plant Health Inspection Service (APHIS) of the United States Department of Agriculture (USDA) prepared this document to assess pest risks associated with importing commercially produced fresh shoots (stems and leaves) of oregano, *Origanum vulgare* L. (Lamiaceae), for consumption from Kenya into the United States and territories. Based on the market access request submitted by the government of Kenya, the pathway was considered to include fresh shoots of oregano shipped by air in cartons. Pest risk ratings depend upon the application of all conditions of the pathway as described. Oregano shoots produced under different conditions were not evaluated and may have a different pest risk.

Using the scientific literature, port-of-entry pest interception data, and information from the government of Kenya, a list of quarantine pests that occur in Kenya (on any host) and are associated with *O. vulgare* (anywhere in the world) was developed. One pest, *Spodoptera littoralis* (Boisduval) (Lepidoptera: Noctuidae), was selected for further analysis. It was considered to have a reasonable likelihood of being associated with the commodity (oregano shoots) at the time of harvest and remaining with it, in viable form, throughout the harvesting process. The species was judged to pose a low risk of introduction into the United States.

Detailed examination and choice of appropriate phytosanitary measures to mitigate pest risk are addressed separately from this document.

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1. Introduction

1.1. Background

The purpose of this document is to assess the pest risk associated with the importation of commercially produced fresh shoots (stems and leaves) of oregano, *Origanum vulgare* L., for consumption from Kenya (referred to as the export area) into the 50 United States and territories (referred to as the pest risk analysis or PRA area).

This is a qualitative risk assessment; the likelihood and consequences of pest introduction are expressed as qualitative ratings rather than in 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, 2017). The use of biological and phytosanitary terms is consistent with ISPM No. 5, "Glossary of Phytosanitary Terms" (IPPC, 2019).

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, Part 319.56 of the Code of Federal Regulations (7 CFR §319.56). Under this regulation, the entry of fresh oregano shoots from Kenya into the United States is not authorized. This commodity risk assessment was initiated following a request by the Kenya Plant Health Inspectorate Service to change the federal regulation to allow entry.

1.3. Determining if a weed risk analysis for the commodity is needed

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

Weed risk analyses are not needed for commodities that are already enterable into the PRA area from other countries, for plant species that are widely established (native or naturalized) or cultivated in the PRA area, or for situations in which the imported plant part(s) cannot easily propagate on its own or be propagated. A weed risk assessment for *Origanum vulgare* is not necessary because the plant is widely established in the United States (USDA-NRCS, 2020).

1.4. Description of the pathway

A pathway is "any means that allows the entry or spread of a pest" (IPPC, 2019). In the context of this document, the pathway is the commodity to be imported, together with all the processes the commodity undergoes (from production through importation and distribution) that may have an impact on pest risk. The following description of this pathway focuses on those relevant conditions and processes. The conclusions in this document are therefore contingent on the application of all components of the pathway as described.

1.4.1. Description of the commodity

The specific pathway of concern is the importation of fresh shoots of oregano, *Origanum vulgare* L., for consumption.

1.4.2. Summary of the production, harvest and post-harvest procedures, and shipping and storage conditions being considered

According to information received from the government of Kenya, the shoots will be packed in cartons and shipped by air.

2. Pest List and Pest Categorization

The pest list is a compilation of plant pests with quarantine status for the PRA area. It includes pests that are present in Kenya (on any host) and are known to be associated with *Origanum vulgare* (anywhere in the world). Pests are considered to be of quarantine significance if they are not present in the PRA area, are actionable at U.S. ports of entry, are regulated non-quarantine pests, are considered for or under federal official control, or are those that require evaluation for regulatory action. Consistent with ISPM No. 5, pests that meet any of these definitions are considered "quarantine pests" and may be 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

In Table 1 are listed the quarantine pests that occur in the export area on any host and are associated with the commodity, whether in the export area or elsewhere in the world. For each pest are indicated 1) the part of the plant the pest is generally associated with and 2) whether the pest is likely to remain with the commodity in a viable form following harvesting from the field and prior to any post-harvest processing. The pest list was developed based on the scientific literature, port-of-entry pest interception data, and information provided by the government of Kenya.

Table 1. Quarantine pests associated with *Origanum vulgare* (oregano) (in any country) and present in Kenya (on any host). Shaded rows indicate organisms likely to follow the import pathway.

Pest name	Presence in Kenya	Host association	Plant part(s)	Considered further?
ARTHROPODS				
HEMIPTERA				
Lygaeidae				
Oxycarenus hyalinipennis (Costa)	Le Pelley, 1959	U.S. port interception[1]	Leaf (U.S. port interception)	No. Association with *O. vulgare* undoubtedly is incidental. The insect is a seed-feeder; hosts are almost entirely restricted to Malvaceae (Sweet, 2000).
LEPIDOPTERA				
Noctuidae				

Pest name	Presence in Kenya	Host association	Plant part(s)	Considered further?
Helicoverpa armigera (Hübner)	CABI, 1993	U.S. port interception	Leaf (U.S. port interception)	No. Status of *O. vulgare* as a true host of the insect could not be confirmed by any additional evidence.
Spodoptera littoralis (Boisduval)	KEPHIS, 2018	KEPHIS, 2018	Leaf (KEPHIS, 2018)	Yes.
Pyralidae				
Hellula undalis (F.)	Le Pelley, 1959	U.S. port interception	Leaf (U.S. port interception)	No. Status of *O. vulgare* as a true host of the insect could not be confirmed by any additional evidence.
ORTHOPTERA				
Acrididae				
Schistocerca gregaria Forsskål	Le Pelley, 1959	U.S. port interception	Leaf (U.S. port interception)	No. Status of *O. vulgare* as a true host of the insect could not be confirmed by any additional evidence.
VIRUSES				
Alfamovirus Alfalfa mosaic virus	Kaiser and Robertson, 1976	Fletcher, 1987	Systemic (Brunt et al., 1997).	Likely distributed worldwide (Brunt et al., 1997). No records for Hawaii, Puerto Rico, or the U.S. Virgin Islands found. See note in section 2.2.1.

[1]Data from the USDA-APHIS Agricultural Quarantine Activity Systems Pest Interception Database (Pest ID).

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2.2. Pests considered but not included on the pest list

2.2.1. Organisms with non-quarantine status

***Alfalfa mosaic virus* (AMV):** We consider commodities for consumption dead-end pathways for virus diseases. AMV would need to move from an infected oregano leaf or shoot via an insect vector or by mechanical transmission, so it has a negligible likelihood of coming into contact with host material in the PRA area.

2.2.2. Organisms with non-quarantine status

Organisms listed in the Appendix are associated with oregano and present in Kenya but are not quarantine pests for the United States.

2.3. Pests selected for further analysis

One pest, *Spodoptera littoralis* (Boisduval) (Lepidoptera: Noctuidae), was selected for further analysis. It is a quarantine pest for the United States and was considered to have a reasonable likelihood of being associated with the commodity (fresh oregano shoots) at the time of harvest and remaining with it, in viable form, throughout the harvesting process.

3. Assessing Pest Risk Potential

3.1. Introduction

For each pest analyzed, an overall pest risk potential is estimated. Risk is described by the likelihood of an adverse event, the potential consequences, and the uncertainty associated with these parameters. For each pest, a determination is made whether or not there is an endangered area within the PRA area. The endangered area is defined as the portion of the PRA area where ecological factors favor pest establishment and where pest presence will likely result in economically important losses. If a pest causes an unacceptable impact, that means it will adversely affect agricultural production (e.g., cause 10 percent or greater yield loss, increase production costs, etc.), an environmentally important host, or international trade. Once an endangered area has been defined, the overall risk of each pest is then determined by assessing the likelihood of its introduction into the endangered area on the imported commodity.

The likelihood of introduction is based on the likelihoods of entry and establishment. Risk is qualitatively assessed using the ratings Low, Medium, and High. The risk factors comprising the likelihood of introduction are interdependent; therefore, the model is multiplicative rather than additive. The different risk categories are defined as follows:

High: Pest introduction is highly likely to occur.
Medium: Pest introduction is possible, but for that to happen, the exact combination of required events needs to occur.
Low: Pest introduction is unlikely to occur because one or more of the required events is unlikely to happen or because the full combination of required events is unlikely to align properly in time and space.

Uncertainty is addressed within the assessment as follows:

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

3.2. Assessment results

3.2.1. *Spodoptera littoralis* (Boisduval) (Lepidoptera: Noctuidae)

Spodoptera littoralis, formerly confused with the allopatric *S. litura* (F.) (CABI/EPPO, 1997; EPPO, 2021), is an important pest of cotton, alfalfa, peanut, cowpea, tomato, potato, tobacco, and various other vegetable and ornamental crops in parts of Africa, southern Europe, and Asia (Gentry, 1965; CABI/EPPO, 1997; Pogue, 2002). In Egypt, yield losses in tomato crops of 26-100% have been reported (Ghada et al., 2019). Average fecundity has been reported to be 1000 eggs per female; there may be 7-8 generations per year (Avidov and Harpaz, 1969). Adult flight of up to 1.5 km over a four-hour period has been documented (Salama and Shoukry, 1972).

Long-distance dispersal may be facilitated by movement in trade. Adults trapped in Switzerland, outside of their historical range, suggested that immature stages may have entered the country on imported plants (Hächler, 1986). The pest is frequently imported into the British Isles on *Chrysanthemum* (Carter, 1984).

Defining the Endangered Area for *Spodoptera littoralis* within the United States

Climatic suitability	*Spodoptera littoralis* has a subtropical to tropical distribution. It has been reported from **Africa:** Aldabra Islands, Algeria, Angola, Ascension Island, Benin, Bioko, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Comoros Islands, Democratic Republic of the Congo, Egypt, Eritrea, Ethiopia, Gambia, Ghana, Guinea, Kenya, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Niger, Nigeria, Réunion, Rodrigues, Rwanda, Saint Helena, São Tomé and Príncipe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe; **Asia:** Bahrain, China (Zhejiang), India (Uttarakhand), Iran (Khuzistan), Iraq (Baghdad, Basra), Israel, Jordan, Lebanon, Oman, Pakistan, Saudi Arabia (Jeddah, Mecca), Syria, Turkey (Adana, Antalya), Yemen; and **Europe:** Cyprus, Greece (including Crete, Dodecanese Islands), Italy (including Sicily), Malta, Portugal (including the Azores and Madeira), Spain (including the Canary Islands and Majorca) (CAB, 1967b; Prasad and Bhattacharya, 1975; Neves Evaristo, 1983; Elawad et al., 1997; Pogue, 2002; Garzia and Siscaro, 2003; Martins et al., 2005; Licciardi et al., 2008; Chen et al., 2016). The distribution spans Plant Hardiness Zones 9-14 (Takeuchi et al., 2018), indicating that climatic conditions suitable for survival of the species occur in areas of the continental United States along the Pacific coast and extend through the southernmost states as far north as southern South Carolina, as well as in Hawaii and the Pacific and Caribbean territories.
Hosts in PRA Area	The species is highly polyphagous. Hosts in the PRA area (Setchell, 1924; Neal, 1965; USDA-NRCS, 2020) include **Amaranthaceae:** *Amaranthus cruentus*, *A. dubius*; **Apiaceae:** *Daucus carota*; **Araceae:** *Colocasia esculenta*; **Arecaceae:** *Phoenix dactylifera*; **Asteraceae:** *Cynara scolymus*, *Helianthus annuus*, *Lactuca sativa*; **Brassicaceae:** *Brassica oleracea*, *B. rapa*, *Raphanus sativus*; **Caryophyllaceae:** *Dianthus caryophyllus*; **Casuarinaceae:** *Casuarina equisetifolia*; **Chenopodiaceae:** *Beta vulgaris*, *Chenopodium album*, *Spinacia oleracea*; **Convolvulaceae:** *Ipomoea batatas*; **Cucurbitaceae:** *Citrullus lanatus*, *Cucurbita pepo*; **Euphorbiaceae:** *Manihot esculenta*, *Ricinus communis*; **Fabaceae:** *Arachis hypogaea*, *Glycine max*, *Medicago sativa*, *Phaseolus vulgaris*, *Pisum sativum*; **Lauraceae:** *Persea americana*; **Liliaceae:** *Allium cepa*; **Malvaceae:** *Abelmoschus esculentus*, *Gossypium hirsutum*, *Hibiscus trionum*; **Moraceae:** *Ficus carica*; **Musaceae:** *Musa ×paradisiaca*; **Myrtaceae:** *Eucalyptus saligna*, *Psidium guajava*; **Poaceae:** *Oryza sativa*, *Sorghum bicolor*, *Zea mays*; **Portulacaceae:** *Portulaca oleracea*; **Rosaceae:** *Fragaria ×ananassa*, *Malus domestica*,

	Prunus domestica, *Pyrus communis*; **Rutaceae:** *Citrus ×sinensis*; **Salicaceae:** *Populus alba*; **Solanaceae:** *Capsicum annuum*, *Nicotiana tabacum*, *Raphanus sativus*, *Solanum lycopersicum*, *S. tuberosum*; **Violaceae:** *Viola odorata*; **Vitaceae:** *Vitis vinifera* (Avidov and Harpaz, 1969; Schmutterer, 1971; Brown and Dewhurst, 1975; Mansour et al., 1981; Carter, 1984; Blackford et al., 1996; CABI/EPPO, 1997; Mesbah et al., 2003; Obeng-Ofori and Sackey, 2003; Sadek and Anderson, 2007; El-Khawas and El-Khawas, 2009; Sadek, 2011; Roméo et al., 2015; Agbodzavu, 2019; Gacemi et al., 2019).
Economically important hosts at risk[a]	Of the hosts listed above, those of significant economic importance include *Daucus carota* (carrot), *Phoenix dactylifera* (date), *Helianthus annuus* (sunflower), *Lactuca sativa* (lettuce), *Brassica oleracea* (cabbage), *Beta vulgaris* (beet), *Spinacia oleracea* (spinach), *Ipomoea batatas* (sweet potato), *Citrullus lanatus* (watermelon), *Cucurbita pepo* (pumpkin), *Arachis hypogaea* (peanut), *Glycine max* (soybean), *Pisum sativum* (pea), *Persea americana* (avocado), *Allium cepa* (onion), *Gossypium hirsutum* (cotton), *Oryza sativa* (rice), *Sorghum bicolor* (sorghum), *Zea mays* (maize), *Malus domestica* (apple), *Prunus domestica* (plum), *Pyrus communis* (pear), *Citrus ×sinensis* (orange), *Capsicum annuum* (bell pepper), *Solanum lycopersicum* (tomato), *S. tuberosum* (potato), *and Vitis vinifera* (grape) (NASS, 2020).
Pest potential on economically important hosts at risk	*Spodoptera littoralis* is likely to cause unacceptable consequences if introduced into the United States. As noted above, the species is an important pest of numerous crops, in which losses can be significant.
Defined Endangered Area	The endangered area encompasses the continental United States and territories within Plant Hardiness Zones 9-14, and within which is found one or more of the above-listed hosts. Colonization of commercial hosts in greenhouses, as is common (e.g., Kehat et al., 1969; Garzia and Siscaro, 2003), could expand the endangered area potentially to encompass the entire continental United States.

[a] As defined by ISPM No. 11, supplement 2, "economically" important hosts refers to both commercial and non-market (environmental) plants (IPPC, 2017).

Assessing the likelihood of introduction of *Spodoptera littoralis* into the endangered area via oregano imported from Kenya

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Entry			
Pest prevalence on the harvested commodity	Low	Moderate	A search of the published literature found no evidence to suggest that *O. vulgare* is a normal or usual host of *S. littoralis*. Agliassa and Maffei (2018) showed that feeding on oregano leaves significantly impaired larval growth.

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of surviving post-harvest processing before shipment	Low	High	Eggs are laid, and early-instar larvae feed, on the lower surface of the younger leaves (KEPHIS, 2018). It is possible that any *S. littoralis* eggs or small larvae present on oregano shoots might go undetected before packing and shipment.
Likelihood of surviving transport and storage conditions of the consignment	Low	High	Temperatures, at which oregano shoots will be stored and transported, have not been specified by the government of Kenya. The combined duration of the egg and larval stages of *S. littoralis* has been reported to range from three to 30 days under spring and autumn conditions in Israel (Avidov and Harpaz, 1969). As consignments are to be shipped by air (KEPHIS, 2018), transport time should be considerably shorter than the developmental period of the moth.
Overall Likelihood of Entry	Low		

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Establishment	Low	Low	Oregano is a culinary herb popular in many dishes (Janke and DeArmond, 2004). More than 25% of the U.S. population lives within the endangered area (Christie et al., 2015). Thus, a large market for imported fresh oregano might exist there. The plants will be shipped all the year round (KEPHIS, 2018). Should early-stage *S. littoralis* be present in consignments, climatic conditions likely would be favorable during much of the year for pest survival following arrival. Thereafter, however, several conditions, including completion of development, successful mate-finding by adults, and location of hosts by mated females for oviposition, would have to be met for establishment to occur. Oregano will be imported for consumption only. Thus, the shoots would be expected to have only an extremely limited probability of introduction directly into the natural or agricultural environments, in which hosts of *S. littoralis* might be found. In the unlikely event that a larva would come into contact with a suitable host to colonize, particularly given the myriad mortality sources in the environment arrayed against early-instar Lepidoptera (Zalucki et al., 2002), the prospects for its survival likely would be bleak. According to Avidov and Harpaz (1969), natural mortality during all stages of the insect is very high. They reported that, in laboratory rearings under optimal conditions, mortality reached 84.2 to 99.5%. In nature, conditions for reproduction are less favorable and mortality is therefore even higher. Longevity of adults is about 4-10 days under favorable conditions of temperature and humidity (CABI/EPPO, 1997), allowing little time for mate-finding and the location of reproductive hosts.
Likelihood of Introduction (combined likelihoods of entry and establishment)	Low		

4. Summary and Conclusions of Risk Assessment

Of the organisms associated with *Origanum vulgare* worldwide and present in Kenya, *Spodoptera littoralis* was identified as a quarantine pest for the United States, as reasonably likely to follow the commodity import pathway, and as likely to cause unacceptable consequences. Thus, it is a candidate for risk management. This result represents a baseline estimate of the risks associated with the import pathway as described in section 1.4.

Detailed examination and choice of appropriate phytosanitary measures to mitigate pest risk are not addressed in this document.

5. Literature Cited

Agbodzavu, M.K. 2019. Bio-ecological studies of amaranths lepidopteran defoliators and development of IPM technologies for their management. Dissertation. Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya.

Agliassa, C. and M.E. Maffei. 2018. *Origanum vulgare* terpenoids induce oxidative stress and reduce the feeding activity of *Spodoptera littoralis*. International Journal of Molecular Sciences 19(9); doi: 10.3390/ijms19092805.

Avidov, Z. and I. Harpaz. 1969. Plant Pests of Israel. Jerusalem: Israel Universities Press.

Birithia, R., W. Waceke, P. Lomo, and D. Masiga. 2012. Identification of root-knot nematode species occurring on tomatoes in Kenya: use of isozyme phenotypes and PCR-RFLP. International Journal of Tropical Insect Science 32(2): 78-84.

Blackford, M., B. Clarke, and L. Dinan. 1996. Tolerance of the Egyptian cotton leafworm *Spodoptera littoralis* (Lepidoptera: Noctuidae) to ingested phytoecdysteroids. Journal of Insect Physiology 42(10): 931-936.

Blackman, R.L. and V.F. Eastop. 2000. Aphids on the World's Crops: An Identification and Information Guide, 2nd ed. Chichester, U.K.: John Wiley & Sons, Ltd.

Bolland, H.R., J. Gutierrez, and C.H.W. Flechtmann. 1998. World Catalogue of the Spider Mite Family (Acari: Tetranychidae). Leiden, Netherlands: E.J. Brill.

Brown, E.S. and C.F. Dewhurst. 1975. The genus *Spodoptera* (Lepidoptera, Noctuidae) in Africa and the Near East. Bulletin of Entomological Research 65(2): 221-262.

Brunt, A.A., K. Crabtree, M.J. Dallwitz, A.J. Gibbs, L. Watson, and E.J. Zurcher (eds.). 1997. *Alfalfa mosaic alfamovirus*. Plant Viruses Online: Descriptions and Lists from the VIDE Database, Version: 16th, January 1997.

CAB. 1961. *Heliothrips haemorrhoidalis* (Bch.). Distribution Maps of Pests, Series A (Agricultural) No. 135. London: Commonwealth Agricultural Bureaux.

CAB. 1967a. *Plutella xylostella* (L.) (*maculipennis* Curt.). Distribution Maps of Pests, Series A (Agricultural) No. 32 (revised). London: Commonwealth Agricultural Bureaux.

CAB. 1967b. *Spodoptera littoralis* (Boisd.). Distribution Maps of Pests, Series A (Agricultural) No. 232. London: Commonwealth Agricultural Bureaux.

CAB. 1969. *Thrips tabaci* Lind. Distribution Maps of Pests, Series A (Agricultural) No. 20 (revised). London: Commonwealth Agricultural Bureaux.

CAB. 1972. *Spodoptera exigua* (Hb.). Distribution Maps of Pests, Series A (Agricultural) No. 302. London: Commonwealth Agricultural Bureaux.

CAB. 1974. *Trichoplusia ni* (Hb.) (*Autographa brassicae* Riley, *Plusia ni* Hb.). Distribution Maps of Pests, Series A (Agricultural) No. 328. London: Commonwealth Agricultural Bureaux.

CABI. 1991. *Spoladea recurvalis* (Fabricius) (= *Hymenia recurvalis* (Fabricius), (*H. fascialis* Cramer)). Distribution Maps of Pests, Series A (Agricultural) No. 527. London: CAB International.

CABI. 1993. *Helicoverpa armigera* (Hübner). Distribution Maps of Pests, Series A No. 15 (2nd revision). London: CAB International.

CABI. 2020. Crop Protection Compendium. CAB International, Wallingford, U.K.; https://www.cabi.org/cpc.

CABI/EPPO. 1997. Data sheets on quarantine pests: *Spodoptera littoralis* and *Spodoptera litura*, pp. 518-525. *In* I.M. Smith, D.G. McNamara, P.R. Scott, and M. Holderness (eds.). Quarantine Pests for Europe, 2nd ed. Wallingford, U.K.: CAB International.

CABI/EPPO. 1998. *Nezara viridula* (Linnaeus). Distribution Maps of Plant Pests No. 27, 2nd revision. Wallingford, U.K.: CAB International.

CABI/EPPO. 1999. *Bemisia tabaci* (Gennadius). Distribution Maps of Plant Pests No. 284, 1st revision. Wallingford, U.K.: CAB International.

CABI/EPPO. 2002. *Acanthoscelides obtectus* (Say). Distribution Maps of Plant Pests No. 625. Wallingford, U.K.: CAB International.

CABI/EPPO. 2006. *Liriomyza sativae* Blanchard. Distribution Maps of Plant Pests No. 477, 1st revision. Wallingford, U.K.: CABI Head Office.

CABI/EPPO. 2017. *Spodoptera frugiperda* (Smith). Distribution Maps of Plant Pests No. 68, 2nd revision. Wallingford, U.K.: CABI Head Office.

Capinera, J.L. 2001. Handbook of Vegetable Pests. San Diego, CA: Academic Press.

Caretta, G., E. Piontelli, A.M. Picco, and G.D. Frate. 1999. Some filamentous fungi on grassland vegetation from Kenya. Mycopathologia 145: 155-169.

Carter, D.J. 1984. Pest Lepidoptera of Europe with Special Reference to the British Isles. Dordrecht, Netherlands: Dr W. Junk Publishers.

Chen, B., B.-S. Teh, C. Sun, S. Hu, X. Lu, W. Boland, and Y. Shao. 2016. Biodiversity and activity of the gut microbiota across the life history of the insect herbivore *Spodoptera littoralis*. Scientific Reports 6: 29505; doi: 10.1038/srep29505.

Christie, D., D. Borchert, and R. Magarey. 2015. Plant Hardiness Zones of the United States: Area and Population Analysis. Raleigh, NC: USDA-APHIS, PPQ, Center for Plant Health Science and Technology, Plant Epidemiology and Risk Analysis Laboratory.

Dhang, P. 2018. Urban Pest Control: A Practitioner's Guide. Wallingford, U.K.: CAB International.

El-Khawas, S.A.M. and M.A.M. El-Khawas. 2009. Tolerance strategies of different host plants to cotton leafworm, with field studies on the major insect pests attacking one of these hosts and common natural enemies. Egyptian Journal of Botany 49: 101-114.

Elawad, S., W. Ahmad, and A.P. Reid. 1997. *Steinernema abbasi* sp. n. (Nematoda: Steinernematidae) from the Sultanate of Oman. Fundamental and Applied Nematology 20(5): 435-442.

EPPO. 2003. EPPO report on notifications of non-compliance (detection of regulated pests). EPPO Reporting Service (8): 11.

EPPO. 2021. EPPO datasheet: *Spodoptera littoralis*. EPPO Global Database. Secretariat of the European and Mediterranean Plant Protection Organization; https://gd.eppo.int/taxon/SPODLI/datasheet.

Farr, D.F. and A.Y. Rossman. 2021. Fungal Databases. USDA-ARS Systematic Mycology and Microbiology Laboratory; http://nt.ars-grin.gov/fungaldatabases/index.cfm.

Fletcher, J. 1987. New plant disease records in New Zealand: additional hosts of *Alfalfa mosaic virus* and *Cucumber mosaic virus*. New Zealand Journal of Agricultural Research 30(4): 505-506.

Foba, C.N., D. Salifu, Z.O. Lagat, L.M. Gitonga, K.S. Akutse, and K.K.M. Fiaboe. 2015. Species composition, distribution, and seasonal abundance of *Liriomyza* leafminers (Diptera: Agromyzidae) under different vegetable production systems and agroecological zones in Kenya. Environmental Entomology 44(2): 223-232.

Gacemi, A., A. Taibi, N. El H. Abed, M.M. Bouzina, D. Bellague, and K. Tarmoul. 2019. Effect of four host plants on nutritional performance of cotton leafworm, *Spodoptera littoralis* (Lepidoptera: Noctuidae). Journal of Crop Protection 8(3): 261-271.

Gaetán, S., A. Curioni, and M. Madia. 2007. Recent occurrence of Fusarium wilt caused by *Fusarium oxysporum* on marjoram in Argentina. Australasian Plant Disease Notes 2(1): 115-116.

García Morales, M., B.D. Denno, D.R. Miller, G.L. Miller, Y. Ben-Dov, and N.B. Hardy. 2016. ScaleNet: A Literature-Based Model of Scale Insect Biology and Systematics. USDA-ARS Systematic Entomology Laboratory; http://scalenet.info/catalogue.

Gardner, D. E. 1997. Additions to the rust fungi of Hawai'i. Pacific Science 51:174-182.

Garibaldi, A., D. Bertetti, P. Pensa, A. Poli, and M.L. Gullino. 2013. First report of web blight on oregano (*Origanum vulgare* L.) caused by *Rhizoctonia solani* AG-1-IB in Italy. Plant Disease 97(8): 1119.

Garibaldi, A., A. Minuto, and M.L. Gullino. 2007. First report of white mold caused by *Sclerotinia sclerotiorum* on *Oreganum* [sic] *vulgare* and *Taraxacum officinale* in Italy. Plant Disease 91(10): 1360.

Garzia, G.T. and G. Siscaro. 2003. Notes on natural enemies of armyworms infesting tomato protected crops in south-eastern Sicily. Acta Horticulturae (614): 837-841.

Gentry, J.W. 1965. Crop insects of northeast Africa-southwest Asia. USDA Agriculture Handbook No. 273.

Ghada, E. Abd-Allah, E.M. Hala, E.M. Amal, and Z.A. Wessam. 2019. Toxic effect of tomato leaves extract against the leaf miner *Tuta absoluta* (Lepidoptera: Gelechiidae) and the cotton leafworm *Spodoptera littoralis* (Lepidoptera:Noctuidae). Egyptian Journal of Plant Protection Research Institute 2(3): 488-492.

Hächler, M. 1986. Notizen über drei in der Westschweiz gefangene subtropische Zierpflanzenschädlinge: *Trichoplusia orichalcea* Fab., *Syngrapha circumflexa* L. und *Spodoptera littoralis* Boisd. (Lep., Noctuidae). Mitteilungen der Schweizerischen Entomologischen Gesellschaft 59(3/4): 263-266.

Halbert, S.E. 2003. Coriander aphid, *Hyadaphis coriandri* (Das) (Insecta: Hemiptera: Aphididae). University of Florida IFAS Extension Fact Sheet No. EENY-296.

Halbert, S.E., G. Remaudière, and S.E. Webb. 2000. Newly established and rarely collected aphids (Homoptera: Aphididae) in Florida and the southeastern United States. Florida Entomologist 83(1): 79-91.

Hamm, R.L., P.E. Kaufman, C.A. Reasor, D.A. Rutz, and J.G. Scott. 2006. Resistance to cyfluthrin and tetrachlorvinphos in the lesser mealworm, *Alphitobius diaperinus*, collected from the eastern United States. Pest Management Science 62(7): 673-677.

IPPC. 2017. Pest risk analysis for quarantine pests. International Standards for Phytosanitary Measures No. 11. Rome: Secretariat of the International Plant Protection Convention, United Nations Food and Agriculture Organization.

IPPC. 2019. Glossary of phytosanitary terms. International Standards for Phytosanitary Measures No. 5. Rome: Secretariat of the International Plant Protection Convention, United Nations Food and Agriculture Organization.

Janke, R. and J. DeArmond. 2004. A grower's guide – oregano: *Origanum vulgare*. K-State Research and Extension Fact Sheet No. MF-2621.

Kaiser, W. and D. Robertson. 1976. Notes on East African plant virus disease II. *Alfalfa mosaic virus*. East African Agricultural and Forestry Journal 42(1): 47-54. [CAB Abstracts]

Kanyagia, S. 1979. A survey of vegetable nematodes in Kenya. East African Agricultural and Forestry Journal 44(3): 178-182.

Kehat, M., D. Blumberg, and S. Greenberg. 1969. Vaporized dichlorvos for the control of the Egyptian cotton leaf worm (*Spodoptera littoralis* Boisd.) on greenhouse roses. Zeitschrift für Angewandte Entomologie 64(1): 44-48.

KEPHIS. 2018. Pest Risk Analysis (PRA) Information for Oregano (*Origanum vulgare* L.) Herbs from Kenya. Nairobi: Kenya Plant Health Inspectorate Service (KEPHIS).

Karuri, H.W., D. Olago, R. Neilson, E. Mararo, and J. Villinger. 2017. A survey of root knot nematodes and resistance to *Meloidogyne incognita* in sweet potato varieties from Kenyan fields. Crop Protection 92: 114-121.

Koike, S., K. Subbarao, A. Roelfs, J. Hennen, and S. Tjosvold. 1998. Rust disease of oregano and sweet marjoram in California. Plant Disease 82(10): 1172.

Le Pelley, R.H. 1959. Agricultural Insects of East Africa. Nairobi, Kenya: East Africa High Commission.

Licciardi, S., F. Assogba-Komlan, I. Sidick, F. Chandre, J.M. Hougard, and T. Martin. 2008. A temporary tunnel screen as an eco-friendly method for small-scale farmers to protect cabbage crops in Benin. International Journal of Tropical Insect Science 27(3/4): 152-158.

Mansour, F., D. Rosen, and A. Shulov. 1981. Disturbing effect of a spider on larval aggregations of *Spodoptera littoralis*. Entomologia Experimentalis et Applicata 29(2): 234-237.

Marchesini, E., T. Cosmi, G. Martini, and G. Galbero. 2004. Indagini sui tripidi vettori di tospovirus in Veneto. *In* A. Brunelli and A. Canova (eds.). ATTI Giomate Fitopatologiche. Vol. 1. Bologna, Italy: Universitá di Bologna, pp. 195-200.

Martins, T., L. Oliveira, and P. Garcia. 2005. Larval mortality factors of *Spodoptera littoralis* in the Azores. BioControl 50(5): 761-770.

Matic, S., G. Tabome, A. Garibaldi, and M.L. Gullino. 2020. Alternaria leaf spot caused by *Alternaria* species: an emerging problem on ornamental plants in Italy. Plant Disease 104(8): 2275-2287.

Mesbah, A.H., H.M. Boraei, and A.H. El-Heneidy. 2003. Importance of *Hibiscus trionum* L. weed, as a source of insect pests infesting cotton plants at Kafr El-Sheikh Governorate. Egyptian Journal of Agricultural Research 81(4): 1609-1618.

Millar, I.M. 1994. A Catalogue of the Aphids (Homoptera: Aphidoidea) of Sub-Saharan Africa (Plant Protection Research Institute Handbook No. 4). Pretoria, South Africa: Biosystematics Division, Plant Protection Research Institute.

Moreno, J., J. Rich, E. French, G. Prine, and R. Dunn. 1992. Reactions of selected herbs to three *Meloidogyne* spp. Nematropica 22(2): 217-225.

Morris, P.F., M.S. Connolly, and D.A. St Clair. 2000. Genetic diversity of *Alternaria alternata* isolated from tomato in California assessed using RAPDs. Mycological Research 104(3): 286-292.

Mound, L.A. and S.H. Halsey. 1978. Whitefly of the World: A Systematic Catalogue of the Aleyrodidae (Homoptera) with Host Plant and Natural Enemy Data. Chichester, U.K.: British Museum (Natural History)/John Wiley & Sons.

Nakahara, S. 1994. The genus *Thrips* Linnaeus (Thysanoptera: Thripidae) of the New World. USDA Technical Bulletin No. 1822.

Nakahara, S. 1997. Annotated list of the *Frankliniella* species of the world (Thysanoptera: Thripidae). Contributions on Entomology, International 2(4): 355-389.

NASS. 2020. Agricultural Statistics 2020. Washington, D.C.: U.S. Government Printing Office.

Nattrass, R.M. 1961. Host lists of Kenya fungi and bacteria. Mycological Papers No. 81.

Neal, M.C. 1965. In Gardens of Hawaii, revised ed. (Bernice P. Bishop Museum Special Publication No. 50). Honolulu: Bishop Museum Press.

Neves Evaristo, F. 1983. Da entomofauna da beterraba sacarina em Portugal. Boletim da Sociedade Portuguesa de Entomologia (37): 77-94.

Obeng-Ofori, D. and J. Sackey. 2003. Field evaluation of non-synthetic insecticides for the management of insect pests of okra *Abelmoschus esculentus* (L.) Moench in Ghana. Ethiopian Journal of Science 26(2): 145-150.

Pogue, M.G. 2002. A World Revision of the Genus *Spodoptera* Guenée (Lepidoptera: Noctuidae) (Memoirs of the American Entomological Society No. 43). Philadelphia: American Entomological Society.

Prasad, J. and A.K. Bhattacharya. 1975. Growth and development of *Spodopteru littoralis* (Boisd.) (Lepidoptera, Noctuidae) on several plants. Zeitschrift für Angewandte Entomologie 79(1): 34-48.

Raabe, R.D., I.L. Conners, and A.P. Martinez. 1981. Checklist of plant diseases in Hawaii. Hawaii Institute of Tropical Agriculture and Human Resources, University of Hawaii Information Text Series No. 022.

Rammah, A. and H. Hirschmann. 1988. *Meloidogyne mayaguensis* n. sp. (Meloidogynidae), a root-knot nematode from Puerto Rico. Journal of Nematology 20(1): 58-69.

Robertson, P.L. 1959. A revision of the genus *Tyrophagus*, with a discussion on its taxonomic position in the Acarina. Australian Journal of Zoology 7(2): 146-181.

Roméo, H.C., D.-L. Champlain, A.D. Chantal, and E.A.P. Stephan. 2015. Diversity and agronomic status of tomato and pepper fruit pests in two agro-ecological zones of southern Cameroon: Western Highland and the southern plateau of Cameroon. African Journal of Agricultural Research 10(11): 1224-1232.

Sadek, M.M. 2011. Complementary behaviors of maternal and offspring *Spodoptera littoralis*: oviposition site selection and larval movement together maximize performance. Journal of Insect Behavior 24(1): 67-82.

Sadek, M.M. and P. Anderson. 2007. Modulation of reproductive behaviour of *Spodoptera littoralis* by host and non-host plant leaves. Basic and Applied Ecology 8(5): 444-452.

Salama, H.S. and A. Shoukry. 1972. Flight range of the moth of the cotton leaf worm *Spodoptera littoralis* (Bois.). Zeitschrift für Angewandte Entomologie 71(2): 181-184.

Sasser, J.N. and C.C. Carter (eds.). 1985. An Advanced Treatise on *Meloidogyne*. Volume I: Biology and Control. Raleigh: North Carolina State University, Department of Plant Pathology/United States Agency for International Development.

Schmutterer, H. 1971. Contribution to the knowledge of the crop pest fauna in Ethiopia. Zeitschrift für Angewandte Entomologie 67(4): 371-389.

Setchell, W.A. 1924. American Samoa: Part I. Vegetation of Tutuila Island. Carnegie Institution of Washington Publication No. 341, pp. 1-188.

Smith, C.F. and C.S. Parron. 1978. An annotated list of Aphididae (Homoptera) of North America. North Carolina Agricultural Experiment Station Technical Bulletin No. 255.

Stevenson, J.A. 1975. The Fungi of Puerto Rico and the American Virgin Islands (Contribution of Reed Herbarium No. 23). Baltimore, MD: Clyde F. Reed.

Stiles, C.M. and P.A. Rayside. 2006. Host range of rust isolates on oregano and mint in Florida. Plant Health Progress 7(1); doi.org/10.1094/PHP-2006-0417-01-RS.

Strong, R.G. and G.T. Okumura. 1958. Insects and mites associated with stored foods and seeds in California. California Department of Agriculture Bulletin 47(3): 233-249.

Sweet, M.H. II. 2000. Seed and chinch bugs (Lygaeoidea), pp. 143-264. *In* C.W. Schaefer and A.R. Panizzi (eds.). Heteroptera of Economic Importance. Boca Raton, FL: CRC Press.

Takeuchi, Y., G. Fowler, and A.S. Joseph. 2018. SAFARIS: Global Plant Hardiness Zone Development. North Carolina State University, Center for Integrated Pest Management/United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, Science and Technology, Plant Epidemiology and Risk Analysis Laboratory, Raleigh, NC; https://safaris.cipm.info/safarispestmodel/StartupServlet?phz.

Throne, J.E. and L.D. Cline. 1994. Seasonal flight activity and seasonal abundance of selected stored-product Coleoptera around grain storages in South Carolina. Journal of Agricultural Entomology 11(4): 321-338.

UGA. 2019a. Widely Prevalent Nematodes of the United States. University of Georgia, Center for Invasive Species and Ecosystem Health; https://www.prevalentnematodes.org/.

UGA. 2019b. Widely Prevalent Viruses of the United States. University of Georgia, Center for Invasive Species and Ecosystem Health; https://www.prevalentviruses.org/.

USDA-ARS. 1960. Index of plant diseases in the United States. USDA Agriculture Handbook No. 165.

USDA-NRCS. 2020. The PLANTS Database. USDA Natural Resources Conservation Service, National Plant Data Team, Greensboro, NC; http://plants.usda.gov/.

Valbuza, M.F., A.L. Matioli, M.E. Sato, M.R. Potenza, and E.C. Campos. 2020. Mites in spice and medicinal dehydrated plants stored in bulk in the metropolitan area of São Paulo. Journal of Stored Products Research 85; doi: 10.1016/j.jspr.2019.101540.

Walters, S.A. and K.R. Barker. 1994. Current distribution of five major *Meloidogyne* species in the United States. Plant Disease 78(8): 772-774.

Zalucki, M.P., A.R. Clarke, and S.B. Malcolm. 2002. Ecology and behavior of first instar larval Lepidoptera. Annual Review of Entomology 47: 361-393.

Zimowska, B. 2015. Fungi threatening the cultivation of oregano (*Origanum vulgare* L.) in south-eastern Poland. Acta Scientiarum Polonorum Hortorum Cultus 14(4): 65-78.

6. Appendix. Pests with Non-quarantine Status

Evidence was found to indicate that the below-listed organisms are associated with oregano and are present in Kenya. Because they are not quarantine pests for the United States, however, they were not listed in Table 1 of this risk assessment.

Included in the list of organisms are references supporting their association with the commodity, their presence in Kenya, and their presence in the United States.

Non-quarantine pests associated with *Origanum vulgare* and present in Kenya.

Organism	In Kenya	In United States	Host Association	Notes
ARTHROPODS				
ACARI				
Acaridae				
Tyrophagus putrescentiae (Schrank)	CABI, 2020	Robertson, 1959	Valbuza et al., 2020	Species is a stored-products pest (Valbuza et al., 2020).
Tetranychidae				
Tetranychus ludeni Zacher	Bolland et al., 1998	Bolland et al., 1998	Bolland et al., 1998	
Tetranychus urticae Koch	Bolland et al., 1998	Bolland et al., 1998	U.S. port interception[1]	
COLEOPTERA				
Anobiidae				
Lasioderma serricorne (F.)	Le Pelley, 1959	Strong and Okumura, 1958	U.S. port interception	Species is a stored-products pest (Strong and Okumura, 1958).
Bruchidae				
Acanthoscelides obtectus (Say)	CABI/EPPO, 2002	CABI/EPPO, 2002	U.S. port interception	
Ptinidae				
Stegobium paniceum (L.)	Le Pelley, 1959	Throne and Cline, 1994	U.S. port interception	Species is a stored-products pest (Dhang, 2018).
Tenebrionidae				
Alphitobius diaperinus (Panzer)	Le Pelley, 1959	Hamm et al., 2006	U.S. port interception	
DIPTERA				
Agromyzidae				
Liriomyza sativae Blanchard	Foba et al., 2015	CABI/EPPO, 2006	U.S. port interception	
HEMIPTERA				
Aleyrodidae				
Bemisia tabaci (Gennadius)	CABI/EPPO, 1999	CABI/EPPO, 1999	EPPO, 2003	

Organism	In Kenya	In United States	Host Association	Notes
Trialeurodes vaporariorum (Westwood)	KEPHIS, 2018	Mound and Halsey, 1978	KEPHIS, 2018	
Aphididae				
Aphis craccivora Koch	Millar, 1994	Smith and Parron, 1978	U.S. port interception	
Aphis fabae Scopoli	Millar, 1994	Smith and Parron, 1978	U.S. port interception	
Aphis gossypii Glover	Millar, 1994	Smith and Parron, 1978	Millar, 1994	
Aphis spiraecola Patch (syn.: *A. citricola* van der Goot) (Blackman and Eastop, 2000)	Millar, 1994	Smith and Parron, 1978	U.S. port interception	
Aulacorthum solani (Kaltenbach)	Millar, 1994	Smith and Parron, 1978	U.S. port interception	
Brachycaudus helichrysi (Kaltenbach)	Millar, 1994	Smith and Parron, 1978	U.S. port interception	
Hyadaphis coriandri (Das)	Millar, 1994	Halbert, 2003; Halbert et al., 2000	U.S. port interception	No records for Hawaii found.
Hyperomyzus lactucae (L.)	Millar, 1994	Smith and Parron, 1978	U.S. port interception	
Macrosiphum euphorbiae (Thomas)	Millar, 1994	Smith and Parron, 1978	U.S. port interception	
Macrosiphum rosae (L.)	Millar, 1994	Smith and Parron, 1978	U.S. port interception	No records for Hawaii found.
Myzus ornatus Laing	Millar, 1994	Smith and Parron, 1978	U.S. port interception	
Myzus persicae (Sulzer)	Millar, 1994	Smith and Parron, 1978	U.S. port interception	
Rhopalosiphoninus latysiphon (Davidson)	Millar, 1994	Smith and Parron, 1978	U.S. port interception	
Rhopalosiphum padi (L.)	Millar, 1994	Smith and Parron, 1978	U.S. port interception	
Coccidae				
Coccus hesperidum L.	García et al., 2016	García et al., 2016	U.S. port interception	
Ortheziidae				
Insignorthezia insignis (Browne)	García et al., 2016	García et al., 2016	U.S. port interception	

Organism	In Kenya	In United States	Host Association	Notes
Pentatomidae				
Nezara viridula (L.)	CABI/EPPO, 1998	CABI/EPPO, 1998	U.S. port interception	
Pseudococcidae				
Dysmicoccus brevipes (Cockerell)	García et al., 2016	García et al., 2016	U.S. port interception	
Ferrisia virgata (Cockerell)	García et al., 2016	García et al., 2016	U.S. port interception	
Planococcus citri (Risso)	García et al., 2016	García et al., 2016	U.S. port interception	
LEPIDOPTERA				
Gelechiidae				
Sitotroga cerealella (Olivier)	Le Pelley, 1959	Strong and Okumura, 1958	U.S. port interception	Species is a stored-products pest (Strong and Okumura, 1958).
Noctuidae				
Spodoptera exigua (Hübner)	CAB, 1972	CAB, 1972	U.S. port interception	
Spodoptera frugiperda (Smith)	CABI/EPPO, 2017	CABI/EPPO, 2017	U.S. port interception	No records for Hawaii found.
Trichoplusia ni (Hübner)	CAB, 1974	CAB, 1974	U.S. port interception	
Plutellidae				
Plutella xylostella (L.)	CAB, 1967a	CAB, 1967a	U.S. port interception	Association with oregano unquestionably is incidental, as the host range of the moth is restricted to Brassicaceae (Capinera, 2001).
Pyralidae				
Spoladea recurvalis (F.)	CABI, 1991	CABI, 1991	U.S. port interception	
THYSANOPTERA				
Thripidae				
Frankliniella occidentalis (Pergande)	Nakahara, 1997	Nakahara, 1997	U.S. port interception	
Frankliniella schultzei (Trybom)	Nakahara, 1997	Nakahara, 1997	U.S. port interception	
Heliothrips haemorrhoidalis (Bouché)	CAB, 1961	CAB, 1961	U.S. port interception	
Thrips nigropilosus Uzel	Nakahara, 1994	Nakahara, 1994	U.S. port interception	
Thrips tabaci Lindeman	CAB, 1969	CAB, 1969	Marchesini et al., 2004	

Organism	In Kenya	In United States	Host Association	Notes
NEMATODES				
Meloidogyne arenaria (Neal) Chitwood	Birithia et al., 2012	CONUS[2] (Walters and Barker, 1994); HI (Walters and Barker, 1994); PR (Rammah and Hirschmann, 1988)	Moreno et al., 1992	No records for the U.S. Virgin Islands found.
Meloidogyne incognita (Kofoid & White) Chitwood	Karuri et al., 2017	CONUS (UGA, 2019a); HI (UGA, 2019a); PR (Sasser and Carter, 1985)	Moreno et al., 1992	No records for the U.S. Virgin Islands found.
Meloidogyne javanica (Treub.) Chitwood	Kanyagia, 1979	CONUS (UGA, 2019a); HI (UGA, 2019a); PR (Sasser and Carter, 1985)	Moreno et al., 1992	No records for the U.S. Virgin Islands found.
FUNGI				
Alternaria alternata (Fr. : Fr.) Keissl.	Caretta et al., 1999	CONUS (Morris et al., 2000); HI (Raabe et al., 1981); PR (Stevenson, 1975); USVI (Stevenson, 1975)	Matic et al., 2020	
Boeremia exigua var. *exigua* (Desm.) Aveskamp, Gruyter & Verkley (syn.: *Phoma exigua* Desm.) (Farr and Rossman, 2021)	Nattrass, 1961	CONUS (USDA-ARS, 1960); HI (Raabe et al., 1981); PR (Stevenson, 1975); USVI (Stevenson, 1975)	Zimowska, 2015	

Organism	In Kenya	In United States	Host Association	Notes
Fusarium oxysporum Schlechtendahl	Nattrass, 1961	CONUS (USDA-ARS, 1960); HI (Raabe et al., 1981); PR (Stevenson, 1975); USVI (Stevenson, 1975)	Gaetán et al., 2007	
Neocosmospora solani (Mart.) L. Lombard & Crous (syn.: *Fusarium solani* [Mart.] Sacc.) (Farr and Rossman, 2021)	Nattrass, 1961	CONUS (USDA-ARS, 1960); HI (Raabe et al., 1981); PR (Stevenson, 1975); USVI (Stevenson, 1975)	Gaetán et al., 2007	
Puccinia menthae Pers.	Nattrass, 1961	CONUS (Stiles and Rayside, 2006), Hawaii (Gardner, 1997).	Koike et al., 1998	No records for Puerto Rico, or the U.S. Virgin Islands found.
Sclerotinia sclerotiorum (Lib.) de Bary	Allen, 1995	CONUS (USDA-ARS, 1960); HI (Raabe et al., 1981)	Garibaldi et al., 2007	No records for Puerto Rico, or the U.S. Virgin Islands found.
Thanatephorus cucumeris (Frank) Donk (syn.: *Rhizoctonia solani* Kühn) (Farr and Rossman, 2021)	Nattrass, 1961	CONUS (USDA-ARS, 1960); HI (Raabe et al., 1981); PR (Stevenson, 1975); USVI (Stevenson, 1975)	Garibaldi et al., 2013	

[1]Data from the USDA-APHIS Agricultural Quarantine Activity Systems Pest Interception Database (Pest ID).
[2]CONUS = continental United States, HI = Hawaii, PR = Puerto Rico, USVI = U.S. Virgin Islands