United States Department of Agriculture

Importation of pineapple (*Ananas comosus*) for consumption from the Philippines into the United States and Territories

A Qualitative, Pathway-Initiated Pest Risk Assessment

United States Department of Agriculture

Animal and Plant Health Inspection Service

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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 the pest risks associated with importing commercially produced fruits of pineapple, *Ananas comosus* (Bromeliaceae), for consumption from the Philippines into the entire United States including Hawaii and the territories. Based on the market expansion request submitted by the Philippines, we considered the pathway to include the following processes and conditions: visually inspected whole pineapple fruit with the crown to be imported year-round. The pest risk ratings depend on the application of all conditions of the pathway as described. Pineapple fruits 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 Philippines to develop a list of pests with quarantine significance for the entire United States. These are pests that occur in the Philippines (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.

Pest type	Taxonomy	Scientific name	Likelihood of Introduction overall rating
Arthropod	Diptera: Tephritidae	*Bactrocera dorsalis*	Medium
	Hemiptera: Pseudococidae	*Maconellicoccus hirsutus* (Green)	Low
	Lepidoptera: Limacodidae	*Parasa lepida*	Low
Weed	Asteraceae	*Mikania micrantha* Kunth.	Medium
		Tridax procumbens L.	Medium
	Poaceae	*Cenchrus polystachios* (L.) Morrone.	Medium
		Ischaemum rugosum Salisb.	Low
		Paspalum scrobiculatum L.	Low
		Rottboellia cochinchinensis (Lour.) Clayton	Medium
		Saccharum spontaneum L.	Medium

The following organisms are being considered for regulation as either a NAPPRA pest plant or a federal noxious weed. These weeds meet the threshold for unacceptable consequences of introduction and have a reasonable likelihood of following the commodity pathway.

Pest type	Taxonomy	Scientific name	Likelihood of Introduction overall rating
Weeds	Poaceae	*Urochloa mutica* (Forssk.) T. Q. Nguyen	Medium

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

This document was prepared by analysts of the Plant Epidemiology and Risk Analysis Laboratory, United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (USDA-APHIS-PPQ). The purpose of this report is to assess the pest risk associated with the importation of commercially produced fresh pineapple fruit of *Ananas comosus* (L.) Merr. for consumption from the Philippines (referred to as the export area) into the entire United States including Hawaii and the territories (referred to as the PRA area).

This is a qualitative risk assessment. The likelihood of pest introduction is expressed as a qualitative rating 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, 20182019).

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 319.56-3 (7 CFR §319.56-3, 2019). The commodity is currently permitted into Guam, Northern Marianas Island, and the North Atlantic region of the U.S. This commodity risk assessment was initiated due to the requestor wishes to expand the market area to California, Texas, and Arizona (BPI, 2020).

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

We determined that the weed risk of pineapple does not need to be analyzed because it is already enterable into the U.S. from other countries (PPQ, 2020c).

1.4. Description of the pathway

A pathway is "any means that allows the entry or spread of a pest" (IPPC, 2018; 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. The following description of this pathway focuses on the conditions and processes that may have an impact on pest risk. Our assessment is therefore contingent on the application of all components of the pathway as described in this section.

1.4.1. Description of the commodity

The specific pathway of concern is the importation of whole fresh pineapple fruit with the crown for consumption (BPI, 2020).

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

According to BPI (2020) pineapple fruits will be harvested year-round depending on the time and amount that is ordered from the customer. Visual inspection of fruit upon arrival to the packing house is the only post-harvest procedure being considered during analysis.

2. Pest List and Pest Categorization

The pest list is a compilation of plant pests of quarantine significance to the U.S. This includes pests that are both present in the Philippines (on any host) and known to be associated with *A. comosus* (anywhere in the world). Pests are considered to be of quarantine significance 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 considered for or 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 the scientific literature, port-of-entry pest interception data, and information provided by the government of the Philippines. In Table 1, we list pests that are of quarantine significance to the PRA area. For each pest, we provide evidence of the pest's presence in the Philippines and its association with pineapple. We also indicate the plant parts with which the pest is generally associated and any 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 shaded rows and are also listed separately in Table 2.

Table 1. List of quarantine pests associated with *Ananas comosus* (in any country) and present in the Philippines (on any host).

Pest name	Presence in Philippines	Host association	Plant part(s) [1]	Considered further? [2]
ARTHROPODS				
INSECTA				
COLEOPTERA				
Scarabaeidae				

[1] 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.

[2] "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 Philippines	Host association	Plant part(s) [1]	Considered further? [2]
Adoretus sinicus Burmeister	Aguilar et al., 2014	Petty et al., 2002	Leaf, root (Petty et al., 2002)	No. Present in Hawaii (Petty et al., 2002), American Samoa, Guam, Northern Mariana Islands (CABI, 2020). Adult beetles are large and conspicuous. Therefore, they are unlikely to remain on the crown through the harvesting process.
Leucopholis irrorata Chevrolat	Arcelo, 2016a; Litsinger et al., 1983	Arcelo, 2016a; Hill, 1983	Roots (Arcelo, 2016a; Hill, 1983)	No.
Oryctes rhinoceros (Linnaeus)	Catley, 1969; Waterhouse, 1993a	Catley, 1969	Leaf, crown (Catley, 1969). Plant part based on its association with other hosts (Catley, 1969).	No. Larvae feed on decaying wood material and are not associated with fruit (Catley, 1969; Giblin-Davis et al., 2001). Adult beetles are large and conspicuous. Therefore, they are unlikely to remain on the crown through the harvesting process. Present in American Samoa, Guam, Hawaii (Marshall et al., 2017)
Xylotrupes gideon (Linnaeus)	Abenis et al., 2018	Waite and Elder, 2004	Fruit (Waite and Elder, 2004).	No. Adult beetles are large and conspicuous. Therefore, they are unlikely to remain on the fruit through the harvesting process. Larvae feed on organic material and roots in soil (Waite and Elder, 2004).
DIPTERA				
Tephritidae				
Bactrocera dorsalis (Hendel) syn.: *B. papayae* Drew & Hancock	Schutze et al., 2012	Hui, 2001	Fruit (Hui, 2001; Macion et al., 1968)	Yes.
HEMIPTERA				
Alydidae				
Lygaeidae				
Nysius vinitor Bergroth	Malipatil, 2010	Rohrbach and Johnson, 2003	Leaf (Rohrbach and Johnson, 2003)	No. Adults are mobile external feeders (Rohrbach and Johnson, 2003), so they are unlikely to remain with the fruit when disturbed.

Pest name	Presence in Philippines	Host association	Plant part(s) [1]	Considered further? [2]
Pseudococcidae				
Geococcus coffeae Green	Ben-Dov, 1994	Ben-Dov, 1994	Root (Hara et al., 2001). Plant part based on association with other hosts.	No. Present in Florida, Hawaii (García Morales et al., 2016), and Puerto Rico (Miller, 2005).
Maconellicoccus hirsutus (Green)	Ben-Dov, 1994	Hodgson and Lagowska, 2011	Buds, fruits, leaves, roots, and stems (Hoy et al., 2006). Plant part based on association with other hosts.	Yes. Non-actionable only to St. Thomas (PestID, 2020). However, present in California, Florida, Georgia, Louisiana, South Carolina, Texas, Hawaii, Puerto Rico, and the US Virgin Islands (García Morales et al., 2016).
LEPIDOPTERA				
Limacodidae				
Parasa lepida (Cramer)	Waterhouse, 1993a	Butani, 1975	Leaf (Butani, 1975)	Yes.
Noctuidae				
Eudocima phalonia (L.); Syn: *Eudocima fullonia* (Clerk), *Ortheis fullonia* (Clerk) (Zilli and Hogenes, 2002)	Zhang, 1994	Denton et al., 1989	Fruit (Denton et al., 1989)	No. Present in Hawaii, American Samoa, and Guam (CABI, 2020). Species in this genus are fruit-piercing moths (CABI, 2020; Ngampongsai et al., 2005). Only adults attack fruit, and they feed externally. This very mobile moth generally feeds at night and is unlikely to remain with the fruit during the harvesting process. Eggs are laid on the underside of host leaves and larvae feed on foliage of different hosts than adults (Chhagan and McKenna, 2019)
Ischyja manlia (Cramer)	Vaylure et al., 2012	Robinson et al., 2001	Fruit (Ngampongsai et al., 2005)	Species in this genus are fruit-piercing moths (Ngampongsai et al., 2005). Only adults attack fruit, and they feed externally. This very mobile moth generally feeds at night and is unlikely to remain with the fruit during the harvesting process.

Pest name	Presence in Philippines	Host association	Plant part(s) [1]	Considered further? [2]
Orthoptera				
Acrididae				
Locusta migratoria manilensis (Meyen)	Steedman, 1990	Steedman, 1990	Leaf, flower, fruit (Steedman, 1990)	No. Adults and immature stages are large mobile external feeder. It is unlikely to remain with the fruit during the harvesting process.
Oxya chinensis (Thunberg)	Buzzetti and Devriese, 2008	Petty et al., 2002	Leaf (Petty et al., 2002)	No. Adults and immature stages are large mobile external feeder. It is unlikely to remain with the fruit during the harvesting process.
Valanga nigricornis (Burmeister)	Waterhouse, 1993a	Waterhouse, 1993a	Leaf (Waterhouse, 1993a)	No. Adults and immature stages are large mobile external feeder. It is unlikely to remain with the fruit during the harvesting process.
Gryllidae				
Tarbinskiellus portentosus (Lichtenstein)	Gupta and Chandra, 2016	Petty et al., 2002	Leaf (Petty et al., 2002)	No. Adults and immature stages are large mobile external feeder. It is unlikely to remain with the fruit during the harvesting process.
Teleogryllus mitratus (Burmeister)	Townsend, 1980	Huang and Wang, 2016	Roots (Huang and Wang, 2016)	No.
MOLLUSKS				
Lissachatina fulica (Bowdich); syn. *Achatina fulica* Bowdich	Constantino-Santos et al., 2014	Gołdyn et al., 2016	Fruit, leaves, roots, buds, stems (CABI, 2020) Plant part based on association with other hosts.	No. Present in Hawaii, American Samoa, Guam, and Northern Marina Islands (CABI, 2020). This species is a large external feeder, unlikely to remain with the fruit during the harvesting process.
NEMATODES				
Radopholus similis (Cobb) Thorne	CABI, 2020	CABI, 2020	Root (CABI, 2020)	No.
WEEDS				
Amaranthaceae				
Achyranthes aspera L.	POWO, 2020;	Girija and Menon, 2019; Tosh et al., 1982	No evidence	No - Limited distribution in the U.S. (Kartesz, 2020; POWO, 2020)

Pest name	Presence in Philippines	Host association	Plant part(s) [1]	Considered further? [2]
Alternanthera sessilis (L.) DC.	NGRP, 2020; POWO, 2020;	Sarkar et al., 2017	No evidence	No - Regulated as a FNW [3] (7 CFR § 360, 2020). Present in more than 5 states (Kartesz, 2020)
Apiaceae				
Centella asiatica (L.) Urb.	NGRP, 2020; POWO, 2020	Sarkar et al., 2017	No evidence	No - Present in Hawaii and the Northern Mariana Islands (NGRP, 2020)
Apocynaceae				
Ichnocarpus frutescens (L.) W. T. Aiton	NGRP, 2020; POWO, 2020	Girija and Menon, 2019	No evidence	No
Araliaceae				
Hydrocotyle javanica Thunb.	NGRP, 2020; POWO, 2020	Sarkar et al., 2017	No evidence	No
Asteraceae				
Acmella calva (DC.) R. K. Jansen, syn.: Spilanthes calva DC.	NGRP, 2020	Girija and Menon, 2019; Sarkar et al., 2017	No evidence	No
Blumea lacera (Burm. f.) DC.	NGRP, 2020; POWO, 2020	Sarkar et al., 2017	No evidence	No - Present in Guam (NGRP, 2020)
Crassocephalum crepidioides (Benth.) S. Moore	NGRP, 2020; POWO, 2020	Girija and Menon, 2019; Kumar and Ramakrishnan, 1989; Sarkar et al., 2017	No evidence	No - Limited distribution in the U.S. (Kartesz, 2020; NGRP, 2020)
Cyanthillium cinereum (L.) H. Rob. syn.: *Vernonia cinerea* (L.) Less.	NGRP, 2020; POWO, 2020	Girija, 2019 #7; CABI, 2020 #3; Sarkar, 2017 #12}	No evidence	No - Limited distribution in the U.S. (Kartesz, 2020)
Grangea maderaspatana (L.) Poir.	POWO, 2020	Sarkar et al., 2017	No evidence	No
Mikania cordata (Burm. f.) B. L. Rob.	Chauhan et al., 2015; NGRP, 2020; POWO, 2020	Chauhan et al., 2015	No evidence	No - Regulated as a FNW (7 CFR § 360, 2020)

[3] FNW = Federal Noxious Weed

Pest name	Presence in Philippines	Host association	Plant part(s) [1]	Considered further? [2]
Mikania micrantha Kunth.	NGRP, 2020; POWO, 2020	AQAS, 2020; CABI, 2020; Girija and Menon, 2019	Fruit (AQAS, 2020)	Yes - This species is regulated as a FNW (7 CFR § 360, 2020). Present in Puerto Rico and in one county in Florida (Kartesz, 2020)
Synedrella nodiflora (L.) Gaertn.	Chauhan et al., 2015; NGRP, 2020; POWO, 2020	CABI, 2020; Chauhan et al., 2015; Girija and Menon, 2019	No evidence	No - Limited distribution in the U.S. (Kartesz, 2020)
Tridax procumbens L.	NGRP, 2020; POWO, 2020	AQAS, 2020; CABI, 2020; Girija and Menon, 2019	Fruit (AQAS, 2020)	Yes - Regulated as a FNW (7 CFR § 360, 2020). Present in Florida Hawaii, Texas, and Puerto Rico (Kartesz, 2020)
Brassicaceae				
Rorippa indica (L.) Hiern	NGRP, 2020; POWO, 2020	Sarkar et al., 2017	No evidence	No - Limited distribution in the U.S. (Kartesz, 2020)
Cannabaceae				
Trema orientalis (L.) Blume	NGRP, 2020	Sarkar et al., 2017	No evidence	No - Limited distribution in the U.S. (Kartesz, 2020)
Commelinaceae				
Commelina benghalensis L.	NGRP, 2020; POWO, 2020	CABI, 2020; Sarkar et al., 2017	No evidence	No - Regulated as a FNW (7 CFR § 360, 2020). Present in more than five state (Kartesz, 2020)
Convolvulaceae				
Camonea vitifolia (Burm. f.) Simões & Staples, syn.: *Merremia vitifolia* (Burm. f.) Hallier f.	NGRP, 2020; POWO, 2020	Girija and Menon, 2019	No evidence	No
Ipomoea aquatica Forssk.	NGRP, 2020; POWO, 2020	Sarkar et al., 2017	No evidence	No - Regulated as a FNW (7 CFR § 360, 2020). Present in Florida, Hawaii, Guam, and Puerto Rico (Kartesz, 2020; PPQ, 2020a).
Ipomoea biflora (L.) Pers. syn.: *Ipomoea plebia* R. Br.	POWO, 2020	Rohrbach and Johnson, 2003	No evidence	No
Cucurbitaceae				

Pest name	Presence in Philippines	Host association	Plant part(s) [1]	Considered further? [2]
Cucumis maderaspatanus L. syn.: *Mukia maderaspatana* (L.) M. Roem.	NGRP, 2020	Sarkar et al., 2017	No evidence	No
Cyperaceae				
Bulbostylis densa (Wall.) Hand.-Mazz.	NGRP, 2020; POWO, 2020	Sarkar et al., 2017	No evidence	No
Cyperus flavidus Retz. syn.: *Cyperus globosus* All.	NGRP, 2020; POWO, 2020	Kumar and Ramakrishnan, 1989	No evidence	No - Regulated under NAPPRA (7 CFR § 319.37-4, 2020; APHIS, 2020)
Eleocharis retroflexa (Poir.) Urb.	POWO, 2020	Sarkar et al., 2017	No evidence	No - Present in Alabama and Puerto Rico (Keener et al., 2020; POWO, 2020)
Euphorbiaceae				
Microstachys chamaelea (L.) Müll. Arg. syn.: *Sebastiania chamaelea* (L.) Müll. Arg.	NGRP, 2020	Girija and Menon, 2019	No evidence	No
Fabaceae				
Grona heterophylla (Willd.) H. Ohashi & K. Ohashi, syn.: *Desmodium heterophyllum* (Willd.) DC.	NGRP, 2020; POWO, 2020	Sarkar et al., 2017	No evidence	No - Present in Hawaii and the Northern Mariana Islands (NGRP, 2020)
Grona triflora (L.) H. Ohashi & K. Ohashi, syn.: *Desmodium triflorum* (L.) DC.	NGRP, 2020; POWO, 2020	Sarkar et al., 2017	No evidence	No - Present in Florida, Louisiana, Hawaii, Puerto Rico, and the Northern Mariana Islands (Kartesz, 2020; NGRP, 2020; POWO, 2020)
Mimosa diplotricha C. Wright	POWO, 2020	CABI, 2020	No evidence	No - Regulated as a FNW (7 CFR § 360, 2020). Present in Hawaii, Puerto Rico, Guam, American Samoa, and the Northern Mariana Islands (NGRP, 2020; POWO, 2020)

Pest name	Presence in Philippines	Host association	Plant part(s) [1]	Considered further? [2]
Mimosa invisa Mart. ex Colla	Chauhan et al., 2015; Sison, 1998	Chauhan et al., 2015; Girija and Menon, 2019; Rohrbach and Johnson, 2003; Sison, 1998	No evidence	No - Present in American Samoa and the Northern Mariana Islands (POWO, 2020; Waterhouse, 1997). Species being considered for regulation as a quarantine species
Hypericaceae				
Hypericum japonicum Thunb.	NGRP, 2020	Sarkar et al., 2017	No evidence	No
Lamiaceae				
Leucas aspera (Willd.) Link	NGRP, 2020; POWO, 2020	Girija and Menon, 2019; Sarkar et al., 2017	No evidence	No
Leucas zeylanica (L.) W. T. Aiton	NGRP, 2020; POWO, 2020	Sarkar et al., 2017	No evidence	No
Linderniaceae				
Bonnaya ciliata (Colsm.) Spreng. syn.: *Lindernia ciliata* (Colsm.) Pennell	NGRP, 2020; POWO, 2020	Sarkar et al., 2017	No evidence	No - Present in Florida (NGRP, 2020; POWO, 2020)
Malvaceae				
Urena lobata L.	NGRP, 2020; POWO, 2020	Sarkar et al., 2017	No evidence	No - Limited distribution in the U.S. (Kartesz, 2020; NGRP, 2020)
Melastomataceae				
Melastoma malabathricum L.	NGRP, 2020; POWO, 2020	CABI, 2020; Sarkar et al., 2017	No evidence	No - Regulated as a FNW (7 CFR § 360, 2020). Present in Florida and Hawaii (Kartesz, 2020; NRCS, 2020a)
Molluginaceae				
Glinus oppositifolius (L.) Aug. DC.	POWO, 2020	Sarkar et al., 2017	No evidence	No
Onagraceae				
Ludwigia perennis L. syn.: *Ludwigia parviflora* Roxb.	NGRP, 2020; POWO, 2020	Girija and Menon, 2019; Sarkar et al., 2017	No evidence	No
Oxalidaceae				
Biophytum sensitivum (L.) DC.	POWO, 2020	Girija and Menon, 2019	No evidence	No

Pest name	Presence in Philippines	Host association	Plant part(s) [1]	Considered further? [2]
Plantaginaceae				
Limnophila rugosa (Roth) Merr.	NGRP, 2020; POWO, 2020	Sarkar et al., 2017	No evidence	No
Poaceae				
Bothriochloa ewartiana (Domin) C.E.Hubb.	POWO, 2020	Popay et al., 2008	Fruit (Popay et al., 2008)	No - Because we found no evidence that this species has established beyond its native range or that it is considered a weed, it is not a threshold pest and does not require further analysis. Because so little is known about this species, we have some uncertainty about its weed potential should it escape beyond its native range.
Cenchrus pedicellatus (Trin.) Morrone, syn.: Pennisetum pedicellatum Trin.	NGRP, 2020; POWO, 2020	Girija and Menon, 2019	No evidence	No - Regulated as a FNW (7 CFR § 360, 2020). Present in Florida (Kartesz, 2020).
Cenchrus polystachios (L.) Morrone. syn: *Pennisetum polystachion* (L.) Schult.	POWO, 2020	AQAS, 2020; Waterhouse, 1993b	Fruit (AQAS, 2020)	Yes - Regulated as a FNW (7 CFR § 360, 2020). Present in more than five states (Kartesz, 2020)
Dinebra chinensis (L.) P. M. Peterson & N. Snow, syn: *Leptochloa chinensis* (L.) Nees	NGRP, 2020; POWO, 2020	CABI, 2020	No evidence	No - Regulated as a FNW (7 CFR § 360, 2020).
Eragrostis tenella (L.) P. Beauv. ex Roem. & Schult. syn.: *Eragrostis amabilis* (L.) Wight & Arn.	POWO, 2020	Sarkar et al., 2017	No evidence	No - Present in Florida, and with a limited distribution in Alabama, California, Georgia, and Mississippi (Kartesz, 2020)
Eragrostis unioloides (Retz.) Nees	POWO, 2020	Sarkar et al., 2017	No evidence	No - Present in Florida, Georgia, Hawaii, and Puerto Rico (Kartesz, 2020; NGRP, 2020; POWO, 2020; Weakley, 2020)

Pest name	Presence in Philippines	Host association	Plant part(s) [1]	Considered further? [2]
Imperata cylindrica (L.) Raeusch.	NGRP, 2020; POWO, 2020	CABI, 2020; Kumar and Ramakrishnan, 1989; Rohrbach and Johnson, 2003; Suwunnamek, 1995	No evidence	No - Regulated as a FNW (7 CFR § 360, 2020). Present in more than five states (Kartesz, 2020)
Isachne globosa (Thunb.) Kuntze, syn.: *Isachne miliacea* Roth	NGRP, 2020; POWO, 2020	Girija and Menon, 2019	No evidence	No - Regulated under NAPPRA (7 CFR § 319.37-4, 2020; APHIS, 2020)
Ischaemum rugosum Salisb.	NGRP, 2020; POWO, 2020	AQAS, 2020	Fruit (AQAS, 2020)	Yes - Regulated as a FNW (7 CFR § 360, 2020).
Oplismenus burmanni (Retz.) P.Beauv.	POWO, 2020	Sarkar et al., 2017	No evidence	No - Present in Florida (Kartesz, 2020)
Paspalum scrobiculatum L.	NGRP, 2020; POWO, 2020	AQAS, 2020	Fruit (AQAS, 2020)	Yes - Regulated as a FNW (7 CFR § 360, 2020). Present in more than five states (Kartesz, 2020; NRCS, 2020a)
Polytrias indica (Houtt.) Veldkamp, syn.: *Ischaemum indicum* (Houtt.) Merr., *Phleum indicum* Houtt.	POWO, 2020	Girija and Menon, 2019	No evidence	No - Present in Florida and Puerto Rico (Kartesz, 2020; NRCS, 2020a)
Rottboellia cochinchinensis (Lour.) Clayton, syn.: *Rottboellia exaltata* (Lour.) Clayton	Chauhan et al., 2015; POWO, 2020; Sison, 1998	AQAS, 2020; CABI, 2020; Sison, 1998	Fruit (AQAS, 2020)	Yes - Regulated as a FNW (7 CFR § 360, 2020). Present in more than five states (PPQ, 2020f).
Saccharum spontaneum L.	NGRP, 2020; POWO, 2020; Rohrbach and Johnson, 2003; Sison and Mendoza Jr., 1992	AQAS, 2020; CABI, 2020; Rohrbach and Johnson, 2003; Sarkar et al., 2017; Sison and Mendoza Jr., 1992	Fruit (AQAS, 2020; Popay et al., 2008)	Yes - Regulated as a FNW (7 CFR § 360, 2020). Present in Florida, Hawaii, and Puerto Rico (Kartesz, 2020)

Pest name	Presence in Philippines	Host association	Plant part(s) [1]	Considered further? [2]
Sorghum halepense (L.) Pers.	Chauhan et al., 2015	CABI, 2020; Chauhan et al., 2015; Rohrbach and Johnson, 2003	No evidence	No - Regulated as a federal noxious weed seed (7 CFR § 361, 2020). Present in more than five states (Kartesz, 2020)
Sporobolus indicus (L.) R. Br. var. *flaccidus* (Roem. & Schult.) Veldkamp, syn.: *Sporobolus diandrus* (Retz.) P. Beauv.	NGRP, 2020; S. indicus (POWO, 2020)	Tosh et al., 1982	No evidence	No - Limited distribution in Hawaii, Louisiana, and Texas (Kartesz, 2020)
Urochloa distachya (L.) T.Q.Nguyen, syn.: *Brachiaria distachya* (L.) Stapf	POWO, 2020	Girija and Menon, 2019	No evidence	No - Limited distribution in Florida, Hawaii, Maryland, Texas, and Puerto Rico (Kartesz, 2020).
Urochloa mutica (Forssk.) T. Q. Nguyen, Syn.: *Brachiaria mutica* (Forssk.) Stapf, *Panicum purpurascens* Raddi	POWO, 2020	Popay et al., 2008	Fruit (Popay et al., 2008)	Yes - Being considered for regulation as a pest under NAPPRA (7 CFR § 319.37-4, 2020) and as a potential FNW (7 CFR § 360, 2020). Present in Florida and with a limited distribution in more than five other states (Kartesz, 2020)
Rubiaceae				
Dentella repens J. R. Forst. & G. Forst.	NGRP, 2020; POWO, 2020	Sarkar et al., 2017	No evidence	No
Mitracarpus hirtus (L.) DC. syn.: *Mitracarpus verticillatus* (Schumach. & Thonn.) Vatke	POWO, 2020	Girija and Menon, 2019; Sarkar et al., 2017	No evidence	No - Limited distribution in southern U.S. and present in Hawaii (Kartesz, 2020)
Oldenlandia diffusa (Willd.) Roxb. syn.: *Scleromitrion diffusum* (Willd.) R.J.Wang	NGRP, 2020; POWO, 2020	Sarkar et al., 2017	No evidence	No
Spermacoce articularis L. f. syn.: *Borreria articularis* (L. f.) F. N. Williams	NGRP, 2020; POWO, 2020	Kumar and Ramakrishnan, 1989	No evidence	No
Solanaceae				

Pest name	Presence in Philippines	Host association	Plant part(s) [1]	Considered further? [2]
Solanum torvum Sw.	POWO, 2020	CABI, 2020	No evidence	No - Regulated as a FNW (7 CFR § 360, 2020). Present in Florida and Hawaii; waif in Alabama, Mississippi, and Texas (PPQ, 2019).
Urticaceae				
Pouzolzia zeylanica (L.) Benn.	POWO, 2020	Sarkar et al., 2017	No evidence	No - Present in Florida (Kartesz, 2020)

2.2. Pests considered but not included on the pest list

2.2.1. Pests with weak evidence for association with the commodity or presence in the export area

Arthropods: *Eutetranychus orientalis* (Klein) (Acari: Tetranychidae) is reported on pineapple (Walter et al., 1995). This insect was reported being found in the Philippines (Walter et al., 1995) as well as Hawaii (Heu, 2007). However, specimens of *E. orientalis* from the Philippines have been determined to be misidentified (Corpuz-Raros, 2005) so the insect was not included on the pest list. It is reportable for the entire United States (PestID, 2020).

Scapanes australis (Boisduval) (Coleoptera: Dynastidae) is reported to infest pineapple (Smee, 1965). The association of *S. australis* with pineapple is based on the general life history of *Oryctes rhinoceros*, and the host range is attributed to rhinoceros beetles in general (Smee, 1965). We found no further evidence in the literature for this host association, so we did not include *S. australis* on the pest list. It is reportable for the entire United States (PestID, 2020).

Lamprolonchaea smaragdi (Walker) Syn: *Lonchaea aurea* Macquart (Diptera: Lonchaeidae) is reported on pineapple in Malaysia (Yunus and Hua, 1980) and found in the Philippines (Pitkin, 2012). However, no other direct evidence of host association with pineapple was found in the literature and no other evidence that this species is regularly intercepted with pineapple, so this pest was not included on the pest list.

Zeugodacus cucurbitae (Coquillett) (Diptera: Tephritidae) is reported as being unable to oviposit onto 'Smooth Cayenne' and other pineapple varieties (Armstrong and Vargas, 1982). However, no other direct evidence of host association was found, so we did not include *Z. cucurbitae* on the pest list. It is reportable for the entire United States (PestID, 2020).

Leptocorisa acuta (Thunberg) (Hemiptera: Alydidae) is reported on pineapple (Litsinger et al., 2015) and in the Philippines (Litsinger et al., 2015; Waterhouse, 1993a). Litsinger et al. (2015) states that *L. acuta* seeks refuge in *Ananas* plantation during the day, returning to grasses at night. No other direct evidence in the literature for this host association was found in the literature and no other evidence that this species is regularly intercepted with pineapple, so this pest was not included on the pest list. It is reportable for the entire United States (PestID, 2020).

Pseudococcus cryptus Hempel (Hemiptera: Pseudococcidae) is reported on pineapple (García Morales et al., 2016; Williams, 2004). However, the Williams (2004) account is from an interception on pineapple. We found no further direct evidence in the literature for this host association and no other evidence that this species is regularly intercepted with pineapple, so we did not include *P. cryptus* on the pest list. It is reportable for the entire United States (PestID, 2020).

Spodoptera litura (Fabricius) (Lepidoptera: Noctuidae) was listed as a pest of pineapple in Taiwan in one report (Petty et al., 2002) and present in the Philippines (Waterhouse, 1993a). A later report states that this association was erroneous (Huang and Wang, 2016). Furthermore, no other sources could be found linking *Spodoptera litura* to pineapple and was not included on the pest list. It is reportable for the entire United States (PestID, 2020).

Selepa celtis Moore (Lepidoptera:Nolidae) was listed as a pest of pineapple in a report on pests of China fruit trees (CASI, 1994) and present in the Philippines (Shubhalaxmi et al., 2011). However, no other sources could be found documenting host association with pineapple and no other evidence that this species is regularly intercepted with pineapple, so we did not include on the pest list. The genus *Selepa* is only listed as reportable (PestID, 2020).

2.2.2. Organisms with non-quarantine status

We found evidence of organisms that are associated with pineapple, and are present in the export area, but are not of quarantine significance for the PRA area. These organisms are listed in the Appendix.

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

2.4. Pests selected for further analysis

We identified 11 quarantine pests for further analysis (Table 2).

Table 2. Pests selected for further analysis.

Pest type	Taxonomy	Scientific name
Arthropod	Diptera: Tephritidae	*Bactrocera dorsalis*
	Hemiptera: Pseudococidae	*Maconellicoccus hirsutus* (Green)
	Lepidoptera: Limacodidae	*Parasa lepida*
Weed	Asteraceae	*Mikania micrantha*
		Tridax procumbens
	Poaceae	*Cenchrus polystachios*
		Ischaemum rugosum
		Paspalum scrobiculatum
		Rottboellia cochinchinensis

	Saccharum spontaneum
	Urochloa mutica

3. Assessing Pest Risk Potential

3.1. Introduction

We estimated the overall pest risk potential for each pest we analyzed. Risk is described by the likelihood of an adverse event, the potential consequences, and the uncertainty associated with these parameters. For each pest, we determined if an endangered area exists within the PRA area. 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 losses. If a pest causes an unacceptable impact (i.e., is a threshold pest), that means it could adversely affect agricultural production by causing 10 percent or greater yield loss, increasing production costs, or impacting an environmentally important host, or international trade. Once we defined the endangered area for a pest, we assessed the pest's overall risk by evaluating 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. We qualitatively assess risk 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. We define the risk categories as follows:

> **High**: This outcome is highly likely to occur.
> **Medium**: This outcome is possible; but for that to happen, the exact combination of required events needs to occur.
> **Low**: This outcome is unlikely to occur because one or more of the required events are 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 rating.
> **Moderate:** Additional or better evidence may or may not change rating.
> **High:** Reliable evidence is not available.

3.2. Assessment

3.2.1. *Bactrocera dorsalis* (Diptera: Tephrididae)

Bactrocera dorsalis (the Oriental fruit fly) is a destructive pest of fruits and vegetables in Asia (Aketarawong et al., 2014) and across sub-Saharan Africa (Drew et al., 2005; Mwatawala et al., 2006). It is present in Hawaii (Heu, 2007). The Oriental fruit fly has been eradicated from the United States multiple times (Alvarez et al., 2015; NAPPO, 2012, 2014). The name *B. dorsalis* includes the Sri Lankan and African variant *B. invadens*, which has been shown to be extremely

invasive across Africa (Schutze et al., 2015). The Oriental fruit fly has a very broad host range with over 400 known hosts (USDA, 2016).

Defining the endangered area for *Bactrocera dorsalis* within the United States

Climatic suitability	*Bactrocera dorsalis* has been reported from Bhutan, Cambodia, China, India, Indonesia, Myanmar, Nepal, Singapore, Taiwan, Vietnam, Italy, and the United States (Hawaii), as well as from various countries in Africa and Oceania (CABI, 2020; Nugnes et al., 2018; Wan et al., 2012). Based on a comparison of the distribution of *B. dorsalis* with a global map of Plant Hardiness Zones (Takeuchi et al., 2018), we estimated that this fruit fly could establish in Plant Hardiness Zones 9-13 in the United States.
Hosts in PRA area	*Bactrocera dorsalis* has a broad host range, including *Citrus* spp., *Psidium guajava* (guava), *Mangifera indica* (mango), *Carica papaya* (papaya), *Persea americana* (avocado), *Solanum lycopersicum* (tomato), *Prunus armeniaca* (apricot), *Prunus persica* (peach), *Pyrus* spp. (pear), and *Ficus* spp. (fig), all of which occur in the PRA area (Weems, 1964).
Economically important hosts at risk[a]	Economically important hosts at risk from this pest include avocado, citrus, mango, peach, pear, and tomato
Pest potential on economically important hosts at risk	This pest is likely to cause unacceptable consequences because damage caused by *B. dorsalis* consists of punctures from adults laying eggs and damage to the fruit pulp from larvae feeding and tunneling (Ye and Liu, 2005). Heavy infestations can cause major losses in fruit production (Drew and Hancock, 1994; White and Elson-Harris, 1992).
Endangered Area	Based on its current distribution and the distribution of its host plants in the PRA area, we define the area endangered by *Bactrocera dorsalis* as those areas of the United States and Territories within Plant Hardiness Zones 9-13 where it does not already occur.

[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 *Bactrocera dorsalis* into the endangered area via *Ananas comosus* imported from the Philippines

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Entry			

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Pest prevalence on the harvested commodity	Low	Low	*Bactrocera dorsalis* has been reported as a pest of pineapple (Hui, 2001; Lin et al., 2013; Macion et al., 1968) ; however, there are few reports of this association. One source states that although bruised or overripened pineapple is used as a host by *B. dorsalis* in the laboratory, pineapple is not usually attacked in the field (Fullaway, 1949). This lack of evidence of field infestation likely indicates pineapple is not a major host of this fruit fly.
Likelihood of surviving post-harvest processing before shipment	Low	Low	*Bactrocera dorsalis* larvae feed inside of the fruit (Steiner, 1957). Although puncture marks produced from laying eggs may be visible on the fruit surface, it is often impossible to recognize fruit fly-infested fruit (White and Elson-Harris, 1992). For these reasons, we did not change the rating.
Likelihood of surviving transport and storage conditions of the consignment	Low	Low	Storage and transport conditions were not considered in the analysis. Therefore, the rating remains unchanged.
Overall Likelihood of Entry	Low		
Likelihood of Establishment	High	Low	With a host range including over 400 plant species (USDA, 2016), host plants are widely available to *B. dorsalis* in the endangered area. Additionally, the adult flies are capable of flying long distances (Chen et al., 2015).
Likelihood of Introduction (combined likelihoods of entry and establishment)	Medium		

3.2.2. *Maconellicoccus hirsutus* (Hemiptera: Pseudococcidae)

Maconellicoccus hirsutus, the pink hibiscus mealybug, infests the stems, leaves, buds, fruits, and roots of its host plants (Hoy et al., 2006). Feeding by the pink hibiscus mealybug can cause stunted growth and deformation of stems, leaves, or fruit (Hoy et al., 2006). Honeydew expelled by the mealybug supports the growth of sooty mold (Hoy et al., 2006). This mealybug can reproduce quickly with up to 15 generations a year (Hoy et al., 2006). Native to Asia, the

mealybug has been introduced into many tropical and subtropical areas around the world (Hoy et al., 2006).

Defining the endangered area for *Maconellicoccus hirsutus* within the United States

Climatic suitability	The pink hibiscus mealybug is present in the Andaman Islands, Australia, Bangladesh, Benin, Brazil, Brunei, Burkina Faso, Burma, Cameroon, Central African Republic, Chad, China, Colombia, Congo, Cuba, Cyprus, Egypt, Fiji, French Guiana, Gabon, Grenada, Guadeloupe, Guam, Guyana, Haiti, , Hong Kong, India, Indonesia, Iran, Israel, Japan, Jordan, Kampuchea, Kenya, Laos, Lebanon, Liberia, Malaysia, Maldives, Martinique, Mexico, Nepal, Niger, Nigeria, Oman, Pakistan, Papua New Guinea, Philippines, Puerto Rico, Reunion, Saint Kitts and Nevis Islands, Saint Lucia, Saint Martin & Saint Barthelemy, Saudi Arabia, Senegal, Seychelles, Singapore, Socotra Island, Somalia, Sri Lanka, Sudan, Taiwan, Tanzania, Thailand, Tonga, Trinidad and Tobago, Tunisia, Tuvalu, U.S. Virgin Islands, United Arab Emirates, United States (Florida, California, and Hawaii), Venezuela, Vietnam, Yemen, Zaire, Zambia, Zanzibar (CABI, 2020; García-Morales et al., 2016). These areas cover Plant Hardiness Zones 10 through 14 (Takeuchi et al., 2020)
Hosts in PRA area	*Maconellicoccus hirsutus* feeds on a wide range of hosts that are present in the PRA area, such as *Abelmoschus esculentus* (okra), *Arachis hypogaea* (peanut), *Asparagus officinalis* (asparagus), *Citrus* spp., *Cucumis sativus* (cucumber), *Glycine max* (soybean), *Helianthus annuus* (sunflower), *Hibiscus syriacus* (rose of Sharon), *Lactuca sativa* (lettuce), *Medicago sativa* (alfalfa), *Nerium oleander* (oleander), *Phaseolus vulgaris* (common bean), *Prunus domestica* (plum), *Solanum lycopersicum* (tomato), *Vitis vinifera* (grape), and *Zea mays* (corn) (García Morales et al., 2016; NRCS, 2020b).
Economically important hosts at risk[a]	Economically important hosts include okra, peanut, asparagus, citrus, cucumber, soybean, lettuce, alfalfa, common bean, plum, tomato, grape, and corn.
Pest potential on economically important hosts at risk	This pest is likely to cause unacceptable consequences because feeding by the pink hibiscus mealybug can cause stunted growth and deformation of stems, leaves, or fruit (Hoy et al., 2006). Honeydew expelled by the mealybug supports the growth of sooty mold (Hoy et al., 2006).
Endangered Area	The endangered area includes anywhere in the United States or territories in Plant Hardiness Zones 10 through 14 where host plants are present.

[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 *Maconellicoccus hirsutus* into the endangered area via *Ananas comosus* imported from the Philippines

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Entry			
Pest prevalence on the harvested commodity	Low	Medium	*Maconellicoccus hirsutus* is documented from pineapple plants (Hodgson and Lagowska, 2011) and is known to infest the fruit of its host plants (CABI, 2020;Hoy et al., 2006). We could only find one source associating *M. hirsutus* with pineapple, so it is not likely a major or frequent host. Therefore, we chose the rating of Medium.
Likelihood of surviving post-harvest processing before shipment	Low	Low	Infestation with pink hibiscus mealybug is easily detectable as the mealybugs are external feeders covered with white wax (CABI, 2020; Hoy et al., 2006). Additionally, black sooty mold is often seen with mealybug infestation (CABI, 2020; Hoy et al., 2006). Therefore, we lowered the risk rating to Low.
Likelihood of surviving transport and storage conditions of the consignment	Low	N/A	Storage and transport conditions were not considered in the analysis. Therefore, the rating remains unchanged.
Overall Likelihood of Entry	Low		
Likelihood of Establishment	Low	Low	This pest has a very low dispersal potential. See notes below.
Likelihood of Introduction (combined likelihoods of entry and establishment)	Low		

Notes

For mealybugs in general, the adult females are wingless and cannot disperse by flying. Females are often large, with bodies distorted by eggs or nymphs which they carry in their abdomens, although females of most species retain their legs and can move to some extent. Males, by contrast, develop wings and can fly as adults (McKenzie, 1967). Although they have limited ability to disperse by walking, mealybug nymphs may be carried away from hosts by wind. Dispersal by wind depends to a large extent on exposure to wind well off the ground, in the branches of the host plant (Barrass et al., 1994; Grasswitz and James, 2008). Crawlers on imported infested vegetables are highly unlikely to be in such environmental conditions,

reducing the potential for aerial dispersal. Dispersal by wind is dependent on the prevailing wind direction; nymphs have no control over where they are blown. Crawlers would be unlikely to survive shipment, especially in chilled, low-humidity conditions. Some consumers of vegetables may dispose of inedible produce in outdoor compost bins, but since only a small number of vegetables are likely to be infested, mealybugs would only very rarely be moved into compost. Once in compost, the mealybugs would rarely be exposed to the kind of wind conditions necessary for dispersal. For these reasons, mealybugs arriving on commercial fruits and vegetables for consumption have a low to negligible likelihood of dispersing to find new hosts.

3.2.3. *Parasa lepida* (Lepidoptera: Limacodidae)

Parasa lepida can be a destructive pest when infestations are high (Desmier de Chenon, 1982). This insect is currently found throughout southern southeast Asia (CABI, 2020). *Parasa lepida* has a very broad host range including agricultural crops and ornamental plants

Defining the endangered area for *Parasa lepida* within the United States

Climatic suitability	*Parasa lepida* has been reported in Bangladesh, Cambodia, China, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, and Vietnam (CABI, 2020) . Based on a comparison of the distribution of *E. orientalis* with a global map of Plant Hardiness Zones (Takeuchi et al., 2018), we estimated that this spider mite could establish in Plant Hardiness Zones 8-13 in the United States.
Hosts in PRA area	*Parasa lepida* is most harmful to *Cocos nucifera* (coconut) (Desmier de Chenon, 1982). Other host plants include *Camellia sinensis* (tea), *Cassia* spp., *Coffea* spp. (coffee), *Eugenia* spp. (stopper), *Gardenia* spp., *Mangifera* spp. (mango), *Metroxylon* spp., *Musa* spp. (banana), *Nephelium* spp., *Nypa* spp., *Rosa* spp. (rose), and *Theobroma cacao* (cocoa) (Desmier de Chenon, 1982). In Japan, where *P. lepida* is invasive, it has also been reported to feed on *Acer* spp. (maple), *Diospyros kaki* (Japanese persimmon), *Ginkgo biloba* (ginkgo), *Liquidambar* spp. (sweetgum), *Magnolia kobus* (Kobus magnolia), *Morella rubra* (red bayberry), *Robinia pseudoacacia* (black locust), *Triadica sebifera* (Chinese tallow), and *Zelkova serrata* (Japanese elm) (Yamazaki et al., 2013).
Economically important hosts at risk[a]	Economically important hosts at risk from this pest include coconut, other palms, tea, and maple (Yamazaki et al., 2013). In Japan, *P. lepida* is not commonly found in primary and secondary forest, but is abundant in urban and newly developed residential areas (Yamazaki et al., 2013).
Pest potential on economically important hosts at risk	Severe infestations in coconuts can cause complete defoliation of individual trees, resulting in heavy yield losses when not controlled (Desmier de Chenon, 1982).
Endangered Area	Based on its current distribution and the distribution of its host plants in the PRA area, we define the area endangered by *Parasa lepida* as Plant Hardiness Zones 8-13 in the 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 *Parasa lepida* into the endangered area via *Ananas comosus* imported from the Philippines

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Entry			
Pest prevalence on the harvested commodity	High	Medium	In India, *P. lepida* is reported to cause damage in pineapple plantations by feeding on the foliage and pupating in folds of leaves (Butani, 1975). Because *P. lepida* adults lay many eggs and larvae feed in large groups, critical damage thresholds are often reached on other hosts (CABI, 2020).
Likelihood of surviving post-harvest processing before shipment	Medium	Low	Eggs of *P. lepida* are small, flat, and translucent and are laid side by side in groups of up to 40 on the undersides of leaves (Desmier de Chenon, 1982), which may escape detection during post-harvest processing. The larvae feed on pineapple foliage (Butani, 1975). On other hosts, *P. lepida* feeds and pupates gregariously and early outbreaks are often localized on individual plants (Desmier de Chenon, 1982). This behavior would make it easier to notice the pest and its damage during culling. Therefore, we reduced the rating to Medium.
Likelihood of surviving transport and storage conditions of the consignment	Medium	Medium	Storage and transport conditions were not considered in the analysis. Therefore, the rating remains unchanged.
Overall Likelihood of Entry	Medium		

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Establishment	Low	Medium	*Parasa lepida* is polyphagous and feeds on the leaves of its hosts, and adults can fly (Desmier de Chenon, 1982). Adults would likely fly away during harvest processes, so only eggs and early instar larvae would likely to remain with the commodity post-harvest. Caterpillars are not likely to be able to travel far to new hosts. For establishment to occur, multiple individuals of the pest would have to successfully develop to the late instar larval stage on the leaves of the crowns discarded into the environment, pupate in the soil, emerge as an adult, and find a mate and a suitable host plant to lay eggs. Considering the low likelihood of all these conditions being met, we rated this risk element Low.
Likelihood of Introduction (combined likelihoods of entry and establishment)	Low		

3.3 Weed risk analyses

Below we estimate the pest risk potential for the analyzed weeds. However, because weeds do not have hosts *per se*, the analyses focus on risk factors that are more relevant for weeds. The section describing the endangered area is replaced with a short summary that describes the type of plant, U.S. regions and habitats at risk, and factors associated with the invasive and weedy potential of the species. The summaries are derived from separate analyses of the plants that establish the weeds meet the concept of a threshold pest and have the capacity to cause unacceptable impacts in the United States, independent of any pathway. Following each summary, we evaluate the likelihood that the weed can follow that pathway in pineapples from the Philippines.

When determining the likelihood that a weed will be harvested with the commodity, we consider several aspects about the biology and habit of the weed in relation to that of pineapple plants. Pineapple plants are 1-2 meters tall, and have stems that are only 25-50 cm tall, depending on the variety. The inflorescence develops at the end of the stems and is usually capped by a crown of bracts, some of which later develop into short leaves (d'Eeckenbrugge and Leal, 2003). Depending on crop cultivar and growing conditions, flowering is forced from 6 to 16 months after planting, and fruit are harvested 5 to 7 months after that (Malézieux et al., 2003). Thus, a variety of weed species maturing in different seasons could disperse seed into pineapple crowns.

3.3.1. *Mikania micrantha* (Asteraceae)

The result of a weed risk assessment for *Mikania micrantha* is High Risk of becoming weedy or invasive in the United States (PPQ, 2013). *Mikania micrantha* is an herbaceous, twining vine that can grow to about 10 meters in length. It is native to tropical regions in Central and South

America. However, it has established and became invasive in other regions of the world, including Australia and southeastern Asia. It has several traits that have contributed to its invasive success, including a short generation time, prolific reproduction, and tolerance to mutilation. As a vine, it readily climbs over other vegetation, smothers it, and prevents forest tree regeneration. In commercial plantations, it reduces yield and increases the costs of control. *Mikania micrantha* has the potential to establish in some areas of the United States, including along coastal regions of the U.S. Gulf Coast. It has small, plumose seeds that are readily dispersed by wind and are dispersed as contaminants in trade (Acevedo-Rodriguez, 2005; PPQ, 2013). *Mikania micrantha* is regulated as a federal noxious weed (7 CFR § 360, 2020).

Assessing the likelihood of introduction of *Mikania micrantha* into the endangered area via *Ananas comosus* imported from the Philippines

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Entry			
Weed prevalence in the export area	High	Negligible	*Mikania micrantha* is found in tropical regions of the Americas and some parts of southeastern Asia (GBIF Secretariat, 2020; NGRP, 2020; POWO, 2020). It is present throughout most islands in the Philippines (GBIF Secretariat, 2020) and is a major invasive species (Joshi, n.d.; Yang et al., 2017).
Likelihood of being harvested with the commodity	High	Negligible	*Mikania micrantha* is a twining herb that can grow to 20 m tall and climb over other plants (Tiwari, 2005; Yang et al., 2017). The seeds are tiny (about 2 mm long) and have a pappus for wind dispersal (Tiwari, 2005; Yang et al., 2017). From 2005 to 2016, this species was intercepted 40 times in pineapples entering the United States (AQAS, 2020). Therefore, we did not change the rating.
Likelihood of surviving post-harvest processing before shipment	High	Moderate	*Mikania micrantha* produces achenes that are about 2 mm long with a silky white pappus. The seeds are black, linear-oblong, and five-angled (Tiwari, 2005). While some may be present near the outside of the crowns, it is likely that others have become wedged between the growing leaves, particularly those that have been in the crowns for longer periods and may have been washed by rains deeper into the crowns. Because the Philippines did not provide any specific information about how they are addressing contaminant weed seeds, we did not change the rating.

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Overall Likelihood of Entry	High		
Likelihood of Establishment	Low	Negligible	The fresh pineapples are being imported for consumption by consumers. It is unlikely that weed seeds lodged in the crowns will escape during transport to markets. Furthermore, we expect that most consumers will dispose the crowns in their trash bins. Thus, we expect that the likelihood of establishment to be low. Although there may be some consumers that compost the crowns and other parts of the fruit, we believe that the overall likelihood of establishment to still be low.
Likelihood of Introduction (combined likelihoods of entry and establishment)	Medium		

3.3.2. *Tridax procumbens* (Asteraceae)

The result of a weed risk assessment for *Tridax procumbens* is High Risk of spreading or causing harm in the United States (PPQ, 2018). *Tridax procumbens* is an annual or short-lived perennial aster that has already demonstrated a strong ability to establish and spread. It is currently naturalized in Florida, Texas, Hawaii, and Puerto Rico, and could establish in other warm areas. It is readily spread by people as a hitchhiker on cars, ships and containers, and as a contaminant of commodities. Seeds are small, about 2 mm long by 1 mm wide, and have a pappus that likely helps seeds attach to some surfaces such as burlap bags. This species is widely considered a weed of agriculture and anthropogenic areas, and even of natural areas to some extent. It is reported to have substantial impacts in Brazilian soybean production and to reduce crop yield in Sri Lanka. It also interferes with harvest in rice and raises production costs due to increased costs of control. *Tridax procumbens* is allelopathic. Plants are controlled with both mechanical and chemical means in agricultural areas, but the species has developed resistance to glyphosate in Australia and is reported to be tolerant to it in Brazil. *Tridax procumbens* is currently regulated as a federal noxious weed (7 CFR § 360, 2020).

Assessing the likelihood of introduction of *Tridax procumbens* into the endangered area via *Ananas comosus* imported from the Philippines

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Entry			

Risk Element	**Risk Rating**	**Uncertainty Rating**	**Evidence for rating (and other notes as necessary)**
Weed prevalence in the export area	High	Negligible	*Tridax procumbens* is widely distributed in tropical and subtropical regions of the world (NGRP, 2020). In the Philippines, it is widely distributed (GBIF Secretariat, 2020) and has been categorized as a common, but not serious or principal weed of agriculture (Barrion-Dupo, 2018; Holm et al., 1991). However, in some crops such as rainfed rice, this species is considered troublesome (Chauhan and Johnson, 2008).
Likelihood of being harvested with the commodity	High	Negligible	*Tridax procumbens* has ascending to procumbent stems that grow 15 – 50 cm long (Holm et al., 1997; Wagner et al., 1999). Plants germinate, flower, and set seed throughout the year (Holm et al., 1997; Kissmann and Groth, 1992; Pemadasa, 1976). Although *T. procumbens* plants are somewhat shorter than pineapple plants, their seeds are wind-dispersed (Tadulingam and Venkatanarayana, 1955) and may be blown into crowns. From 1995 to 2016 this species was intercepted 43 times in pineapples entering the United States (AQAS, 2020). Therefore, we did not change the rating.
Likelihood of surviving post-harvest processing before shipment	High	Medium	*Tridax procumbens* produces achenes that are brown to black, about 2 mm long by 1 mm wide at the apex, and with a pappus that is 5-6 mm long (Holm et al., 1997). While some may be present near the outside of the crowns, it is likely that others have become wedged between the growing leaves, particularly those that have been in the crowns for longer periods and may have been washed by rains deeper into the crowns. Because the Philippines did not provide any specific information about how they are addressing contaminant weed seeds, we did not change the rating.
Overall Likelihood of Entry	High		

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Establishment	Low	Negligible	The fresh pineapples are being imported for consumption by consumers. It is unlikely that weed seeds lodged in the crowns will escape during transport to markets. Furthermore, we expect that most consumers will dispose the crowns in their trash bins. Thus, we expect that the likelihood of establishment to be low. Although there may be some consumers that compost the crowns and other parts of the fruit, we believe that the overall likelihood of establishment to still be low.
Likelihood of Introduction (combined likelihoods of entry and establishment)	Medium		

3.3.3. *Cenchrus polystachios* (Poaceae)

The most likely outcome of a PPQ WRA for *Cenchrus polystachios* is High Risk of becoming weedy or invasive in the United States (PPQ, 2020d). *Cenchrus polystachios* is a grass that invades agricultural systems and natural areas in tropical regions. It forms dense stands that outcompete native species. It also increases fuel loads, promoting hotter, more destructive wildfires that can reach the canopy. It is naturalized in several counties in Texas and Florida and is present in one county each in Nevada, Arizona, and Mississippi. It is also present in Hawaii and Puerto Rico. Based on its tropical and subtropical distribution, it could likely establish in the southern United States and the island territories. This species is regulated as a federal noxious weed, but under the older name *Pennisetum polystachion* (7 CFR § 360, 2020; PPQ, 2020d).

Assessing the likelihood of introduction of *Cenchrus polystachios* into the endangered area via *Ananas comosus* imported from the Philippines

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Entry			
Weed prevalence in the export area	High	Negligible	*Cenchrus polystachios* is widely distributed in the tropics (GBIF Secretariat, 2020). It is present on the major islands of the Philippines (GBIF Secretariat, 2020), and Waterhouse (1993b) rates it as a widespread and important weed. It infests rice and plantations (Moody, 1989; Parsons and Cuthbertson, 2001).

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of being harvested with the commodity	High	Low	*Cenchrus polystachios* grows 2 to 3 meters tall. The seeds have feathery bristles and are wind-dispersed (Biosecurity Queensland, 2016). From 2014 to 2016, this species was intercepted three times on pineapples entering the United States (AQAS, 2020). Because plants are tall and have wind-dispersed seed we believe it is likely that seeds will blow or fall into pineapple crowns.
Likelihood of surviving post-harvest processing before shipment	High	Moderate	*Cenchrus polystachios* produces seeds that are 3 to 5 mm long with feathery bristles (Biosecurity Queensland, 2016). If seeds are present, it is likely that some have become wedged between the growing leaves in pineapple tops, particularly those that have been in the crowns for longer periods and may have been washed by rains deeper into the crowns. Because the Philippines did not provide any specific information about how they are addressing contaminant weed, we did not change the rating.
Overall Likelihood of Entry	High		
Likelihood of Establishment	Low	Negligible	The fresh pineapples are being imported for consumption by consumers. It is unlikely that weed seeds lodged in the crowns will escape during transport to markets. Furthermore, we expect that most consumers will dispose the crowns in their trash bins. Thus, we expect that the likelihood of establishment to be low. Although there may be some consumers that compost the crowns and other parts of the fruit, we believe that the overall likelihood of establishment to still be low.
Likelihood of Introduction (combined likelihoods of entry and establishment)	Medium		

3.3.4. *Ischaemum rugosum* (Poaceae)

The most likely outcome of a PPQ WRA for *Ischaemum rugosum* is High Risk of becoming weedy or invasive in the United States (PPQ, 2020b). *Ischaemum rugosum* is a grass that grows to 150 cm and is a major weed of rice. It grows best in warm, wet climates and could potentially

establish anywhere in the southern United States where rice is grown. The plant produces large numbers of seeds that can often escape pre-emergent herbicides because of their dormancy. Herbicide-resistant populations have also been detected. It can significantly reduce yield in rice, and because it matures at the same time as the rice crop, it is often an agricultural contaminant. In Guam, it is a significant weed, though its native status is unclear. *Ischaemum rugosum* is a federal noxious weed (7 CFR § 360, 2020). The seeds are light brown, triangular, 2.5-3 mm long, and 1 mm wide. They are distinguished from other species by transverse ridges on the glumes that are readily visible to the naked eye (PPQ, 2020b).

Assessing the likelihood of introduction of *Ischaemum rugosum* into the endangered area via *Ananas comosus* imported from the Philippines

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Entry			
Weed prevalence in the export area	High	Negligible	*Ischaemum rugosum* is distributed in tropical regions of Oceania, Central and South America, and western Africa (GBIF Secretariat, 2020; POWO, 2020).It is widely distributed in the Philippines (GBIF Secretariat, 2020). Holm et al. (1991) list it as a common agricultural weed, and Waterhouse (1993b) rates it as an important weed. It significantly reduces yield in rice (Lim et al., 2015) and is a very common seed contaminant (Galinato et al., 1999).
Likelihood of being harvested with the commodity	Medium	Moderate	*Ischaemum rugosum* is often a short grass (Roseleine and Suzuki, 2012), but it can grow up to 150 cm tall (Naidu, 2012). In 2011, this species was intercepted twice on pineapples entering the United States twice (AQAS, 2020). Therefore, because we do not believe it is likely to be routinely harvested with pineapples, we reduced the rating one level.
Likelihood of surviving post-harvest processing before shipment	Medium	Moderate	*Ischaemum rugosum* produces seeds that are 2.5 to 3 mm long and 1 mm wide (Galinato et al., 1999). If seeds are present, it is likely that some have become wedged between the growing leaves, particularly those that have been in the crowns for longer periods and may have been washed by rains deeper into the crowns. Because the Philippines did not provide any specific information about how they are addressing contaminant weed seeds, we did not change the rating.

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Overall Likelihood of Entry	Medium		
Likelihood of Establishment	Low	Negligible	The fresh pineapples are being imported for consumption by consumers. It is unlikely that weed seeds lodged in the crowns will escape during transport to markets. Furthermore, we expect that most consumers will dispose the crowns in their trash bins. Thus, we expect that the likelihood of establishment to be low. Although there may be some consumers that compost the crowns and other parts of the fruit, we believe that the overall likelihood of establishment to still be low.
Likelihood of Introduction (combined likelihoods of entry and establishment)	Low		

3.3.5. *Paspalum scrobiculatum* (Poaceae)

The most likely outcome of a PPQ WRA for *Paspalum scrobiculatum* is High Risk of becoming weedy or invasive in the United States (PPQ, 2020c). *Paspalum scrobiculatum* is a grass with wild and cultivated forms. It is regulated as a federal noxious weed (7 CFR § 360, 2020). It is listed as naturalized in one county in each of five states. Herbarium records, however, indicate that its range may be wider, although sparsely distributed, and it could likely establish throughout the southeastern United States. It is reported as a weed of rice and other crops and as an invader of disturbed areas, but we did not find any references on its specific impact. It reproduces vegetatively and by seed, and the seeds can be dispersed by water. Plants are not inherently toxic, but the grains can become infected with a toxic fungus and must be carefully cleaned prior to consumption (PPQ, 2020c).

Assessing the likelihood of introduction of *Paspalum scrobiculatum* into the endangered area via *Ananas comosus* imported from the Philippines

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Entry			

Risk Element	**Risk Rating**	**Uncertainty Rating**	**Evidence for rating (and other notes as necessary)**
Weed prevalence in the export area	High	Negligible	*Paspalum scrobiculatum* is widely distributed in tropical and subtropical regions of the world (NGRP, 2020). In the Philippines, it is found on the southern islands (GBIF Secretariat, 2020) and has been categorized as a serious weed of agriculture (Holm et al., 1991). It is common in upland rice and grows well in disturbed areas (Galinato et al., 1999).
Likelihood of being harvested with the commodity	Medium	Moderate	*Paspalum scrobiculatum* has ascending stems that grow up to 90 cm tall (Galinato et al., 1999), which is somewhat shorter than pineapple plants. Kaul (1986) reports that the seeds are wind dispersed, but we found no evidence of adaptation for wind dispersal. From 2005 to 2016 this species was intercepted twice in pineapples entering the United States (AQAS, 2020). Because we did not find any evidence that this species would be routinely harvested with the commodity, we lowered the rating by one level.
Likelihood of surviving post-harvest processing before shipment	Medium	Moderate	*Paspalum scrobiculatum* produces spikelets that are about 3 mm long (Galinato et al., 1999). If seeds are present, it is likely that some have become wedged between the growing leaves, particularly those that have been in the crowns for longer periods and may have been washed by rains deeper into the crowns. Because Philippines did not provide any specific information about how they are addressing contaminant weed seeds, we did not change the rating.
Overall Likelihood of Entry	Medium		

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Establishment	Low	Negligible	The fresh pineapples are being imported for consumption by consumers. It is unlikely that weed seeds lodged in the crowns will escape during transport to markets. Furthermore, we expect that most consumers will dispose the crowns in their trash bins. Thus, we expect that the likelihood of establishment to be low. Although there may be some consumers that compost the crowns and other parts of the fruit, we believe that the overall likelihood of establishment to still be low.
Likelihood of Introduction (combined likelihoods of entry and establishment)	Low		

3.3.6. *Rottboellia cochinchinensis* (Poaceae)

Rottboellia cochinchinensis is a vigorous annual grass and a prolific seed producer (PPQ, 2020f). It is found in disturbed areas such as roadsides, contour banks, and railways and is a weed of at least 18 agricultural crops worldwide. It is found in the tropics and subtropics and tolerates both wet and dry conditions. *Rottboellia cochinchinensis* was introduced into the United States in the early 1900s and is naturalized in southern states from Georgia to Texas. It is found in only one county in Illinois and Indiana. We estimate that 21 to 38 percent of the United States is climatically suitable for this species. *Rottboellia cochinchinensis* is likely to cause significant impacts if introduced to areas where it does not occur. It has a high growth rate and can reach very high densities within three years of invading a new area. In the United States, herbicides are used to manage the weed in corn, soybean, and sugarcane crops and on roadsides. Once introduced, this weed can be difficult to eradicate because its seeds continue to germinate throughout the entire growing season, so it requires multiple control strategies (PPQ, 2020f). *Rottboellia cochinchinensis* is regulated as a federal noxious weed (7 CFR § 360, 2020).

Assessing the likelihood of introduction of *Rottboellia cochinchinensis* into the endangered area via *Ananas comosus* imported from the Philippines

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Entry			

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Weed prevalence in the export area	High	Negligible	*Rottboellia cochinchinensis* is widely distributed in tropical and subtropical regions of the world (NGRP, 2020). In the Philippines, it is present throughout the major islands (GBIF Secretariat, 2020) and has been categorized as a serious weed of agriculture (Holm et al., 1991). It is a major weed of pineapple (Chauhan et al., 2015; Sison, 1998).
Likelihood of being harvested with the commodity	High	Negligible	*Rottboellia cochinchinensis* grows 1 to 3 meters tall (Holm et al., 1977; Lensce and Griffin, 1991) and germinates throughout the growing season (Lensce and Griffin, 1991; Smith et al., 2001). From 1992 to 2017 this species was intercepted approximately 200 times in pineapples entering the United States (AQAS, 2020). Therefore, we did not change the rating.
Likelihood of surviving post-harvest processing before shipment	High	Medium	Seeds are 3 to 3.5 mm long and 1.75 to 2 mm wide (Reed, 1977).While some may be present near the outside of the crowns, it is likely that others have become wedged between the growing leaves, particularly those that have been in the crowns for longer periods and may have been washed by rains deeper into the crowns. Because the Philippines did not provide any specific information about how they are addressing contaminant weed, we did not change the rating.
Overall Likelihood of Entry	High		
Likelihood of Establishment	Low	Negligible	The fresh pineapples are being imported for consumption by consumers. It is unlikely that weed seeds lodged in the crowns will escape during transport to markets. Furthermore, we expect that most consumers will dispose the crowns in their trash bins. Thus, we expect that the likelihood of establishment to be low. Although there may be some consumers that compost the crowns and other parts of the fruit, we believe that the overall likelihood of establishment to still be low.

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Introduction (combined likelihoods of entry and establishment)	Medium		

3.3.7. *Saccharum spontaneum* (Poaceae)

The result of the weed risk assessment for *Saccharum spontaneum* is High Risk of becoming weed or invasive in the United States (PPQ, 2016). *Saccharum spontaneum* is a federal noxious weed and an invasive species with a variety of well-documented, significant environmental and agricultural impacts. It causes yield loss in a variety of crops, reduces species diversity in natural areas, and essentially stops forest succession in tropical regions. It grows in a diverse range of environments from wet to dry habitats, low to high elevations, and tropical to temperate. Although *S. spontaneum* is widely distributed around the world, it appears to be particularly problematic in only India and Panama. Although a large portion of the United States is climatically suitable for the establishment of *S. spontaneum*, it is unclear whether the climate is perfectly suited for this species to express its full invasive potential (PPQ, 2016). *Saccharum spontaneum* is regulated as a federal noxious weed (7 CFR § 360, 2020).

Assessing the likelihood of introduction of *Saccharum spontaneum* into the endangered area via *Ananas comosus* imported from the Philippines

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Entry			
Weed prevalence in the export area	High	Negligible	*Saccharum spontaneum* is widely distributed in tropical and subtropical Asia (NGRP, 2020). In the Philippines, it is widely distributed (GBIF Secretariat, 2020) and has been categorized as a principal weed of agriculture (Holm et al., 1991). It is an important weed of pineapple (Holm et al., 1997; Rohrbach and Johnson, 2003; Sison and Mendoza Jr., 1992).
Likelihood of being harvested with the commodity	High	Negligible	*Saccharum spontaneum* varies considerably in height but can grow up to 6 meters tall (Holm et al., 1997). Seeds are dispersed by wind (Holm et al., 1997). From 1996 to 2016, this species was intercepted 49 times in pineapples entering the United States (AQAS, 2020). Therefore, we did not change the rating.

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of surviving post-harvest processing before shipment	High	Medium	Spikelets are 3.3 to 4.5 mm long with silky hairs (Scher et al., 2015). While some may be present near the outside of pineapple crowns, it is likely that others have become wedged between the growing leaves, particularly those that have been in the crowns for longer periods and may have been washed by rains deeper into the crowns. Because the Philippines did not provide any specific information about how they are addressing contaminant weed seeds, we did not change the rating.
Overall Likelihood of Entry	High		
Likelihood of Establishment	Low	Negligible	The fresh pineapples are being imported for consumption by consumers. It is unlikely that weed seeds lodged in the crowns will escape during transport to markets. Furthermore, we expect that most consumers will dispose the crowns in their trash bins. Thus, we expect that the likelihood of establishment to be low. Although there may be some consumers that compost the crowns and other parts of the fruit, we believe that the overall likelihood of establishment to still be low.
Likelihood of Introduction (combined likelihoods of entry and establishment)	Medium		

3.3.8. *Urochloa mutica* (Poaceae)

The most likely outcome of a PPQ WRA for *Urochloa mutica* is High Risk of spreading or causing harm in the United States (PPQ, 2020e). *Urochloa mutica* is a semi-aquatic perennial grass that primarily affects natural systems and human use of waterways. It can tolerate drought and brackish water but not frost; therefore, it is most likely to establish in moist habitats in the southeastern United States, Hawaii, and the island territories. The plant forms large monocultures and floating mats from which fragments can detach to disperse the species. Fragments can also be spread by livestock, birds, and vehicles. The species displaces native vegetation, eliminating food and habitat for birds. It also promotes more frequent and hotter fires when tall, dry fuel builds up. Because it forms large populations in wet areas, it blocks water flow in streams and canals and interferes with navigation and water recreation. The species is invasive in central and southern Florida, where management efforts have eliminated it from some

public bodies of water (PPQ, 2020e). It is present in one to five counties in Texas, Louisiana, Alabama, and South Carolina. Propagules other than seeds are prohibited entry into the United States from all countries except Canada (7 CFR § 319.37-4, 2020). PPQ is considering expanding its regulation under NAPPRA to include seed.

Assessing the likelihood of introduction of *Urochloa mutica* into the endangered area via *Ananas comosus* imported from the Philippines

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Entry			
Weed prevalence in the export area	High	Negligible	*Urochloa mutica* is widely distributed in the tropical Americas and is also present in tropical regions of Africa, Asia, and Oceania (GBIF Secretariat, 2020. *Urochloa mutica* is present in the Philippines (POWO, 2020). It is categorized as a principal weed of agriculture (Holm et al., 1991) and is listed as a weed of rice (Moody, 1989). Therefore, we rated its prevalence as high, with negligible uncertainty.
Likelihood of being harvested with the commodity	High	Negligible	*Urochloa mutica* can grow up to 8 feet tall (IFAS, 2020), so seeds could easily fall into pineapple crowns, though seed production is low (IFAS, 2020). Popay et al. (2008) found seeds in the crowns of pineapples imported into New Zealand. From 2010 to 2019, it was intercepted 17 times with pineapple at U.S. ports of entry (AQAS, 2020; ARM, 2020). Therefore, we did not change the rating.
Likelihood of surviving post-harvest processing before shipment	High	Moderate	*Urochloa mutica* spikelets are about 3 mm long (IFAS, 2020). While some may be present near the outside of the crowns, it is likely that others have become wedged between the growing leaves, particularly those that have been in the crowns for longer periods and may have been washed by rains deeper into the crowns. Because the Philippines did not provide any specific information about how they are addressing contaminant weed seeds, we did not change the rating.
Overall Likelihood of Entry	High		

Risk Element	Risk Rating	Uncertainty Rating	Evidence for rating (and other notes as necessary)
Likelihood of Establishment	Low	Negligible	The fresh pineapples are being imported for consumption by consumers. It is unlikely that weed seeds lodged in the crowns will escape during transport to markets. Furthermore, we expect that most consumers will dispose the crowns in their trash bins. Thus, we expect that the likelihood of establishment to be low. Although there may be some consumers that compost the crowns and other parts of the fruit, we believe that the overall likelihood of establishment to still be low.
Likelihood of Introduction (combined likelihoods of entry and establishment)	Medium		

4. Summary

Of the organisms associated with pineapple worldwide and present in the export area, we identified 10 organisms that are quarantine pests for the PRA area. These pests are likely to meet the threshold for unacceptable consequences in the PRA area, and have a reasonable likelihood of following the commodity pathway (Table 3). Thus, these pests are candidates for risk management. These results represent a baseline estimate of the risks associated with the import commodity pathway as described in section 1.4.

Table 3. Summary of pests selected for further evaluation and determined to be candidates for risk management. All of these pests meet the threshold for unacceptable consequences of introduction and have a reasonable likelihood of following the commodity pathway.

Pest type	Scientific name	Likelihood of Introduction overall rating	Uncertainty statement (optional)[a]
Arthropod	*Bactrocera dorsalis*	Medium	
	Maconellicoccus hirsutus	Low	
	Parasa lepida	Low	
Weed	*Mikania micrantha* Kunth.	Medium	
	Tridax procumbens L.	Medium	
	Cenchrus polystachios (L.) Morrone.	Medium	
	Ischaemum rugosum Salisb.	Low	
	Paspalum scrobiculatum L.	Low	
	Rottboellia cochinchinensis (Lour.) Clayton	Medium	
	Saccharum spontaneum L.	Medium	

[a]The uncertainty statement, if included, identifies the most important source(s) of uncertainty.

Table 4. Summary of weeds selected for further evaluation and that are being considered for regulation as either a NAPPRA pest plant (7 CFR § 319.37-4, 2020) or a federal noxious weed (7 CFR § 360, 2020). These weeds meet the threshold for unacceptable consequences of introduction and have a reasonable likelihood of following the commodity pathway.

Pest type	Scientific name	Likelihood of Introduction overall rating	Uncertainty statement (optional)[a]
Weeds	*Urochloa mutica* (Forssk.) T. Q. Nguyen	Medium	

[a]The uncertainty statement, if included, identifies the most important source(s) of uncertainty.

Our assessment of risk is contingent on the application of all components of the pathway as described in section 1.4. The choice of appropriate phytosanitary measures to mitigate pest risk is not addressed in this document.

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6. Appendix: Pests with non-quarantine status

We found some evidence of the below listed organisms being associated with pineapple and present in the Philippines. Because these organisms are not of quarantine significance for the U.S. (PestID, 2020; or as defined by ISPM 5, IPPC, 20182019), we did not list them in Table 1 of this risk assessment. Also, we did not do an intensive evaluation of their association pineapple or their presence in the Philippines. Therefore, we consider the following pests to have only "potential" association with the commodity and presence in the Philippines.

We list these organisms along with the references supporting their potential presence in the Philippines, their presence in the U.S., and their potential association with the pineapple. If any of the organisms listed in the table are **not** present in the U.S., we also provide justification for their non-quarantine status. Unless otherwise noted, these organisms are non-actionable at U.S. ports of entry.

Organism	In Philippines	In U.S.	Host Association	Notes
ARTHROPODS				
Acari: Acaridae				
Tyrophagus putrescentiae (Schrank)	CABI, 2020	CABI, 2020	CABI, 2020	
Acari: Tarsonemidae				
Steneotarsonemus ananas (Tyron)	Corpuz-Raros, 2005	Jeppson et al., 1975	Corpuz-Raros, 2005	
Acari: Tenuipalpidae				
Dolichotetranychus floridanus (Banks)	Jeppson et al., 1975	Jeppson et al., 1975	Jeppson et al., 1975	
INSECTA				
Blattodea: Blaberidae				
Pycnoscelus surinamensis (Linnaeus)	Roth, 1998	Roth, 1998	Lever, 1947	
Coleoptera: Anthribidae				
Araecerus fasciculatus (DeGeer)	Waterhouse, 1993a	CABI, 2020	Carter, 1967	
Coleoptera: Cerambycidae				
Sybra alternans Wiedemann	Chen et al., 2000	Chen et al., 2000	Chen et al., 2000	
Coleoptera: Cleridae				
Necrobia rufipes De Geer	Bawalan, 2008	CABI, 2020	Archibald and Chalmers, 1983	
Coleoptera: Curculionidae				
Sitophilus zeamais Motschulsky	CABI, 2020	CABI, 2020	Archibald and Chalmers, 1983	
Coleoptera: Nitidulidae				
Carpophilus dimidiatus (Fabricius)	Navarro et al., 1997	Ewing and Cline, 2005	Schmidt, 1935	

Carpophilus hemipterus (L.)	Zimmerman, 1990	Ewing and Cline, 2005	Schmidt, 1935
Carpophilus maculatus Murray	Brown, 2009	Brown, 2009	Brown, 2009
Carpophilus obsoletus Erichson	Bawalan, 2008	Brown, 2009	Brown, 2009
Epuraea luteola Erichson	Dasgupta et al., 2016	Ewing and Cline, 2005	Lim and Lowings, 1977
Urophorus humeralis (Fabricius)	Leng, 1918	CABI, 2020	CABI, 2020
Coleoptera: Scarabaeidae			
Exomala orientalis (Waterhouse)	CABI, 2020	CABI, 2020	CABI, 2020
Coleoptera: Tenebrionidae			
Alphitobius laevigatus (Fabricius)	CABI, 2020	CABI, 2020	Archibald and Chalmers, 1983
Tribolium castaneum Herbst	CABI, 2020	CABI, 2020	Yunus and Hua, 1980
Coleoptera: Silvanidae			
Ahasverus advena (Waltl)	CABI, 2020	CABI, 2020	Archibald and Chalmers, 1983
Diptera: Drosophila			
Drosophila ananassae Doleschall	Van Der Linde and Sevenster, 2006	Stone et al., 1965	Yunus and Hua, 1980
Diptera: Muscidae			
Atherigona orientalis Schiner	CABI, 2020	CABI, 2020	CABI, 2020
Hemiptera: Coccidae			
Coccus viridus (Green)	CABI, 2020	CABI, 2020	Williams and Watson, 1990
Milviscutulus mangiferae (Green)	García Morales et al., 2016	García Morales et al., 2016	Williams and Watson, 1990
Parasaissetia nigra (Neitner)	García Morales et al., 2016	García Morales et al., 2016	García Morales et al., 2016
Hemiptera: Diaspididae[4]			
Aonidiella aurantii (Maskell)	Arcelo, 2016b	García Morales et al., 2016	Arcelo, 2016b
Aspidiotus destructor Signoret	CABI, 2020	CABI, 2020	Hill, 1983
Aspidiotus excisus Green, syn.: *Temnaspidiotus excisus* Green	García Morales et al., 2016	García Morales et al., 2016	García Morales et al., 2016
Aspidiotus nerii Bouche, syn.: *A. hederae* Vallot	García Morales et al., 2016	García Morales et al., 2016	García Morales et al., 2016

[4] All armored scales (Diaspididae) are non-actionable at U.S. ports of entry on fruits and vegetables for consumption (NIS, 2008). Therefore, we did not need to determine whether they occur in the United States.

Chrysomphalus aonidum (Linn.)	Arcelo, 2016b	García Morales et al., 2016	Arcelo, 2016b
Diaspis boisduvalii (Signoret)	García Morales et al., 2016	García Morales et al., 2016	Beardsley, 1966
Diaspis bromeliae (Kerner)	García Morales et al., 2016	García Morales et al., 2016	Beardsley, 1966
Lepidosaphes beckii (Newman)	García Morales et al., 2016	García Morales et al., 2016	García Morales et al., 2016
Melanaspis bromiliae (Leonardi)	García Morales et al., 2016	García Morales et al., 2016	Beardsley, 1966
Pinnaspis aspidistrae (Signoret)	Arcelo, 2016b	García Morales et al., 2016	Arcelo, 2016b
Pinnaspis strachani (Cooley)	García Morales et al., 2016	García Morales et al., 2016	Yunus and Hua, 1980
Pseudaonidia trilobitiformis (Green)	García Morales et al., 2016	García Morales et al., 2016	Petty et al., 2002
Unaspris citri (Comstock)	García Morales et al., 2016	CABI, 2020	CABI, 2020
Hemiptera: Pseudococcidae			
Dysmicoccus brevipes (Cockerell)	CABI, 2020	CABI, 2020	CABI, 2020
Dysmicoccus neobrevipes Beardsley	CABI, 2020	CABI, 2020	CABI, 2020
Ferrisia virgata (Cockerell)	García Morales et al., 2016	García Morales et al., 2016	García Morales et al., 2016
Nipaecoccus nipae (Maskell)	García Morales et al., 2016	García Morales et al., 2016	García Morales et al., 2016
Paracoccus marginatus Williams and Granara de Willink	CABI, 2020	CABI, 2020	CABI, 2020
Planococcus citri (Risso)	CABI, 2020	CABI, 2020	CABI, 2020
Planococcus minor (Maskell)	García Morales et al., 2016	García Morales et al., 2016	García Morales et al., 2016
Pseudococcus jackbeardsleyi Gimpel and Miller	García Morales et al., 2016	García Morales et al., 2016	García Morales et al., 2016
Pseudococcus longispinus Targioni Tozzetti	CABI, 2020	CABI, 2020	CABI, 2020
Pseudococcus viburni (Signoret)	García Morales et al., 2016	García Morales et al., 2016	García Morales et al., 2016
Saccharicoccus sacchari (Cockerell)	CABI, 2020	CABI, 2020	CABI, 2020
Hymenoptera: Formicidae			
Solenopsis geminata (Fabricius)	CABI, 2020	CABI, 2020	CABI, 2020
Lepidoptera: Noctuidae			
Agrotis ipsilon Hufnagel	CABI, 2020	CABI, 2020	Petty et al., 2002
Spodoptera exigua Hübner	CABI, 2020	CABI, 2020	Petty et al., 2002

Thysanoptera: Phlaeothripidae			
Haplothrips gowdeyi Franklin	CABI, 2020	CABI, 2020	Rohrbach and Johnson, 2003
Thysanoptera: Thripidae			
Frankliniella schultzei (Trybom)	CABI, 2020	CABI, 2020	Rohrbach and Johnson, 2003
Thrips hawaiiensis (Morgan)	CABI, 2020	CABI, 2020	Rohrbach and Johnson, 2003
Thrips tabaci Lindeman	CABI, 2020	CABI, 2020	Hill, 1983
Bacteria			
Dickeya chrysanthemi (Burkholder et al.) Samson et al., syn.:*Erwinia chrysanthemi* (Burkh.) Young et al.	CABI, 2020; Ebron et al., 1987 Kaneshiro et al., 2005; Rohrbach and Schmitt, 2003	CABI, 2020; Rohrbach, 1989; Kaneshiro et al., 2005; Evans et al., 2002	CABI, 2020; Rohrbach, 1989; Kaneshiro et al., 2005; Evans et al., 2002
Dickeya zeae Samson et al., syn.: *Erwinia carotovora* (Jones) Bergey et al.	CABI, 2020 Bradbury, 1986; Ebron et al., 1987	CABI, 2020; Rohrbach, 1989	CABI, 2020; Rohrbach, 1989
Pantoea citrea Kageyama et al., syn.: *Erwinia citreus* Sonoyama et al.	CABI, 2020	CABI, 2020	CABI, 2020
Pantoea ananatis (Serrano) Mergaert et al., syn.: *Bacillus ananas* Serrano, *Erwinia ananas* Serrano, *Erwinia ananas* pv. *uredovora* (Pon et al.) Dye	CABI, 2020; Serrano, 1928; Coutinho and Venter, 2009	Schwartz and Otto, 2000; Carr et al., 2013	CABI, 2020; Coutinho and Venter, 2009
Fungi			
Asterinella stuhlmannii (Henn.) Theiss., syn.: *Prillieuxina stuhlmannii* (Henn.) Arx	Farr and Rossman, 2020	Farr and Rossman, 2020	Farr and Rossman, 2020
Athelia rolfsii (Curzi) C.C. Tu & Kimbr., syn.:*Corticium rolfsii* Curzi	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020
Curvularia lunata (Wakker) Boedijn., syn.: *Cochliobolus lunatus* R.R. Nelson & F.A. Haasis	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020	Farr and Rossman, 2020
Fusarium oxysporum Schlechtendahl	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020

Gibberella fujikuroi (Sawada) Ito, syn.: *Fusarium moniliforme* J. Sheld	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020
Gibberella sacchari (E.J. Butler & Hafiz Khan) W. Gams, syn.: *Fusarium neoceras* Wollenw. & Reinking	Farr and Rossman, 2020	Farr and Rossman, 2020	Farr and Rossman, 2020
Glomerella cingulata (Stonem.) Spauld. & Schrenk, syn.: *Colletotrichum gloeosporioides* (Penz.) Penz. & Sacc.	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020
Haematonectria haematococca (Berk. & Broome) Samuels & Rossman, syn.: *Fusarium haematococcum* Nalim, Samuels & Geiser	CABI, 2020	CABI, 2020	CABI, 2020; Farr and Rossman, 2020
Lasiodiplodia theobromae (Pat.) Griffon & Maubl., syn.: *Botryodiplodia theobromae* Pat.	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020
Phytophthora cinnamomi Rands	CABI, 2020	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020
Phytophthora meadii McRae	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020
Phytophthora nicotianae Breda de Haan	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020
Phytophthora palmivora (E. J. Butler) E. J. Butler	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020	CABI, 2020; Farr and Rossman, 2020
Nematodes			
Helicotylenchus dihystera (Cobb) Sher	CABI, 2020	CABI, 2020	CABI, 2020
Hemicriconemoides mangiferae Siddiqi	CABI, 2020	CABI, 2020	CABI, 2020
Meloidogyne incognita (Kofoid & White, 1919) Chitwood	CABI, 2020	CABI, 2020	CABI, 2020
Meloidogyne javanica (Treub, 1885) Chitwood	CABI, 2020	CABI, 2020	CABI, 2020
Pratylenchus brachyurus (Godfrey, 1929) Filipjev & Schuurmans Stekhoven	CABI, 2020	CABI, 2020	CABI, 2020

Rotylenchulus reniformis Linford & Oliveira	CABI, 2020	CABI, 2020	CABI, 2020
Viruses			
Cucumber mosaic virus Bromoviridae	CABI, 2020	CABI, 2020	CABI, 2020
Pineapple mealybug wilt-associated viruses (PMWaV-1, PMWaV-2).	CABI, 2020	CABI, 2020	CABI, 2020
WEEDS			
Amaranthaceae			
Amaranthus spinosus L.	POWO, 2020	Kartesz, 2020; POWO, 2020	CABI, 2020; Sarkar et al., 2017; Tosh et al., 1982
Amaranthus viridis L.	POWO, 2020	POWO, 2020	Sarkar et al., 2017
Araliaceae			
Hydrocotyle sibthorpioides Lam.	NGRP, 2020; POWO, 2020	Kartesz, 2020	Sarkar et al., 2017
Asteraceae			
Acanthospermum hispidum DC.	POWO, 2020	NGRP, 2020	CABI, 2020
Ageratum conyzoides L.	NGRP, 2020; POWO, 2020; Sison, 1998	NGRP, 2020	AQAS, 2020; CABI, 2020; Girija and Menon, 2019; Sison, 1998
Ageratum houstonianum Mill.	POWO, 2020	NGRP, 2020; POWO, 2020	Sarkar et al., 2017
Bidens pilosa L.	NGRP, 2020; POWO, 2020	NGRP, 2020	Kumar and Ramakrishnan, 1989
Chromolaena odorata (L.) R. M. King & H. Rob. syn.: *Eupatorium odoratum* L.	Chauhan et al., 2015; NGRP, 2020; POWO, 2020	NGRP, 2020	CABI, 2020; Chauhan et al., 2015; Girija and Menon, 2019; Tosh et al., 1982
Eclipta prostrata (L.) L.	NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	Sarkar et al., 2017
Emilia sonchifolia (L.) DC.	NGRP, 2020; POWO, 2020	(Kartesz, 2020)	CABI, 2020; Girija and Menon, 2019; Sarkar et al., 2017
Erigeron canadensis L. syn.: *Conyza canadensis* (L.) Cronquist	POWO, 2020	NGRP, 2020; POWO, 2020	CABI, 2020
Galinsoga parviflora Cav.	NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	Kumar and Ramakrishnan, 1989
Pseudognaphalium luteoalbum (L.) Hilliard & B. L. Burtt syn.: *Laphangium luteoalbum* (L.) Tzvelev; *Helichrysum luteoalbum* (L.) Rchb.	NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	Sarkar et al., 2017

Sonchus oleraceus L.	NGRP, 2020; POWO, 2020	NGRP, 2020	AQAS, 2020
Xanthium strumarium L.	NGRP, 2020	NGRP, 2020; POWO, 2020	Sarkar et al., 2017
Brassicaceae			
Cardamine hirsuta L.	NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	Sarkar et al., 2017
Caryophyllaceae			
Drymaria cordata (L.) Willd. ex Schult.	NGRP, 2020	Kartesz, 2020	AQAS, 2020; CABI, 2020; Sarkar et al., 2017
Stellaria media (L.) Vill.	NGRP, 2020	NGRP, 2020; POWO, 2020	Sarkar et al., 2017
Chenopodiaceae			
Dysphania ambrosioides (L.) Mosyakin & Clemants	POWO, 2020	NGRP, 2020; POWO, 2020	Sarkar et al., 2017
Commelinaceae			
Commelina diffusa Burm. f.	Chauhan et al., 2015; NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	CABI, 2020; Chauhan et al., 2015; Girija and Menon, 2019
Murdannia nudiflora (L.) Brenan syn.: *Commelina nudiflora* L.	NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	CABI, 2020; Kumar and Ramakrishnan, 1989; Sarkar et al., 2017
Convolvulaceae			
Ipomoea cairica (L.) Sweet	NGRP, 2020; POWO, 2020	Kartesz, 2020; NGRP, 2020; POWO, 2020	Rohrbach and Johnson, 2003
Ipomoea indica (Burm.) Merr.	POWO, 2020	Kartesz, 2020; NGRP, 2020; POWO, 2020	Rohrbach and Johnson, 2003
Ipomoea purpurea (L.) Roth	POWO, 2020	Kartesz, 2020; POWO, 2020	Rohrbach and Johnson, 2003
Ipomoea triloba L.	NGRP, 2020; POWO, 2020; Sison, 1998	NGRP, 2020	AQAS, 2020; Chauhan et al., 2015; Rohrbach and Johnson, 2003; Sison, 1998
Cucurbitaceae			
Momordica charantia L.	NGRP, 2020	NGRP, 2020	CABI, 2020
Cyperaceae			
Bulbostylis barbata (Rottb.) C. B. Clarke	NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	Girija and Menon, 2019

Cyperus brevifolius (Rottb.) Endl. ex Hassk. syn.: *Kyllinga brevifolia* Rottb.	NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	Sarkar et al., 2017
Cyperus iria L.	NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	Girija and Menon, 2019; Sarkar et al., 2017; Tosh et al., 1982
Cyperus rotundus L.	Chauhan et al., 2015; NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	Chauhan et al., 2015; Girija and Menon, 2019; Rohrbach and Johnson, 2003; Tosh et al., 1982
Fimbristylis dichotoma (L.) Vahl	POWO, 2020	NGRP, 2020; POWO, 2020	CABI, 2020
Euphorbiaceae			
Euphorbia hirta L.	NGRP, 2020	NGRP, 2020; POWO, 2020	CABI, 2020; Girija and Menon, 2019; Sarkar et al., 2017
Fabaceae			
Crotalaria pallida Aiton syn.: *Crotalaria mucronata* Desv.	Chauhan et al., 2015	Kartesz, 2020	Chauhan et al., 2015; Rohrbach and Johnson, 2003
Mimosa pudica L.	Chauhan et al., 2015; POWO, 2020	Kartesz, 2020	AQAS, 2020; CABI, 2020; Chauhan et al., 2015; Girija and Menon, 2019
Heliotropiaceae			
Heliotropium indicum L.	NGRP, 2020	NGRP, 2020; POWO, 2020	CABI, 2020; Sarkar et al., 2017
Linderniaceae			
Torenia crustacea (L.) Cham. & Schltdl. syn.: *Lindernia crustacea* (L.) F. Muell.	NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	Sarkar et al., 2017
Malvaceae			
Melochia corchorifolia L.	NGRP, 2020; POWO, 2020	POWO, 2020	Girija and Menon, 2019; Sarkar et al., 2017
Sida acuta Burm. f.	NGRP, 2020 #21; Sison, 1998 #6}	NGRP, 2020; POWO, 2020	CABI, 2020; Sarkar et al., 2017; Sison, 1998
Sida rhombifolia L.	NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	Girija and Menon, 2019
Mazaceae			
Mazus pumilus (Burm. f.) Steenis	NGRP, 2020; POWO, 2020	POWO, 2020	Sarkar et al., 2017
Nyctaginaceae			

Boerhavia diffusa L.	NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	Sarkar et al., 2017
Oxalidaceae			
Oxalis corniculata L.	POWO, 2020	POWO, 2020	CABI, 2020; Sarkar et al., 2017
Oxalis debilis Kunth	NGRP, 2020	NGRP, 2020	Sarkar et al., 2017
Passifloraceae			
Passiflora foetida L.	POWO, 2020	POWO, 2020	CABI, 2020
Phyllanthaceae			
Phyllanthus urinaria L.	NGRP, 2020; POWO, 2020	Kartesz, 2020	AQAS, 2020; Girija and Menon, 2019
Piperaceae			
Peperomia pellucida (L.) Kunth	NGRP, 2020	NGRP, 2020; POWO, 2020	Girija and Menon, 2019; Sarkar et al., 2017
Poaceae			
Axonopus compressus (Sw.) P.Beauv.	POWO, 2020	POWO, 2020	CABI, 2020; Sarkar et al., 2017
Axonopus fissifolius (Raddi) Kuhlmann	POWO, 2020	Kartesz, 2020	AQAS, 2020
Cenchrus purpureus (Schumach.) Morrone, syn.: *Pennisetum purpureum* Schumach.	NGRP, 2020; POWO, 2020	(Kartesz, 2020)	CABI, 2020
Chloris gayana Kunth	NGRP, 2020; POWO, 2020	Kartesz, 2020	AQAS, 2020
Cynodon dactylon (L.) Pers.	Chauhan et al., 2015; POWO, 2020; Sison, 1998	Kartesz, 2020	AQAS, 2020; Girija and Menon, 2019; Sison, 1998
Dactyloctenium aegyptium (L.) Willd	Chauhan et al., 2015; NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	Chauhan et al., 2015; Girija and Menon, 2019; Tosh et al., 1982
Digitaria bicornis (Lam.) Roem. & Schult	NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	Sarkar et al., 2017
Digitaria insularis (L.) Fedde syn.: Trichachne insularis (L.) Nees	Chauhan et al., 2015; POWO, 2020	Kartesz, 2020	AQAS, 2020; CABI, 2020; Chauhan et al., 2015
Digitaria sanguinalis (L.) Scop.	POWO, 2020; Sison, 1998	NGRP, 2020	AQAS, 2020; Rohrbach and Johnson, 2003; Sison, 1998; Tosh et al., 1982
Echinochloa colona (L.) Link	Chauhan et al., 2015; NGRP, 2020	NGRP, 2020	Chauhan et al., 2015; Sarkar et al., 2017
Echinochloa crus-galli (L.) P.Beauv.	NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	Tosh et al., 1982

Eleusine indica (L.) Gaertn.	NGRP, 2020; POWO, 2020; Sison, 1998	NGRP, 2020	AQAS, 2020; Chauhan et al., 2015; Rohrbach and Johnson, 2003; Sarkar et al., 2017; Sison, 1998
Eragrostis ciliaris (L.) R. Br.	NGRP, 2020; POWO, 2020	POWO, 2020	Tosh et al., 1982
Megathyrsus maximus (Jacq.) B. K. Simon & S. W. L. Jacobs syn.: *Panicum maximum* Jacquin	POWO, 2020	NGRP, 2020	AQAS, 2020; CABI, 2020; Kumar and Ramakrishnan, 1989; Rohrbach and Johnson, 2003
Melinis repens (Willd.) Zizka syn.: *Rhynchelytrum repens* (Willd.) C. E. Hubb.; *Rhynchelytrum roseum* (Nees) Stapf & C. E. Hubb.	POWO, 2020	NGRP, 2020	AQAS, 2020; Popay et al., 2008
Panicum repens L.	Chauhan et al., 2015; NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	CABI, 2020; Chauhan et al., 2015; Rohrbach and Johnson, 2003
Paspalum conjugatum P. J. Bergius	NGRP, 2020; POWO, 2020; Sison, 1998	Kartesz, 2020	AQAS, 2020; CABI, 2020; Girija and Menon, 2019; Rohrbach and Johnson, 2003; Sison, 1998
Paspalum dilatatum Poir.	NGRP, 2020; POWO, 2020	Kartesz, 2020; NGRP, 2020; POWO, 2020	Rohrbach and Johnson, 2003
Paspalum paniculatum L.	POWO, 2020	(Kartesz, 2020)	AQAS, 2020
Paspalum urvillei Steud.	POWO, 2020	POWO, 2020	CABI, 2020; Rohrbach and Johnson, 2003
Setaria parviflora (Poir.) M.Kerguelen	POWO, 2020	NGRP, 2020	AQAS, 2020; CABI, 2020
Setaria pumila (Poir.) Roem. & Schult.	NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	CABI, 2020
Setaria verticillata (L.) P.Beauv.	POWO, 2020	POWO, 2020	CABI, 2020
Polygonaceae			
Persicaria hydropiper (L.) Delarbre	NGRP, 2020; POWO, 2020	POWO, 2020	Sarkar et al., 2017
Portulaceae			
Portulaca oleracea L.	POWO, 2020	POWO, 2020	Sarkar et al., 2017
Rubiaceae			
Oldenlandia corymbosa L.	Doubtful (POWO, 2020)	POWO, 2020	CABI, 2020

Spermacoce tenuior L. syn.: *Borreria laevis* (Lam.) Griseb.	Sison, 1998	NGRP, 2020; POWO, 2020	Sison, 1998
Solanaceae			
Solanum americanum Mill.	POWO, 2020	NGRP, 2020; POWO, 2020	Sarkar et al., 2017
Solanum nigrum L.	POWO, 2020	NGRP, 2020; POWO, 2020	CABI, 2020
Verbenaceae			
Phyla nodiflora (L.) Greene	NGRP, 2020; POWO, 2020	NGRP, 2020; POWO, 2020	Sarkar et al., 2017