Importation of fresh edible flowers of Izote (*Yucca guatemalensis* Baker) into the continental United States from Guatemala

A Pathway-Initiated Risk Assessment

Version 1

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Agency Contact

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Executive Summary

The Animal and Plant Health Inspection Service (APHIS) of the United States Department of Agriculture (USDA) prepared this risk assessment document to examine plant pest risks associated with importing fresh flowers of izote (*Yucca guatemalensis* Baker) from Guatemala into the continental United States. We prepared a list of pests associated with izote in Guatemala based on documentation submitted by the Ministry for Agriculture and Livestock and Food of Guatemala, scientific literature, records of intercepted pests at ports-of-entry, and the opinions of experts in the field on izote production.

We identified one pest, the gray pineapple mealybug (*Dysmicoccus neobrevipes* Beardsley), as a quarantine pest that may follow the pathway and be introduced with negative consequences if not mitigated with specific phytosanitary measures. The Pest Risk Potential for *D. neobrevipes* was Medium.

Identification and selection of appropriate sanitary and phytosanitary measures to mitigate risk for pests with particular Pest Risk Potential ratings are undertaken as part of the risk-management phase and is not discussed in this document.

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1. Introduction

1.1. Background

This risk assessment was prepared by the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ), Center for Plant Health Science and Technology (CPHST), Plant Epidemiology and Risk Analysis Laboratory (PERAL). Our purpose was to examine pest risks associated with the importation of Izote *Yucca guatemalensis* Baker as fresh fruit from Guatemala into the continental United States. This risk assessment examined the pest risk of commercial quality izote, which undergoes cleaning and washing of sap of each individual fruit as part of standard post-harvest treatment.

Plant pest risks associated with the importation of fresh fruit of Izote from Guatemala into the United States were estimated and assigned the qualitative terms of high, medium or low, in accordance with the template document, *Guidelines for Pathway-Initiated Pest Risk Assessments, Version 5.02* (PPQ, 2000).

Regional and international plant protection organizations such as the North American Plant Protection Organization (NAPPO) and the International Plant Protection Convention (IPPC) provide standards for conducting pest risk analyses (IPPC, 2009: ISPM #s 11; NAPPO, 2004). The use of biological and phytosanitary terms is consistent with the 'Glossary of Phytosanitary Terms and the Compendium of Phytosanitary Terms' (IPPC, 2009: ISPM #5). The methods used to initiate, conduct, and report this assessment, as well as the use of biological and phytosanitary terms are based on these standards. The IPPC standards describe three stages of pest risk analysis: Stage 1, Initiation; Stage 2, Risk Assessment; and Stage 3, Risk Management. This document satisfies the requirements of IPPC Stages 1 and 2.

1.2. Commodity information

Yucca guatemalensis Baker (Class: Monocotyledonae, Order: Asparagales, Family: Agavaceae) is native to the southwestern United States, Puerto Rico, Mexico, and Guatemala (Bartolomaus et al., 1990; Gardening Australia, 2000; Sanchez de Lorenzo, 2003; USDA and NRCS, 2002). Izote belongs to the *Yucca* genus, which includes approximately 40 species, distributed mainly in the United States, Mexico, Central America, and Cuba (Nuñez, 1994). The synonym *Yucca elephantipes* is commonly cited for this species in several documents and in databases in Guatemala and Central America.

Yucca guatemalensis is known as izote in Guatemala, and is also called spineless or giant yucca. Its leaves are pliable and lack the sharp spines on the tips that are characteristic of most yuccas. The plant may reach a height of 9.1m (30 ft) (USDA and NRCS. 2002). With age the stem becomes rough and thick, and when mature it develops a swollen base and often branches a few feet off the ground. The leaves, which grow in a spiral rosette, are shiny green, reaching 1.2m (4 ft) in length and close to 7.6 cm (3 in) in width, with serrated margins (Bailey and Bailey, 1976; Christman, 2002). Izote grows in arid regions of southern Mexico and Central America.

The inflorescence is an erect panicle 60-70 cm (23.62-27.56 in.) long, with distinct white, fragrant flowers with 1 to 2 (Grayum, 2003; Nuñez, 1994). The stamens are attached right under the ovary. The flowers are white or pale yellow and correspond to a clustered inflorescence. In Guatemala, budding occurs when the plant reaches 4 to 7 years of age. Inflorescences appear at the beginning of the rainy season (April, May) and generally one inflorescence per stem is formed (Bartolomaus et al., 1990; Nuñez, 1994).

The flowers of izote are edible and, in Guatemala, are consumed cooked or stewed with eggs or pickled. The flowers contain calcium, iron, thiamine, niacin, phosphorus, carotene, and ascorbic acid (Nuñez, 1994).

Figure 1. (a) Izote Inflorescence (CEF, 2005). (b) Packed izote flowers (CEF, 2005).

2. Risk Assessment

In this risk assessment, the first five Risk Elements considered are combined to form an assessment of the risk associated with the Consequences of Introduction. Six Sub-Elements are evaluated and combined for value that estimate the risk associated with the Likelihood of Introduction. Together, the Consequences of Introduction and the Likelihood of Introduction values form an assessment of the Pest Risk Potential.

2.1. Initiating Event: Proposed Action

This commodity-based, pathway-initiated assessment is in response to a request made by the Ministry for Agriculture, Livestock, and Food of Guatemala (dated March 28, 2011) to the USDA for authorization to allow the importation of izote. In this case, the importation into the continental United States of izote flowers, grown in Guatemala, is a potential pathway for the introduction of plant pests.

2.2. Assessment of Weed Potential of *Yucca guatemalensis*

The results of the screening for the potential of izote as a weed did not prompt a weed-initiated risk assessment (Table 1).

Table 1. Assessment of weed potential of *Yucca guatemalensis.*

Scientific name and author: *Yucca guatemalensis* Baker
Plant family: Agavaceae
Synonyms: *Yucca elephantipes* Regel; *Y. gigantea* Baker; *Y. ghiesbreghtii* Baker; *Y. lenneana* Baker; *Y. mazelii* Hort. ex Watson; *Y. mooreana* Hort. Peacock ex Baker; *Y. roezlii* Hort. ex Baker. (Etter and Kristen, 1997-2004; FACTOPIA, 2005; Moller, 1998-2003).
Common names: Bayoneta, Bluestem yucca, Elephant yucca, Flor de itabo, Hitavo, Izote, Palmito, Soft-Tip Yucca, Spineless yucca (CABI, 2012 Gilman and Watson, 1994; Randall et al., 2002; Grayum, 2003; World Agroforestry Centre, 2005)

Phase 1:
This plant is native to the southwest United States (Bartolomaus et al., 1990). This species reportedly occurs in Belize, Costa Rica, Ecuador, Guatemala, Mexico, Nicaragua, and the United States (GDIF, 2005).

Phase 2:
NO Geographical Atlas of World Weeds (Holm et al*.,* 1991a).
NO The World's Worst Weeds (Holm et al*.,* 1991b).
NO Report of the Technical Committee to Evaluate Noxious Weeds; Exotic Weeds for the Federal Noxious Weed Act (APHIS, 2000).
NO Economically Important Foreign Weeds (Reed, 1977).
NO Weed Science Society of America, 2005.
NO AGRICOLA (AGRIS/CARIS, 2005).
NO Alien Plant Invaders of Natural Areas (Swearingen, 2003).
Other literature and database search indicating weediness:
NO World weeds: natural histories and distributions (Holm et al*.,* 1997).
NO World Economic Plants (Wiersema and León, 1999).
NO Florida's Invasive Species List, Florida Exotic Pest Plant Council (FLEPPC, 2003).
NO CABI, 2012 Crop Protection Compendium. Search on Weed.

Phase 3:
A weed-initiated risk assessment is not initiated for *Yucca guatemalensis* because there is no evidence of invasive behavior by this plant within the literature and due to the fact that the responses to the above were negative.

2.3. Current Status, Decision History and Pest Interceptions

Currently, the exportation of fresh flowers of izote for consumption into the United States from Guatemala is not permitted (USDA, 2005).

A number of pests have been intercepted on izote entering the United States, but most were not identified to species level (see Appendix A).

2.4. Pest Categorization—Identification of Pests of Izote in Guatemala

In Table 2, we present information on the geographic distribution, host associations, and regulatory data for izote from Guatemala. We listed (1) the presence of pests in Guatemala relative to their presence within the United States, (2) the generally affected plant part or parts, (3) the quarantine status of the pest in the United States, (4) whether or not the pest is likely to follow the pathway into the United States on izote, and (5) pertinent citations for either the distribution or the biology of the pest. Many organisms are not sources of phytosanitary risk on izote from Guatemala because they do not satisfy the definition of a quarantine pest. A quarantine pest is defined as "A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled" (IPPC, 2009: ISPM No. 5).

Table 2. Pests associated with *Yucca guatemalensis* and present in Guatemala.

Pest Scientific Name and Taxonomy	Geographic distribution[1]	Plant part affected[2]	Quarantine pest	Follow pathway	References
ARTHROPODA					
Insecta					
Coleoptera: Curculionidae					
Scyphophorus acupunctatus Gyllenhal	GU, US	R, S	No	No	Berry, 1959; CABI, 2012; Nearctica, 1998
Hemiptera: Diaspididae					
Chrysomphalus dictyospermi (Mogan)	GU, US	F, L, S, Sh	No	No	Ben-Dov et al., 2005; CABI, 2012
Hemiptera: Pseudococcidae					
Dysmicoccus neobrevipes Beardsley	GU, US (FL)	F, Fl, L, R	Yes	Yes	Ben-Dov et al., 2005; Kessing and Mau, 1992; OIRSA, 2005; Williams and Granara, 1992

[1] Geographic Distribution: CA = Central America, SV = El Salvador, US = United States.
[2] Plant Part Affected: Branch= B, Flower= Fl, Fruit= F, Leaf= L, Root= R, Seeds= Se, Seedling= Sd, Shoot= Sh, Stem= S, Tuber= T.

Pest Scientific Name and Taxonomy	Geographic distribution[1]	Plant part affected[2]	Quaran-tine pest	Follow pathway	References
Nipaecoccus nipae (Maskell)	GU, US	F, L, S, Sh	No	No	Ben-Dov et al., 2005; CABI, 2012; Howard et al., 2001; Williams and Granara, 1992
Pseudococcus landoi [3] (Balachowsky)	GU	F	Yes	No	Ben-Dov et al., 2005; PestID 2012
BACTERIA					
Erwinia spp. Enterobacteriales	GU	S, Sd	Yes	No	Bonilla and Merino, 1988; Clark, 1990; FUSADES, 2005
FUNGI[4]					
Alternaria alternata (Fr.:Fr.) Keissl Syn*: A. tenuis* Nees (Mitosporic fungi: Hyphomycetes)	GU, US	L	No	No	Escobar, 2003; Farr et al., 1989; Villalobos and Cárdenas, 2002
Alternaria sp. (Mitosporic fungi: Hyphomycetes)	GU, US	L, Sd,F	Yes	Yes	Acuña and Rivera, 1976; Farr et al., 1989; McGuire and Crandall, 1967; Padilla and Palma, 1985
Apodothina pringlei (Peck) Syn: *Sphaerodothis pringlei* (Peck) Thiss & Syd (Loculoascomycetes: Dothideales)	GU, US	L	No	No	Farr et al., 1989; Wellman, 1977
Curvularia sp. (Mitosporic fungi: Hyphomycetes)	GU	L	Yes	No	Acuña and Rivera, 1976; Alfieri et al., 1994; Escobar, 2003; Bonilla and Merino, 1988; Farr et al., 1989; Villalobos and Cárdenas, 2002
Cytosporina sp. (Mitosporic fungi: Coelomycetes)	GU	L	Yes	No	Anonymous, undated; Farr et al., 1989; Villalobos and Cárdenas, 2002

[3] The evidence for yucca being a host is ambiguous. Only Ben Dov et al. (2005) mention yucca as a host, while Williams and Granara (1992) and Ben-Dov (1994) do not, and their descriptions consistently state that the primary host is banana (*Musa* sp). In addition, the only evidence that the mealybug may convey on flowers is from PestID (2012), but the plant part descriptions are ambiguous, are found on only one species from one inspector, and are equally likely to be result of data entry error as a description of the area where the mealybugs were found. Due to the high likelihood of data error and the lack of consistent evidence, we do not analyze this insect.

[4] Fungal taxonomic classification as in Farr et al. (1989).

Pest Scientific Name and Taxonomy	Geographic distribution[1]	Plant part affected[2]	Quaran-tine pest	Follow pathway	References
Fusarium sp. (Mitosporic fungi: Hyphomycetes)	GU	L, S, Sd	Yes	Yes	Clark et al., 1988; Farr et al., 1989; Farr et al., 2005; Padilla and Palma, 1985; González et al., 2001
Glomerella cingulata (Stoneman) Spauld. & H. Screnk. (Anamorph: *Colletotrichum gloesporoides* (Penz.) Penz.& Sacc. In Penz) (Pyrenomycetes: Phyllachorales)	GU, US	Fl, L	No	Yes	Acuña and Rivera, 1976; Farr et al., 1989; McGuire and Crandall, 1967; Rodríguez, 2003; Villalobos and Cárdenas, 2002; Wellman, 1977
Sclerotium rolfsii Sacc. (Mitosporic fungi: Agonomycetes)	GU, US	R	No	No	Acuña and Rivera, 1976; Alfieri et al., 1994; Farr et al., 1989; FUSADES, 2005; Villalobos and Cárdenas, 2002
NEMATODA[5]					
Helicotylenchus spp. (Hoplolaimidae)	GU	R	Yes	No	Fernández et al., 2002; Ferris, 2001; Padilla and Palma, 1985
Meloidogyne spp. (Heteroderidae)	GU	R	Yes	No	CABI, 2006; Fernández et al., 2002; Ferris, 2001; Padilla and Palma, 1985; González et al., 2001
Rotylenchulus reniformis Linford & Oliveira (Hoplolaimidae)	GU, US	R	No	No	CABI, 2006; Ferreira and Boley, 1991; Ferris, 2001
Pratylenchus spp. (Pratylenchidae)	GU	R	Yes	No	Fernández et al., 2002; Ferris, 2001; Padilla and Palma, 1985
VIRUS					
Yucca baciliform badnavirus	GU	L	Yes	No	Brunt, 1996 onwards

[5] Nematode taxonomic classification as in Ferris (2001).

2.5. Quarantine Pests Likely to Follow the Pathway

We found one quarantine pest, *Dysmicoccus neobrevipes*, that is likely to follow the pathway (i.e., be included in commercial shipments of izote flowers from Guatemala). We found no reports of this insect on izote flowers in the worldwide literature, but we analyzed this insect in detail because it is reported on *Yucca elephantipes*, and because biological information about this insect indicated it was associated with flowers of other species.

In addition, we found the following pests that were only identified to the genus level: *Erwinia* sp., *Alternaria* sp., *Curvularia* sp., *Cytosporina* sp. *Fusarium* sp., *Meloidogyne* spp., and *Pratylenchus* spp. Lack of species identification may indicate limited taxonomic knowledge about that group, inappropriate life stage for full identification, or poor quality of the specimen. This lack of biological information on any given insect or pathogen should not be equated with low risk. By necessity, pest risk assessments focus on those organisms for which biological information is available and for which effective mitigation procedures may be developed (IPPC, 2009: ISPM No. 11). Agricultural inspectors at the port-of-entry will continue to take action against pests not identified to the species level if other species in the same genus are quarantine pests. Furthermore, if pests identified to only higher taxa are intercepted in the future, the USDA may re-evaluate their risk. Should any of these pests be intercepted in shipments of izote flowers, quarantine action will be taken and additional risk analyses will be conducted.

2.6. Consequences of Introduction

We rated the potential consequences of introduction for *D. neobrevipes* using five Risk Elements: Climate-Host Interaction, Host Range, Dispersal Potential, Economic Impact, and Environmental Impact. For each Risk Element, pest is assigned a rating of Low (1 point), Medium (2 points), or High (3 points). We then calculated a cumulative risk rating by adding up all of the Risk Element values. The ratings for *D. neobrevipes* for the five risk elements are shown below (Table 3).

***Dysmicoccus neobrevipes* Beardsley**

2.6.1. Climate-Host Interaction

Dysmicoccus neobrevipes is widespread in the following tropical countries: the Bahamas, Barbados, Brazil, Colombia, Costa Rica, the Dominican Republic, Ecuador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Panama, Peru, Puerto Rico, Suriname, Trinidad and Tobago, and the Virgin Islands (in Central and South America) (Ben-Dov et al., 2005; Williams and Granara, 1992). In the Asian Pacific basin, this species is reported in American Samoa, Fiji, Guam, the Hawaiian Islands, Kiribati, the Marshall Islands, the Northern Mariana Islands, and Western Samoa. In East Asian countries, it is reported in India, China, Malaysia, Pakistan, the Philippines, Singapore, Thailand, and Vietnam, and within the Palearctic region, it is reported in Sicily (Ben-Dov et al., 2005; CABI, 2006; Kessing and Mau, 1992). Some of the aforementioned regions are located at latitudes corresponding to plant hardiness zones 8 to 11 of the continental United States (USDA-ARS, 2003). Thus, this species may become established within these areas due to suitable environmental conditions. Furthermore, within the United States, in Florida, Louisiana, Missouri, Arkansas, Colorado, New Mexico, and Tennessee, among others, there are cultivated areas of different species that can be hosts of this pest such as *Ananas comosus*, *Citrus aurantifolia*, *Citrus limon*, *Citrus sinensis*, *Lycopersicum sculentum*, *Musa* sp., and *Zea mays* (Ben-Dov et al., 2005; USDA and NRCS, 2002). Consequently, we rated this element Medium.

2.6.2. Host Range

The main host for *D. neobrevipes* is pineapple (*Ananas comosus*) (Ben-Dov et al., 2005; CABI, 2006). Nonetheless, several authors report this pest on more than 45 species and 18 genera of plants (DAFF, 2004; Kessing and Mau, 1992; Williams and Granara, 1992). On the other hand, Ben-Dov et al. (2005) reports this insect on 44 different plant families, 9 genera, and 67 species, which include *Aglaonema treubii*, *Allium cepa*, *Annona muricata*, *A. reticulata*, *A. squamosa*, *Citrus aurantifolia*, *C. limon, C. sinensis*, *Guettarda speciosa, Lycopersicon esculentum*, *Mangifera indica*, *Musa paradisiaca*, *Nephelium lappaceum*, *Plumeria acuminata*, *Samanea saman*, *Solanum melongena*, *Tectona grandis*, *Vigna sesquipedalis,* and *Zea mays*. Many of these species are widely cultivated in the United States (USDA and NRCS, 2002). Consequently, the risk rating for Host Range is High.

2.6.3. Dispersal Potential

The immature stage of this species may move for a short period of time, no more than one day, but may disperse several yards to other plants via wind or phoresy by other insects, such as the three ant species, *Iridomyrmex humilis*, *Solenopsis germinata* var. *rufa*, and *Pheidole megacephala* (Hymenoptera: Formicidae) (DAFF, 2004; Kessing and Mau, 1992). More than 1,300 interceptions of this pest have been reported in PestID from 40 different countries. We rated Dispersal Potential Low.

2.6.4. Economic Impact

If *D. neobrevipes* enters the United States it is likely to cause yield loss to crops such as *Ananas comosus*, *Citrus aurantifolia*, *C. limon*, *C. sinensis*, *Lycopersicum sculentum*, *Musa* sp., and *Zea mays,* which are present at least in Florida, Louisiana, Missouri, Arkansas, Colorado, New Mexico, and Tennessee (USDA and NRCS, 2002). We rated Economic Impact Medium.

2.6.5. Environmental Impact

Dysmicoccus neobrevipes is found on 44 plant families. Of these, the following families contain species listed as threatened or endangered: Agavaceae, Annonaceae, Anacardiaceae, Apocynaceae, Cucurbitaceae, Liliaceae, Orchidaceae, Polygonaceae, Sterculiaceae, and Verbenaceae (USFWS, 2005). These families are found within the continental United States in areas suitable for this insect's development. Species belonging to these families are considered to be threatened and endangered in the continental United States, i.e., *Agave arizonica* and *Nolina brittoniana* from the Agavaceae family (see Appendix B) (USFWS, 2005).

The establishment of this pest would likely lead to the implementation of chemical and biological control programs in order to control its populations, as well as the populations of the ants that protect it (examples of controls where it was introduced). The risk rating for Environmental Impact is High.

Table 3. Risk rating for Consequences of Introduction.

Pest	Risk elements					Cumulative Risk Rating
	Climate-Host Interaction	Host Range	Dispersal Potential	Economic Impact	Environmental Impact	
Dysmicoccus neobrevipes	Med (2)	High (3)	Low (1)	Med (2)	High (3)	Medium (11)

2.7. Likelihood of Introduction

The Likelihood of Introduction is based upon two separate components. First, we estimate the amount of commodity likely to be imported (Sub-Element #1). The rating for the quantity annually imported is based on the amount reported by the country of the proposed export and is converted into standard units of 40-foot-long shipping containers. Second, we estimate pest opportunity using five biological features (Sub-Elements #2-6). Details of the rating criteria are explained in PPQ (2000). These ratings are summarized below (Table 4).

2.7.1. Quantity of commodity annually imported

Currently, izote flower production in Guatemala is small-scale because, in the majority of the cases, this plant is grown as a live barrier against erosion (Clark et al., 1988). Izote plants are mainly harvested as cane for ornamental use to export to different countries (Cubías, 1992; Nuñez, 1994).

Although we found no specific information about the quantity of izote flowers that would be exported annual, both the commodity and the market suggest that the quantity would be small. Thus, the quantity of commodity initially exported annually is expected be Low; exports are unlikely to be greater than ten 40-foot-long containers per year.

2.7.2. Survival of post-harvest treatment

Many elements of post-harvest processing described above may be highly effective against surface feeders, including mealybugs. For example, washing and drying would likely reduce the presence of *D. neobrevipes* on flowers of izote, but no research confirms this. Since no standard post-harvest treatments have been described for this product, the likelihood of these pests surviving is High.

2.7.3. Survive shipment

We have no information on the shipping conditions for izote from Guatemala, but *D. neobrevipes* seems likely to survive the shipment period, based on the fact that live *D. neobrevipes* have been intercepted more than 1,300 times on shipments of different products (PestID, 2012). The risk associated with this pest surviving during shipment is High.

2.7.4. Not detected at the port-of-entry

Dysmicoccus neobrevipes adults are 0.15 cm (1/17 in) in length and 0.01 cm (1/25 in) in width. They are brown to grayish-orange, taking a grayish appearance in combination with the waxy exudate that covers them (Kessing and Mau, 1992). The larvae are likely to be seen as they move. Coloration differences between the pests and the izote flowers should facilitate their detection at ports-of-entry. This pest has been intercepted by inspectors (see above) on several products. The risk of not detecting this pest at the port-of-entry is Medium.

2.7.5. Imported or moved to an area environmentally suitable for survival

The main markets for this product are located in the southwestern United States (California and Texas) (Batres et al., 2001). Because the demand for the product is so specific, we do not anticipate that it will be sold outside of these areas. This pest requires tropical and sub-tropical climates and considering destination markets within the area suitable for survival, the probability of it being moved to an area suitable for its survival is Medium(2).

2.7.6. Come into contact with host material suitable for reproduction

Dysmicoccus neobrevipes has many hosts available for reproduction (Ben-Dov et al., 2005; DAFF, 2004). Despite that, the pest has a limited inherent ability to move long distances. The mobile stage (crawlers) move for no more than one day, and only over short distances on the same plant or to neighboring plants (DAFF, 2004; Kessing and Mau, 1992). Izote flower importations from Guatemala are expected to occur only from May to October, when izote budding occurs in Guatemala (MAG, 2011). The rating for the risk that *D. neobrevipes* will find host material suitable for reproduction is Low.

The likelihood that a particular pest will be introduced is reflected in the value for the Cumulative Risk Rating. The Cumulative Risk Rating is Medium (11 points) for *Dysmicoccus neobrevipes* (Table 4).

Table 4. Risk Rating for Likelihood of Introduction

Pest	Sub-Element						Cumulative Risk Rating[a]
	Quantity Imported Annually	Survive Post-Harvest Treatment	Survive Shipment	Not Detected at Port of Entry	Moved to Suitable Habitat	Contact with Host Material	
Dysmicoccus neobrevipes	Low (1)	High (3)	High (3)	Med (2)	Med (2)	Low (1)	Medium (12)

[a] Low is 6-9 points, Medium is 10-14 points, and High is 15-18 points.

2.8. Pest Risk Potential and Conclusion

Pest Risk Potential is the sum of the Consequences of Introduction and the Likelihood of Introduction values (Table 5). Pest Risk Potential is a baseline estimate of the risks associated with importation of the commodity in the absence of mitigation measures. *Dysmicoccus neobrevipes* has a Medium Pest Risk Potential.

Identification and selection of appropriate phytosanitary measures to mitigate the risk from pests with particular Pest Risk Potential ratings is undertaken as part of the risk management phase within APHIS and is not finalized in this document. The appropriate risk management strategy for a particular pest depends on the risk posed by that pest. APHIS risk management programs are risk-based and dependent upon the availability of appropriate mitigation methods.

Table 5. Pest Risk Potential

Pest	Consequences of Introduction	Likelihood of Introduction	Pest Risk Potential[a]
Dysmicoccus neobrevipes	Medium (11)	Medium (12)	Medium (23)

[a] Low is 11-18 points; Medium is 19-26 points and High is 27-33 points.

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5. Appendices

Appendix A. Pests intercepted on *Yucca guatemalensis* from 1985 to 2004 (PestID, 2009).

Pest	Origin	Plant part affected	Interceptions (no.)
Amphiacusta sp.	Honduras	Plant	1
Anomala sp.	Honduras	Plant	1
Anthostomella sp.	Dominican Republic	Stem	1
Anurogryllus sp.	Honduras	Plant	1
Bagnalliella sp.	Costa Rica, Honduras	Cutting, Plant	11
Batrachedra sp.	Mexico	Cutting	1
Cicadellidae, species of	Costa Rica	Cutting, Plant	4
Cladosporium sp.	Costa Rica	Cutting	1
Coccidae, species of	Costa Rica	Cutting	1
Diaprepes abbreviatus	Honduras	Plant	1
Discochora yuccae	Costa Rica	Plant	1
Dyscinetus sp.	Honduras	Cutting	1
Dysmicoccus neobrevipes	Dominican Republic	Cutting, Plant	2
Elateridae, species of	Honduras	Cutting	1
Gryllidae, species of	Honduras	Cutting	1
Gryllus sp.	Honduras	Cutting, Plant	3
Hepialidae, species of	Honduras	Cutting	1
Heteroptera, species of	Costa Rica	Cutting	1
Insecta, species of	Costa Rica, Honduras	Cutting, Plant	5
Lepidoptera, species of	Honduras	Cutting	2
Luzara rufipennis	Honduras	Plant	1
Montezumina sp.	Guatemala	Leaf	1
Noctuidae, species of	Costa Rica	Plant	1
Orthoptera, species of	Costa Rica	Cutting	1
Pentatomidae, species of	Honduras	Cutting	1
Phlaeothripidae, species of	Honduras	Cutting, Plant	3
Phoma sp.	Costa Rica	Cutting	2
Phyllophaga sp.	Honduras	Cutting, Plant	2
Phyllosticta sp.	Costa Rica	Plant	1
Phyllosticta yuccae	Costa Rica, Guatemala, Honduras,	Cutting, Plant	51
Prodoxus sp.	Mexico	Cutting, Stem	4
Scolytidae, species of	Guatemala	Stem	1
Scythrididae, species of	Mexico	Cutting	1
Tettigoniidae, species of	Costa Rica, Guatemala, Honduras	Cutting, Plant, Stem	8

Appendix B. Plant species related to families of hosts of *Dysmicoccus neobrevipes* listed by the U.S. Fish and Wildlife Service considered as endangered or threatened.

AGAVACEAE
Agave arizonica
Nolina brittoniana

ANNONACEAE
Asimina tetramera

ANACARDIACEAE
Deeringothamnus rugelii
Rhus michauxii

APOCYNACEAE
Amsonia kearneyana
Cycladenia jonesii
Pteralyxia kauaiensis

CUCURBITACEAE
Cucurbita okeechobeensis ssp. *okeechobeensis*

LILIACEAE
Allium munzii
Brodiaea filifolia
Brodiaea pallida
Calochortus tiburonensis
Chlorogalum purpureum
Erythronium propullans
Fritillaria gentneri
Harperocallis flava
Helonias bullata
Lilium occidentale
Lilium pardalinum .
Trillium persistens
Trillium reliquum

ORQUIDIACEAE
Isotria medeoloides
Spiranthes parksii
Spiranthes delitescens
Platanthera praeclara
Platanthera leucophaea
Piperia yadonii

POLYGONACEAE
Chorizanthe howellii

Chorizanthe orcuttiana
Chorizanthe pungens var. *hartwegiana*
Chorizanthe pungens var. *pungens*
Chorizanthe robusta (incl. vars. *robusta* and *hartwegii*)
Chorizanthe valida
Dodecahema leptoceras
Eriogonum apricum (incl. var. *prostratum*)
Eriogonum gypsophilum
Eriogonum kennedyi var. *austromontanum*
Eriogonum longifolium var. *gnaphalifolium*
Eriogonum ovalifolium var. *vineum*
Eriogonum ovalifolium var. *williamsiae*
Eriogonum pelinophilum
Oxytheca parishii var. *goodmaniana*
Polygonella basiramia
Polygonella myriophylla
Polygonum hickmanii

STERCULIACEAE
Ayenia limitaris
Fremontodendron
Fremontodendron californicum ssp. *decumbens*
Fremontodendron mexicanum

VERBENACEAE
Nesogenes rotensis
Verbena californica