Movement of Durian Fruit, *Durio zibethinus*, from Hawaii into other regions of the United States

Qualitative, Pathway-Initiated Pest Risk Assessment

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A. Introduction

This pest risk assessment was prepared by the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture (USDA) to examine plant pest risks associated with the movement into other parts of the United States of **fresh durian fruit (*Durio zibethinus*) grown in Hawaii**. This is a qualitative pest risk assessment, that is, estimates of risk are expressed in qualitative terms such as high or low as opposed to numerical terms such as probabilities or frequencies.

International plant protection organizations (*e.g.*, North American Plant Protection Organization (NAPPO), International Plant Protection Convention (IPPC) of the United Nations Food and Agriculture Organization (FAO)) provide guidance for conducting pest risk analyses. The methods used to initiate, conduct, and report this plant pest risk assessment are consistent with guidelines provided by NAPPO, IPPC and FAO. The biological and phytosanitary terms (*e.g.*, introduction, quarantine pest) used in this document conforms with the *NAPPO Compendium of Phytosanitary Terms* (NAPPO 1995) and the *Definitions and Abbreviations* (Introduction Section) in *International Standards for Phytosanitary Measures, Section 1—Import Regulations: Guidelines for Pest Risk Analysis* (FAO 1995).

Pest risk assessment is one component of an overall pest risk analysis. The *Guidelines for Pest Risk Analysis* provided by FAO (1995) describe three stages in pest risk analysis. This document satisfies the requirements of FAO Stages 1 (initiation) and 2 (risk assessment).

The Food and Agriculture Organization (FAO, 1995) defines "pest risk assessment" as "Determination of whether a pest is a quarantine pest and evaluation of its introduction potential". "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" (FAO, 1995; NAPPO, 1995). Thus, pest risk assessments should consider both the likelihood and consequences of introduction of quarantine pests. Both issues are addressed in this qualitative pest risk assessment.

This document presents the findings of our qualitative plant pest risk assessment. The assessment methods or the criteria used to rate the various risk elements have not been described in detail. Details of the methodology and rating criteria can be found in the "template" document: ***Pathway-Initiated Pest Risk Assessment: Guidelines for Qualitative Assessments, version 4.0*** (USDA, 1995); to obtain a copy of the template, contact the individual named in the proposed regulations.

B. Risk Assessment

1. Initiating Event: Proposed Action

This pest risk assessment is commodity-based, and therefore "pathway-initiated"; the assessment is in response to the request for USDA authorization to allow movement of a particular commodity presenting a potential plant pest risk. In this case, the movement of **fresh durian fruits grown in Hawaii** into other parts of the U.S. is a potential pathway for introduction of plant pests. Regulatory authority for the movement of fruits and vegetables from Hawaii into other parts of the U. S. is found in 7 CFR §318.13 .

Durio zibethinus J. Murr. belongs to the family Bombacaceae which consists of about 25 genera with

150 species. The fruit is ovoid in shape and 20 to 30 cm long. It has a creamy, delicious, but unpleasant-smelling pulp. The large yellow seeds are sometimes cooked and eaten. This tree requires a tropical climate to thrive and as a consequence is widely cultivated in tropical Asia, sparingly so in the New World tropics and apparently only in Florida in the contiguous United States (Neal, 1965 & Alfieri *et. al.,* 1994).

2. Assessment of Weediness Potential of durian, *Durio zibethinus*

Table 1 shows the results of the weediness screening for *Durio zibethinus*. These findings did not require a pest-initiated risk assessment.

Table 1: Process for Determining Weediness Potential of Commodity

Commodity: *Durio zibethinus* Murray - (Durian)

Phase 1: Durian is grown to a limited extent in Florida.

Phase 2: Is the species listed in:

NO	*Geographical Atlas of World Weeds* (Holm, 1979)
NO	*World's Worst Weeds* (Holm, 1977)
NO	*Report of the Technical Committee to Evaluate Noxious Weeds; Exotic Weeds for Federal Noxious Weed Act* (Gunn & Ritchie, 1982)
NO	*Economically Important Foreign Weeds* (Reed, 1977)
NO	Weed Science Society of America list (WSSA, 1989)
NO	Is there any literature reference indicating weediness (*e.g.*, *AGRICOLA*, *CAB*, *Biological Abstracts*, *AGRIS*; search on "species name" combined with "weed").

Phase 3: Conclusion:

This commodity does not pose a significant risk as a weed and we proceeded with this pest risk assessment according to our guidelines (USDA, 1995).

3. Previous Risk Assessments, Current Status and Pest Interceptions

3a. Decision history for *Durio* spp.

There are no previous risk assessments (decision sheets) on *Durio* spp. from Hawaii.

3b. Interceptions from Hawaii FY 1985-95

There were no interception from Hawaiian *Durio* spp. during this period.

4. Pest List: Pests Associated with durian in Hawaii

Table 2 shows the pest list for *Durio* spp., which was developed after a review of the information sources listed in USDA (1995). The pest list summarizes information on the distribution of each pest, pest-commodity association, and regulatory history.

Table 2: Pest List - *Durio* spp.

Scientific Name, Classification	Distribution[1]	Comments[2]	References
Pathogens			
Colletotrichum gloeosporioides (Penz.) Penz. & Sacc. in Penz. (Fungi Imperfecti: Coelomycetes)	HI,US	c,m,o,z_e	Raabe *et. al.*, 1981; Alahakoon & Brown, 1994; Lim, 1990
Colletotrichum sp. (Fungi Imperfecti: Coelomycetes)	HI,US	a	Kunishi & Kitagawa, 1996; Farr *et. al.*, 1989
Fusarium solani (Mart.) Sacc. (Fungi Imperfecti: Hyphomycetes)	HI,US	c,m,o,z_e	Lim, 1990; Raabe *et. al.*, 1981; Farr *et. al.*, 1989
Fusarium sp. (Fungi Imperfecti: Hyphomycetes)	HI,US	a	Kunishi & Kitagawa, 1996; Farr *et. al.*, 1989
Lasiodiplodia theobromae (Pat.) Griffon & Maubl. (Fungi Imperfecti: Coelomycetes)	HI,US	a,c,m,o	Raabe *et. al.*, 1981; Singh, 1973
Phoma sp. (Fungi Imperfecti: Coelomycetes)	HI,US	a	Kunishi & Kitagawa, 1996; Farr *et. al.*, 1989
Phytophthora palmivora (E. J. Butler) E. J. Butler (Oomycetes, Peronsporales)	HI,US	c,m,o,z_e	Raabe *et. al.*, 1981; CMI 1985; Lee *et. al.*, 1991; Farr *et. al.*, 1989
Pythium vexans de Bary (Oomycetes: Peronosporales)	HI,US	a,m,o	Raabe *et. al.*, 1981; Singh, 1973
Rhizoctonia solani Kuhn (Fungi Imperfecti: Agonomycetes)	HI,US	c,m,o	Raabe *et. al.*, 1981; Singh, 1973
Rhizopus stolonifer (Ehrenb.:Fr.) Vuill. (Zygomycetes: Mucorales)	HI,US	c,m,o	Lim, 1990; Raabe *et. al.* 1981; Farr *et. al.*, 1989
Sclerotium rolfsii Sacc. (Fungi Imperfecti: Agonomycetes)	HI,US	c,m,o,z_e	Lim, 1990; Raabe, *et. al.*, 1981; Farr *et. al.*,1989

Arthropods			
Bactrocera dorsalis (Hendel) (Diptera: Tephritidae)	HI,US[3]	h,l	White & Elson-Harris, 1992
Maconellicoccus hirsutus (Green) (Homoptera: Pseudococcidae)	HI	m,n,x,z_e	Anon, 1994; USDA, 1996

[1] Distribution legend: HI = Hawaii; US = Other parts of the United States

[2] Comments:
- a = Pest mainly associated with a plant part other than the commodity.
- c = Listed in non-reportable dictionary as non-actionable.
- h = Quarantine pest: pest has limited distribution in the U.S. and is under official control.
- l = A single unconfirmed report lists this species (with no supporting evidence).
- m = The pest occurs within the PRA area and has been reported to attack the specified host species in other geographic regions; but has not been reported to attack the specified host species in the PRA area.
- n = Listed in the USDA catalogue of intercepted pests as actionable.
- o = Organism does not meet the geographical and regulatory definition for a quarantine pest.
- x = Multiple interception records exist on this host from other tropical areas.
- z_e = External pest: is known to attack or infest *Durio zibethinus* fruits and it would be reasonable to expect the pest may remain with the commodity during processing and shipping.

3 *Bactrocera dorsalis* has been detected on occasion in the United States. Whenever it is detected, a quarantine is established and an eradication program implemented. This fruit fly is considered to be quarantine pests in the United States.

5. List of Quarantine Pests

The list of quarantine pests for commercial shipments of durian fruits from Hawaii is provided in Table 3. Although *Bactrocera dorsalis* is included in Table 2, it was not considered a quarantine pest for this host. The durian fruit has a very tough and thick outer rind and is fairly common in the Hawaiian Islands where it has not been associated with either of the *Bactrocera* spp. or *Ceratitis*. Currently durian fruits are permitted entry without treatment for fruit flies from the Philippines and Thailand. Fruit flies have not been associated with these imports.

Table 3: Quarantine Pests: Durian fruits	
Arthropods	*Maconellicoccus hirsutus*

6. Quarantine Pests Likely to Follow Pathway (*i.e.*, Quarantine Pests Selected for Further Analysis)

Only those quarantine pests that can reasonably be expected to follow the pathway, *i.e.* be included in commercial shipments of *Durio zibethinus,* were analyzed in detail (see USDA, 1995 for selection criteria). Only quarantine pests listed in Table 4 were selected for further analysis and subjected to steps 7-9 below. Although *Maconellicoccus hirsutus* has not been associated with annona in Hawaii, they have been intercepted on fruits from other tropical areas so it was included for further evaluation.

Table 4: Quarantine Pest Selected for Further Analysis: Hawaiian durian fruits for consumption

Arthropod	**Maconellicoccus hirsutus**

7. Economic Importance: Consequences of Introduction

The consequences of introduction was considered for each quarantine pest selected for further analysis. For qualitative, pathway-initiated pest risk assessments, these risks were estimated by rating each pest with respect to five risk elements. A full description of these elements and rating criteria can be found in USDA (1995). Table 5 shows the risk ratings for these risk elements. The cumulative (Total score for Risk Elements 1-5 (*i.e.*, the "Consequences of Introduction Risk Rating") is considered to be a biological indicator of the potential destructiveness of the pest.

Table 5: Risk Rating: Consequences of Introduction

Pest	Climate/Host	Host Range	Dispersal	Economic	Environ-mental	Risk Rating
Maconellicoccus hirsutus	medium	high	medium	high	high	high

8. Likelihood of Introduction

Each pest was rated with respect to introduction potential (*i.e.*, entry and establishment). Two separate components were considered. First, the amount of commodity likely to be moved was estimated. More movement leads to greater risk; the results is a risk rating that applies to the commodity and country in question and is the same for all quarantine pests considered. Second, five biological features concerning the pests and its interactions with the commodity were considered. The resulting risk ratings were specific to each pest. The cumulative risk rating for introduction was considered to be an indicator of the likelihood that a particular pest would be introduced. A full description of these elements and rating criteria can be found in USDA (1995). Table 6 shows the ratings for these risk elements.

Table 6: Risk Rating: Likelihood of Introduction

Pest	Quantity of commodity imported annually	Likelihood survive postharvest treatment	Likelihood survive shipment	Likelihood not detect at port of entry	Likelihood moved to suitable habitat	Likelihood find suitable host	Risk rating
Maconellicoccus hirsutus	low	high	high	medium	low	low	medium

9. Conclusion: Pest Risk Potential and Phytosanitary Measures

The measure of pest risk potential combines the risk ratings for consequences and likelihood of introduction as described in USDA (1995). Table 7 shows the estimated pest risk potential for the quarantine pest selected for further analysis for the movement of *Durio zibethinus* fruits from Hawaii.

Table 7: Pest Risk Potential, Quarantine Pests, *Durio zibethinus* from Hawaii

Pest	Pest risk potential
Maconellicoccus hirsutus	high

Usually for a pest receiving a high PRP risk rating, we would strongly recommend specific phytosanitary measures. However, this pest has not been associated with *Durio* spp. in Hawaii and therefore movement of the fruit is unlikely to serve as a pathway for introduction. Although *M. hirsutus* is established in Hawaii it has had little or no impact, probably due to the introduction of a parasite about the same time. PPQ currently inspects other commodities which serve as hosts for this mealy- bug from the Caribbean area. If this mealybug is intercepted on Hawaiian durian fruits, Operational Support staff may establish appropriate sanitary and phytosanitary measures they believe necessary to mitigate pest risk. The pest risk management phase is not part of this document. Appropriate sanitary and phytosanitary measures to mitigate pest risk will be determined during the pest risk management phase.

PPQ has intercepted over 180 pests on durian fruits from other tropical areas since 1985; however, virtually all external pests listed could be detected by inspection. Some of these same pests occur in Hawaii in addition to other polyphagous quarantine pests and have been intercepted as hitchhikers with other commodities. Should any of these pests be intercepted on commercial (or any other) shipments of *Durio zibethinus,* quarantine action may be taken.

C. References

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