Importation of Pomegranate Fruits, *Punica granatum* from Israel into 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 importation into the United States of **fresh pomegranate fruits (*Punica granatum*) grown in Israel**. This is a qualitative pest risk assessment, that is, estimates of risk are expressed in qualitative terms such as high or low rather than numerical terms such as probabilities or frequencies. The details of methodology and rating criteria can be found in: ***Pathway-Initiated Pest Risk Assessment: Guidelines for Qualitative Assessments, version 4.0*** (USDA, 1995); available from the individual named in the proposed regulations, or on our web site at www.aphis.usda.gov/ppq/bats/bant.

International plant protection organizations, *e.g.*, North American Plant Protection Organization (NAPPO) and 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. Our use of biological and phytosanitary terms, *e.g.*, introduction, quarantine pest, conforms with the *NAPPO Compendium of Phytosanitary Terms* (Hopper, 1996) and the *Definitions and Abbreviations* (Introduction Section) in *International Standards for Phytosanitary Measures, Section 1—Import Regulations: Guidelines for Pest Risk Analysis* (FAO 1996).

The *Guidelines for Pest Risk Analysis* provided by FAO (1996) describe three stages in pest risk analysis. This document satisfies the requirements of FAO Stages 1 (initiation) and 2 (risk assessment).

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 a request for USDA authorization to allow importation of a particular commodity presenting a potential plant pest risk. In this case, the importation of **fresh pomegranate fruits (*Punica granatum*) grown in Israel** is a potential pathway for introduction of plant pests. Pomegranate fruits are currently enterable from Israel into North Atlantic ports subject to mandatory cold treatment for the Mediterranean fruit fly. No decision sheet was found in the files and a new pest risk assessment was initiated to determine the current pest risk. Regulatory authority for the importation of fruits and vegetables from foreign sources into the U.S. is found in 7 CFR §319.56 .

2. Assessment of Weediness Potential of Pomegranate, *Punica granatum*

The results of the weediness screening (Table 1) did not prompt a pest-initiated risk assessment.

Table 1: Process for Determining Weediness Potential of Commodity

Commodity: *Punica granatum* L. Pomegranate (Punicaceae)

Phase 1: Pomegranate is commercially cultivated in California. According to the PLANTS database, pomegranate has been introduced into Alabama, Florida, Louisiana, Utah, Puerto Rico and the Virgin Islands.

Phase 2: Is the species listed in:

NO	*Geographical Atlas of World Weeds* (Holm *et al.*, 1979)
NO	*World's Worst Weeds* (Holm *et al.*, 1977)
NO	*Report of the Technical Committee to Evaluate Noxious Weeds; Exotic Weeds for Federal Noxious Weed Act* (Gunn and 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: No evidence of weediness traits were noted in the literature.

3. Previous Risk Assessments and Current Status

Decision history for *Punica granatum*

1925 - Italy: Denied entry, no acceptable treatment for medfly.
1987 - Greece: Entry permitted at all ports with mandatory treatment (T107(a)) for medfly.
1988 - Turkey: Entry permitted at all ports with mandatory treatment (T107) for medfly.
1988 - Iran: Denied entry, no acceptable treatment for two species of *Dacus*.

4. Pest List: Pests Associated with *Punica* spp.

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

Table 2: Pest List - *Punica* spp.

Scientific Name, Classification	Distribution[1]	Comments[2]	References
Pathogens			
Alternaria alternata (Fr.:Fr.)Keissl. (Fungi Imperfecti: Hyphomycetes)	IL,US	c,o	Farr *et al.*, 1989; Palti *et al.*, 1977
Aspergillus niger Tiegh. (Fungi Imperfecti: Hyphomycetes)	IL,US	c,o	Barkai-Golan, 1981; Farr *et al.*, 1989
Botrytis cinerea Pers.:Fr. (Fungi Imperfecti: Hyphomycetes)	IL,US	c,m,o	Farr *et al*, 1989, Rotem and Aust, 1991
Colletotrichum gloeosporioides (Pens.) Penz. & Sacc in Penz. (Fungi Imperfecti: Coelomycetes)	IL,US	c,m,o	Farr *et al.*, 1989; Prusky *et al.*, 1991
Penicillium expansum Link (Fungi Imperfecti: Hyphomycetes)	IL,US	c,o	Barkai-Golan, 1974; Farr *et al.*, 1989
Rhizoctonia solani Kuhn (Mycelia Sterilia: Agonomycetes)	IL,US	c,m,o	Farr *et al.*, 1989; Hadar and Mandelbaum, 1992
Rosellinia necatrix Prill (Pyrenomycetes: Xylariales) anamorph: *Dematophora nectarix* R. Hartig	IL,US	a,o	Farr *et al.*, 1989; Sztejnberg and Madar, 1979
Sphaceloma punicae Bitanc. & Jenkins (Fungi Imperfecti: Coelomycetes)	IL,US(FL)	g,z_{ei}	Farr *et al.*, 1989; USDA, 1997
Bacteria			
Agrobacterium tumefaciens (Smith & Townsend) Conn	IL,US	a,c,o	Bradbury, 1986
Viruses			
None found in the literature			
Arthropods			
Acaudaleyrodes citri (Priesner and Hosny) (Homoptera: Aleyrodidae)	IL	a	Avidov and Harpaz; 1969; Rivnay and Gerling, 1987
Aleyrodidae, species of. (Homoptera)	IL	z_e	USDA, 1997
Apate monachus Fab. (Coleoptera: Bostrichidae)	IL	a	Avidov and Harpaz, 1969

Aphis gossypii Glover (Homoptera: Aphididae)	IL,US	a,c,o	Avidov and Harpaz, 1969; USDA, 1997
Aphis punicae Passerini (Homoptera: Aphididae)	IL	a	Avidov, and Harpaz, 1969
Apomyelois (*Ectomyelois*) *ceratoniae* Zeller (Lepidoptera: Pyralidae)	IL,US(HI)	c,o	Gothilf, 1970; USDA, 1997; Zhang, 1994
Aurigena chlorana Cast. and Bory (Coleoptera: Buprestidae)	IL	a	Avidov and Harpaz, 1969
Bemisia tabaci (Gennadius) (Homoptera: Aphididae)	IL,US	a,c,o	Avidov and Harpaz, 1969; CIE, 1986
Ceratitis capitata (Wiedemann) (Diptera: Tephritidae)	IL,US[3]	h,x,z[1]	USDA, 1997
Ceroplastes floridensis (Comstock) (Homoptera: Coccidae)	IL,US	a,c,o	Avidov and Harpaz, 1969; CIE, 1982
Ceroplastes sinensis Del. G. (Homoptera: Coccidae)	IL?,IR,LB	a,v	CIE, 1980; Farahbakhsh, 1961
Ceroplastes sp. (Homoptera: Coccidae)	IL	z[6]	USDA, 1997
Chrysomphalus aonidum (L.) (Homoptera: Diaspididae)	IL,US	o,c,z[6]	Avidov and Harpaz, 1969; IIE, 1988
Crematogaster sp. (Hymenoptera: Formicidae)	IL	z[6]	USDA, 1997
Cryptoblabes gnidiella Milliere (Lepidoptera: Pyralidae)	IL,US(HI)	g,x,z[1]	Asher *et al.*, 1983; USDA, 1997; Zhang, 1994
Cryptoblabes sp. (Lepidoptera: Pyralidae)	IL	z[1]	USDA, 1997
Deudorix (=*Virachola*) *isocrates* (F.) (Lepidoptera: Lycaenidae)	IL	z[1]	Hill, 1987
Deudorix (=*Virachola*) *livia* Klug (Lepidoptera: Lycaenidae)	IL	z[1]	Avidov and Harpaz, 1969
Ectomyelois sp. (Lepidoptera: Pyralidae)	IL	z[1]	USDA, 1997
Eriophyes granati Can. (Acari: Eriophyidae)	IL	a	Avidov and Harpaz, 1969; Jeppson *et al.*, 1975
Heliothrips haemorrhoidalis (Bouche) (Thysanoptera: Thripidae)	IL,US	c,o,z[6]	Avidov and Harpaz, 1969; CIE, 1961
Lepidosaphes ulmi (L.) (Homoptera: Diaspididae)	IL,US	c,o,z[6]	Avidov and Harpaz, 1969; CIE, 1958
Lobesia botrana Denis & Schiffermuller (Lepidoptera: Tortricidae)	IL	e (infrequent host)	Taylor, 1988; Zhang, 1994
Lycaenidae, species of. (Lepidoptera)	IL	z[1]	USDA, 1997
Maladera matrida Argaman (Coleoptera: Scarabaeidae)	IL	a	Golberg *et al.*, 1991
Microcerotermes diversus Silv. (Isoptera: Termitidae)	IL	a	Avidov and Harpaz, 1969

Olethreutinae, species of. (Lepidoptera)	IL	x,z_i	USDA, 1997
Oxycarenus hyalinipennis (Costa) (Heteroptera: Lygaeidae)	IL	z_e	USDA, 1997
Parasaissetia nigra (Nietn.) (Homoptera: Coccidae)	IL,US	o,z_e	Arnett, 1985; Jadhav and Ajri, 1985; Kfir and Rosen, 1980
Parlatoria oleae (Colvee) (Homoptera: Diaspididae)	IL,US	m,o	Avidov and Hkarpas, 1969; Butani, 1976
Piezodorus lituratus (Frabricius) (Heteroptera: Pentatomidae)	IL	z_e	USDA, 1997
Planococcus citri (Risso) (Homoptera: Pseudococcidae)	IL,US	c,o,z_e	Avidov and Harpaz, 1969; CIE, 1969
Planococcus lilacinus (Ckll.) (Homoptera: Pseudococcidae)	IL	z_e	Hill, 1987
Planococcus sp. (Homoptera: Pseudococcidae)	IL	z_e	USDA, 1997
Pseudococcidae, species of. (Homoptera)	IL	z_e	USDA, 1997
Pyralidae, species of. (Lepidoptera)	IL	z_i	USDA, 1997
Retithrips syriacus (Mayet) (Thysanoptera: Thripidae)	IL	a,v	Hill, 1987; Izhar *et al.*, 1992
Riodinidae, species of. (Lepidoptera)	IL	z_e	USDA, 1997
Saissetia oleae (Olivier) (Homoptera: Coccidae)	IL,US	c,o	Avidov and Harpaz, 1969; CIE, 1976
Siphoninus granati (Priesner and Hosny) (Homoptera: Aleyrodidae)	IL	a	Avidov and Harpaz, 1969
Siphoninus phillyreae Haliday (Homoptera: Aleyrodidea)	IL,US(CA)	a,o	Golberg *et al.*, 1991; Bellows *et al.*, 1992
Tenuipalpus punicae P. & B. (Acari: Tenuipalpidae)	IL(?)	v,z_e	Hassan *et al.*, 1986; Zaher and Yousef, 1972
Tephritidae, species of. (Diptera)	IL	z_i	USDA, 1997
Zeuzera pyrina (L.) (Lepidoptera: Cossidae)	IL,US	a,c,o	Avidov and Harpaz, 1969; CIE, 1973

[1] Distribution legend: IL = Israel; IR = Iran; LB = Lebanon; US = United States; CA = California; FL = Florida; HI = Hawaii;

[2] Comments:

- a = Pest mainly associated with a plant part other than the commodity.
- c = Listed in USDA's non-reportable dictionary as non-actionable.
- e = Although pest attacks commodity, it would not be expected to remain with the commodity during processing.
- g = Quarantine pest: pest has limited distribution in U.S. and is under official control as follows: pest listed by name in USDA's pest dictionary, official quarantine action may be taken on this pest when intercepted on this commodity.
- h = Quarantine pest: pest has limited distribution in the U.S. and is under official control as follows: (1) pest listed by name in USDA's pest dictionary, official quarantine action may be taken on this pest when intercepted on this commodity and, (2) pest is a program pest.
- 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.
- o = Organism does not meet the geographic or regulatory definition of a quarantine pest.
- v = No specific reports of the pest from PRA area, but regional reports exist and the pest may be present in the PRA area.
- x = Multiple interceptions exist.
- z_e = External pest: is known to attack or infest *Punica* spp. and it would be reasonable to expect the pest may remain with the commodity during processing and shipping.
- z_i = Internal pest: is known to attack or infest *Punica* spp. and it would be reasonable to expect the pest may remain with the commodity during processing and shipping.

[3] *Ceratitis capitata* has been detected on occasion in the continental United States. Whenever *C. capitata* has been detected, a quarantine was established and an eradication program was implemented. *C. capitata* is considered a quarantine pests in the United States. An infestation in Florida is currently under eradication.

5. List of Quarantine Pests

The list of quarantine pests for commercial shipments of pomegranates from Israel is provided in Table 3. Should any of these pests be intercepted on commercial (or any other) shipments of *Punica granatum* quarantine action may be taken.

Table 3: Quarantine Pests:

Pathogens	*Sphaceloma punicae*
Arthropods	*Acaudaleyrodes citri*
	Aleyrodidae, species of.
	Apate monachus
	Aphis punicae
	Aurigena chlorana
	Ceratitis capitata
	Ceroplastes sinensis
	Ceroplastes sp.
	Crematogaster sp.
	Cryptoblabes gnidiella
	Cryptoblabes sp.
	Deudorix isocrates
	Deudorix livia
	Ectomylelois sp.
	Eriophyes granati
	Lobesia botrana
	Lycaenidae, species of.
	Maladera matrida
	Microcerotermes diversus
	Olethreutinae, species of.
	Oxycarenus hyalinipennis
	Piezodorus lituratus
	Planococcus linacinus
	Planococcus sp.
	Pseudococcidae, species of.
	Pyralidae, species of.
	Riodinidae, species of.
	Siphoninus granati
	Tenuipalpus punicae
	Tephritidae, species of.

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 *Punica granatum*, were analyzed in detail (USDA, 1995). Only quarantine pests listed in Table 4 were selected for further analysis and subjected to steps 7-9 below.

Table 4: Quarantine Pest Selected for Further Analysis:

Pathogens	*Sphaceloma punicae*
Arthropods	*Ceratitis capitata*
	Cryptoblabes gnidiella
	Deudorix isocrates
	Deudorix livia
	Planococcus lilacinus

Other plant pests in this Assessment, not chosen for further scrutiny, may be potentially detrimental to the agricultural production systems of the United States; however, there were a variety of reasons for not subjecting them to further analysis. For example, they are associated mainly with plant parts other than the commodity; they may be associated with the commodity (however, it was not considered reasonable to expect these pests to remain with the commodity during processing); they have been intercepted as biological contaminants of these commodities during inspections by Plant Protection and Quarantine Officers but would not be expected to be present with every shipment. In addition, the biological hazard of organisms identified only to the generic level are not assessed due to the lack of adequate biological/taxonomic information. 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. By developing detailed assessments for known pests that inhabit a variety of niches on the parent species, *i.e.* on the surface of or within the bark/wood, on the foliage, etc., effective mitigation measures can be developed to eliminate the known organism and any similar unknown ones that inhabit the same niches.

7. Economic Importance: Consequences of Introduction

The consequences of introduction were considered for each quarantine pest selected for further analysis. For qualitative, pathway-initiated pest risk assessments, these risks are estimated by rating each pest with respect to five risk elements (USDA, 1995). Table 5 shows the risk ratings for these risk elements.

Table 5: Risk Rating: Consequences of Introduction

Pest	Climate/ Host	Host Range	Dispersal	Economic	Environ-mental	Risk Rating
Sphaceloma punicae	high	low	low	low	medium	medium
Ceratitis capitata	high	high	high	high	high*	high
Cryptoblabes gnidiella	medium	high	medium	medium	medium	medium
Deudorix spp.	medium	high	medium	medium	high**	high
Planococcus lilacinus	high	high	low	medium	high***	high

**Ceratitis capitata* is known to attack members of the plant genera, *Eugenia, Ochrosia, Opuntia, Prunus, Santalum,* and *Solanum.* In the United States, *Eugenia haematocarpa, E. koolauensis, E. woodburyana, Ochrosia kilaueaenis, Opuntia treleasei, Prunus geniculata, Santalum freycinetianum* var. *lanaiense, Solanum drymophilum, S. incompletum,* and *S. sandwicense* are Federal listed endangered species.

***Deudorix livia* is known to attack a member of the plant genus, *Vicia.* In the United States, *Vicia menziesii* is a Federal listed endangered species.

****Planococcus lilacinus* is known to attack members of the plant genera, *Amaranthus, Solanum* and *Ziziphus.* In the United States, *Amaranthus pumilus, Solanum drymophilum, Solanum incompletum, Solanum sandwicense,* and *Ziziphus celata* are Federally listed endangered species.

We believe it would be reasonable to assume that these pests may attack these endangered plants. We automatically gave these pests a risk rating of 'high' for Consequence of Introduction because of existing legislation regarding endangered plants.

8. Likelihood of Introduction

Each pest is rated with respect to introduction potential, *i.e.,* entry and establishment. Two separate components are considered. First, the amount of commodity likely to be imported is estimated. More imports lead to greater risk; therefore, the risk rating for the quantity of commodity is the same for all quarantine pests considered. Second, five biological features, (risk elements) concerning the pest and its interactions with the commodity are considered. The resulting risk ratings are 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 (USDA, 1995). Table 6 shows our 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 detected at port of entry	Likelihood moved to suitable habitat	Likelihood find suitable host	Risk rating
Sphaceloma punicae	low	high	high	low	low	low	medium
Ceratitis capitata	low	high	high	high	high	high	high
Cryptoblabes gnidiella	low	high	high	low	medium	medium	medium
Deudorix spp.	low	medium	medium	low	medium	medium	medium
Planococcus lilacinus	low	high	high	low	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 (USDA, 1995). The estimated pest risk potential for each quarantine pest selected for further analysis is provided in Table 7.

Table 7: Pest Risk Potential, Quarantine Pests, Israel Pomegranates

Pest	Pest risk potential
Sphaceloma punicae	medium
Ceratitis capitata	high
Cryptoblabes gnidiella	medium
Deudorix spp.	high
Planococcus lilacinus	high

Plant pests with a high Pest Risk Potential may require specific phytosanitary measures. The choice of appropiate sanitary and phytosanitary measures to mitigate risk is undertaken as part of Risk Management and is not addressed, *per se*, in this document.

PPQ has over 2000 plant pest interceptions from pomegranates from other areas; however, virtually all external pests listed could be detected by inspection. Some of these same pests occur in Israel in addition to other 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 *Punica granatum*, quarantine action may be taken.

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