Importation of leaves and tips of snow peas, *Pisum sativum* var. *macrocarpon* from Guatemala into the United States

Qualitative, Pathway-Initiated Pest Risk Assessment

March 1998

Agency Contact:

Biological Assessment and Taxonomic Support
Plant Protection and Quarantine
Animal and Plant Health Inspection Service
U.S. Department of Agriculture
4700 River Road, Unit 133
Riverdale, MD 20737-1236

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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 leaves and tips of snow peas (*Pisum sativum* var. *macrocarpon*) grown in Guatemala**. 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 the web site: www.aphis.usda.gov/ppq/bats/bant.

International plant protection organizations, *e.g.*, North American Plant Protection Organization (NAPPO) and 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 and FAO. Our use of biological and phytosanitary terms conforms with the *NAPPO Compendium of Phytosanitary Terms* (Hopper, 1995) 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 leaves and tips of snow peas (*Pisum sativum* var. *macrocarpon*) grown in Guatemala** is a potential pathway for introduction of plant pests. 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 Snow Peas, *Pisum sativum* var. *macrocarpon*

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: *Pisum sativum* L. var. *macrocarpon* Ser. (snow pea) (Fabaceae)

Phase 1: Snow peas are widely cultivated in the United States

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: There are no reports at the species level of weedy tendencies in any of the available literature and the plant is grown throughout the United States, commercially and for home use.

3. Previous Risk Assessments, Current Status, and Pest Interceptions

3a. Decision history for *Pisum sativum* from Central America

1927 - Guatemala peas (green) enterable at South Pacific Ports.
1972 - Nicaragua fresh snow peas enterable at all ports subject to inspection.
1988 - Guatemala snow peas (young leaves and stems) denied entry because of a rust disease.
1988 - Honduras, Guatemala, and El Salvador: Memorandum Number 88-17-56 recommended that peas in the pod destined to all continental U.S. ports be fumigated as a condition of entry for pod borers. Shelled peas to be inspected as a condition of entry.
1988 - Memorandum Number 88-25-56 recommended that legumes found infested with *Cydia fabivora, Epinotia aporema,* and/or *Maruca testulalis* be treated as a condition of entry into the US. Shipments entering and destined to Puerto Rico, U.S. Virgin Islands, Hawaii, or Guam infested with *Maruca testulalis* would not require treatment as the pest is established in these locations.
1988 - Caribbean and South America: Memorandum Number 88-26-56 recommended permitting entry of snow pea (whole pods) at all ports subject to inspection for pod borers.
1991 - Nicaragua peas (pod & shelled) enterable all ports. Shelled peas enterable subject to inspection. Peas in pod subject to mandatory treatment under T-104a.

1991 - Panama: Memorandum Number 91-56-43 recommended mandatory treatment of peas in the pod and that shelled peas be permitted entry at all ports subject to inspection.

1991 - Belize: Memorandum Number 91-56-60 recommended mandatory treatment of peas in the pod from countries infested with *Epinotia aporema* and *Maruca testulalis.*

3b. Pest interceptions from 1985-1998 from Guatemala

PEST	HOST
ACANTHOSCELIDES OBVELATUS	PISUM SATIVUM (FRUIT)
AEOLUS SP.	PISUM SATIVUM (FRUIT)
AGROMYZIDAE, SPECIES OF	PISUM SATIVUM (DRIED FRUIT)
AGROMYZIDAE, SPECIES OF	PISUM SATIVUM (FRUIT)
AGROMYZIDAE, SPECIES OF	PISUM SATIVUM (LEAF)
AGROMYZIDAE, SPECIES OF	PISUM SATIVUM (SEED)
AGROMYZIDAE, SPECIES OF	PISUM SATIVUM (STEM)
AGROMYZIDAE, SPECIES OF	PISUM SATIVUM
AGROMYZIDAE, SPECIES OF	PISUM SATIVUM VAR. MACROCARPON (FRUIT)
AGROMYZIDAE, SPECIES OF	PISUM SP. (FLOWER)
AGROMYZIDAE, SPECIES OF	PISUM SP. (FRUIT)
AGROMYZIDAE, SPECIES OF	PISUM SP. (LEAF)
AGROMYZIDAE, SPECIES OF	PISUM SP. (SEED)
AGROMYZIDAE, SPECIES OF	PISUM SP.
ALTICA SP.	PISUM SATIVUM (FRUIT)
ANAXIPHA SP.	PISUM SATIVUM (FRUIT)
ANOMALA SP.	PISUM SATIVUM (FRUIT)
ANOMALA SP.	PISUM SATIVUM
ANOMALA SP.	PISUM SP. (FRUIT)
ANTHONOMUS SP.	PISUM SATIVUM (FRUIT)
APHIDIDAE, SPECIES OF	PISUM SATIVUM (FRUIT)
APHIDIDAE, SPECIES OF	PISUM SATIVUM (SEED)
APHIDIDAE, SPECIES OF	PISUM SP. (FRUIT)
APTOPUS SP.	PISUM SATIVUM (FRUIT)
ASCOCHYTA SP.	PISUM SATIVUM (LEAF)
BLAPSTINUS SP.	PISUM SATIVUM (FRUIT)
CHALEPUS SP.	PISUM SATIVUM (FRUIT)
CICADELLIDAE, SPECIES OF	PISUM SATIVUM
CLADOSPORIUM SP.	PISUM SATIVUM (FRUIT)
COLLETOTRICHUM SP.	PISUM SATIVUM (FRUIT)
CONODERUS PICTUS	PISUM SATIVUM (FRUIT)
CONODERUS SP.	PISUM SATIVUM (LEAF)
COPITARSIA SP.	PISUM SATIVUM (FRUIT)
COPITARSIA SP.	PISUM SATIVUM (POD)
COPITARSIA SP.	PISUM SATIVUM (SEED)
COPITARSIA SP.	PISUM SATIVUM
COPITARSIA SP.	PISUM SP. (FRUIT)
COPITARSIA SP.	PISUM SP. (SEED)
COPITARSIA SP.	PISUM SP. (STEM)
CUERNA MEXICANA	PISUM SATIVUM (FRUIT)
CURCULIONIDAE, SPECIES OF	PISUM SATIVUM (FRUIT)
CURCULIONIDAE, SPECIES OF	PISUM SATIVUM (POD)
CURCULIONIDAE, SPECIES OF	PISUM SP. (FRUIT)
DIABROTICA PORRACEA	PISUM SATIVUM (FRUIT)
DIPHAULACA SP.	PISUM SP. (FRUIT)
DIPLOTAXIS SP.	PISUM SATIVUM (FRUIT)
DIPLOTAXIS SP.	PISUM SP. (FRUIT)
DISONYCHA SP.	PISUM SP. (FRUIT)
ECPANTHERIA SP.	PISUM SATIVUM (FRUIT)
ELATERIDAE, SPECIES OF	PISUM SATIVUM (FRUIT)
EPICAERUS SP.	PISUM SATIVUM (FRUIT)
EPICAERUS SP.	PISUM SATIVUM (SEED)
EPINOTIA APOREMA	PISUM SATIVUM (FRUIT)
EPINOTIA APOREMA	PISUM SATIVUM (SEED)
EPINOTIA APOREMA	PISUM SP. (FRUIT)
EPINOTIA APOREMA	PISUM SP. (SEED)
EPITRAGUS SP.	PISUM SATIVUM (FRUIT)
EPITRIX SP.	PISUM SATIVUM (FRUIT)
EUXOA SORELLA	PISUM SATIVUM (FRUIT)
FRANKLINIELLA BORINQUEN	PISUM SATIVUM (FRUIT)
FRANKLINIELLA SP.	PISUM SATIVUM (FRUIT)
FRANKLINIELLA SP.	PISUM SP. (FRUIT)
GLYPHONYX SP.	PISUM SATIVUM (FRUIT)
GNATHOTRICHUS SP.	PISUM SATIVUM (FRUIT)
GRYLLUS SP.	PISUM SATIVUM (FRUIT)

HARMOSTES SP.	PISUM SATIVUM (FRUIT)
HORISTONOTUS RUFIVENTRIS	PISUM SATIVUM (FRUIT)
HYLASTES ATER	PISUM SATIVUM (FRUIT)
LEPIDOPTERA, SPECIES OF	PISUM SATIVUM (FRUIT)
LIGYRUS SP.	PISUM SATIVUM (SEED)
LIRIOMYZA HUIDOBRENSIS	PISUM SATIVUM (FRUIT)
LIRIOMYZA HUIDOBRENSIS	PISUM SATIVUM (LEAF)
LIRIOMYZA HUIDOBRENSIS	PISUM SATIVUM
LOBOMETOPON GUATEMALENSE	PISUM SATIVUM (FRUIT)
LOBOMETOPON SP.	PISUM SATIVUM (FRUIT)
LOBOMETOPON SP.	PISUM SATIVUM
LOBOMETOPON SP.	PISUM SP. (FRUIT)
MYODOCHA UNISPINOSA	PISUM SATIVUM (FRUIT)
NOCTUIDAE, SPECIES OF	PISUM SATIVUM (FRUIT)
NOCTUIDAE, SPECIES OF	PISUM SATIVUM (SEED)
NOCTUIDAE, SPECIES OF	PISUM SATIVUM
NOCTUIDAE, SPECIES OF	PISUM SP. (FRUIT)
NOCTUIDAE, SPECIES OF	PISUM SP. (SEED)
NODONOTA SP.	PISUM SP. (FRUIT)
ORTHODES SP.	PISUM SATIVUM (FRUIT)
PHAEDON SP.	PISUM SATIVUM (FRUIT)
PHYCITINAE SPECIES OF	PISUM SATIVUM (FRUIT)
PHYLLOPHAGA SP.	PISUM SATIVUM (FRUIT)
PHYLLOPHAGA SP.	PISUM SP. (FRUIT)
PITYOPHTHORUS SP.	PISUM SATIVUM (DUNNAGE)
PLUSIINAE, SPECIES OF	PISUM SATIVUM
PLUTELLIDAE, SPECIES OF	PISUM SP. (FRUIT)
RHOPALOSIPHUM SP.	PISUM SATIVUM (FRUIT)
SPODOPTERA SP.	PISUM SP. (FRUIT)
STRIGODERMA SP.	PISUM SATIVUM (SEED)
TENEBRIONIDAE, SPECIES OF	PISUM SP. (FRUIT)
THRIPIDAE, SPECIES OF	PISUM SATIVUM (FRUIT)
THRIPIDAE, SPECIES OF	PISUM SP. (FRUIT)
TINEIDAE, SPECIES OF	PISUM SATIVUM (FRUIT)

4. Pest List: Pests Associated with *Pisum* 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 - *Pisum* spp.

Scientific Name, Classification	Distribution[1]	Comments[2]	References
Pathogens			
Alternaria brassicae (Berk.) Sacc. (Fungi Imperfecti: Hyphomycetes)	GT,US	c,o	CMI, 1984, CPC, 1997
Aphanomyces euteiches Drechs. (Oomycetes: Saprolegniales)	CZ[4],US	a,o	Farr *et al.*, 1989; Slinkhard *et al.*, 1994
Ascochyta pisi Lib. (Fungi Imperfecti: Coelomycetes)	GT,US	o	Farr *et al.*,1989; Schieber and Sanchez, 1968
Botryotinia (=*Sclerotinia*) *fuckeliana* (de Bary) Whetzel (Discomycetes: Helotiales)`	Worldwide[3]	c,o	CMI, 1974
Colletotrichum gloeosporioides (Penz.) Penz. and Sacc. in Penz.(Fungi Imperfecti: Coelomycetes)	GT,US	c,o	Farr *et al.*, 1989; Schieber and Sanchez, 1968
Erysiphe pisi Syd. (Pyrenomycetes: Erysiphales))	Worldwide[3]	o	CMI, 1967
Erysiphe polygoni D.C. (Pyrenomycetes: Erysiphales)	GT,US	c,o	CMI, 1976; Schieber and Sanchez, 1968
Fusarium oxysporum Schlechtend.:Fr. f.sp. *pisi* (J.C. Hall) W. C. Snyder and Hanna (Fungi Imperfecti: Hyphomycetes)	Widespread[3]	o	IMI, 1996
Fusarium solani (Mart.) Sacc. (Fungi Imperfecti: Hyphomycetes)	CZ[4],US	a,c,o	Farr *et al.*, 1989; Slinkard *et al.*, 1994
Mycosphaerella pinodes (Berk. & Blox.) Vestergr. (Loculoascomycetes: Dothideales) Anamorph: *Ascochyta pinodes* L.K. Jones	GT,US	c,o	CMI, 1979, Hagedorn, 1984
Mycovellosiella phaseoli (Drummond) Deighton (Fungi Imperfecti: Hyphomycetes)	GT	k	CMI, 1977
Peronospora viciae (Berk.) Casp. (Oomycetes: Peronosporales)	CZ[4],US	o	Farr *et al.*, 1989; Slinkard *et al.*, 1994
Phakopsora meibomiae (Arthur) Arthur	GT	k[7]	Bromfield, 1984; Ono *et al.*, 1992; Tschanz, 1998
Phoma pinodella (L.K. Jones) Morgan-Jones & K.B. Burch (Fungi Imperfecti: Coelomycetes)	CZ[4],US	o	Farr *et al.*,1989; Slinkard *et al.*, 1994

Pythium aphanidermatum (Edson) Fitzp. (Oomycetes: Peronosporales)	CZ[4],US	c,o	CMI, 1964; Farr *et al.*, 1989
Pythium ultimum Trov (Oomycetes: Peronosporales)	CZ[4],US	c,o	Farr *et al.*, 1989; Slinkard *et al.*, 1994
Rhizoctonia solani Kuhn (Agonomycetes)	GT,US	c,o	Farr *et al.*,1989; Schieber and Sanchez, 1968
Sclerotina sclerotiorum (Lib.) de Bary (Discomycetes: Helotiales)	CZ[4],US	c,o	Farr *et al.*, 1989; Slinkard *et al.*, 1994
Sclerotium rolfsii Sacc. (Agonomycetes)	GT,US	c,o	CMI, 1992; Farr *et al.*, 1989
Thanatephorus cucumeris (A.B. Frank) Donk (Basidiomycetes: Tulasnellales)	GT,US	c,o	Anon., 1984; Farr *et al.*, 1989
Uroymces fabae (Grev.) Fuckel (Basidiomycetes: Uredinales) = *U. vicia-fabae* (Pers.) Schrter.	GT,US	c,o	CMI, 1990; FAO, 1993; Farr *et al.*, 1989
Bacteria			
Agrobacterium tumefaciens (Smith & Townsend) Conn	Worldwide[3]	c,o	Bradbury, 1986
Erwinia carotovora subsp. *carotovora* (Jones) Bergey *et al.*	Worldwide[3]	c,o	Bradbury, 1986
Pseudomonas solanacearum (Smith) Smith	GT,US	c,o	Bradbury, 1986
Pseudomonas syringae pv. *phaseolicola* (Burkholder) Young, Dye & Wilkie	GT,US	c,o	Bradbury, 1986
Xanthomonas campestris pv. *phaseoli* (Smith) Dye	GT,US	c,o	Bradbury, 1986; FAO, 1993
Viruses			
Alfalfa mosaic alfamovirus	Worldwide[3]	o	Brunt *et al.*, 1996
Bean yellow mosaic potyvirus	Worldwide[3]	o	Brunt *et al.*, 1996
Beet western yellows luteovirus	Worldwide[3]	o	Brunt *et al.*, 1996
Clover yellow vein potyvirus	Worldwide[3]	o	Brunt *et al.*, 1996
Cucumber mosaic cucumovirus	Worldwide[3]	o	Brunt *et al.*, 1996; CPC, 1997
Lettuce mosaic potyvirus	Worldwide[3]	o	Brunt *et al.*, 1996
Pea mosaic potyvirus	Worldwide[3]	o	Brunt *et al.*, 1996
Pea seed-borne mosaic potyvirus	Worldwide[3]	o	Hagedorn, 1984
Peanut mottle potyvirus	Worldwide[3]	o	Brunt *et al.*, 1996
Tomato spotted wilt tosposvirus	Worldwide[3]	o	Brunt *et al.*, 1996

Arthropods			
Acyrthosiphon pisum (Harris) (Homoptera: Aphididae)	Worldwide[3]	c,o,y	Blackman and Eastop, 1984
Agrotis ipsilon (Hufnagel) (Lepidoptera: Noctuidae)	GT,US	c,o	CIE, 1969; Kranz *et al.*, 1977
Aphis gossypii Glover (Homoptera: Aphididae)	GT,US	c,o,y	Blackman and Eastop, 1984; CIE, 1968
Apion godmani Wagner (Coleoptera: Curculionidae)	GT,US(AZ,TX)	c,e,o	McGuire and Crandall, 1967; O'Brien and Wibmer, 1982
Aulacorthum solani (Kaltenbach) (Homoptera: Aphididae)	Widespread[3]	c,o,y	Blackman and Eastop, 1984
Bemisia tabaci (Gennadius) (Homoptera: Aleyrodidae)	GT,US	c,o,y[5]	EPPO, 1992; FAO, 1993
Diaphania hyalinata Linnaeus (Lepidoptera: Pyralidae)	GT,US	c,k,o	Paddock, 1978; Zhang, 1994
Epilachna varivestis Mulsant (Coleoptera: Coccinellidae)	GT, US	c,o	CIE, 1954; Kranz *et al.*, 1977
Epinotia aporema Walsingham (Lepidoptera: Tortricidae)	GT	n,x,z,	Oakley, 1953; Zhang, 1994
Etiella zinckenella (Treitschke) (Lepidoptera: Pyralidae)	GT,US	c,o,z,	McGuire and Crandall, 1967; Zhang, 1994
Frankliniella occidentalis (Pergande) (Thysanoptera: Thripidae)	GT,US	c,o,y	IIE, 1993
Fundella pellucens Zeller (Lepidoptera: Pyralidae)	GT,US	c,o	Saunders *et al.*, 1983; Zhang, 1984
Helicoverpa zea Boddie (Lepidoptera: Noctuidae)	GT,US	c,o	EPPO, 1995
Liriomyza huidobrensis (Blanchard) (Diptera: Agromyzidae)	GT,US(CA,HI, TX,UT,WA)	h,x,z,	EPPO, 1997; Gary *et al.*, 1986; Heinz and Chaney, 1995; Malais *et al.*, 1992; Spencer, 1973; Spencer and Steyskal, 1986
Liriomyza sativa Blanchard (Diptera: Agromyzidae)	CZ[4],US	c,o	EPPO, 1997
Liriomyza trifolii (Burgess) (Diptera: Agromyzidae)	GT,US	c,o	FAO, 1993; EPPO, 1997
Macrosiphum euphorbiae (Thomas) (Homoptera: Aphididae)	Widespread[3]	c,o,y	Blackman and Eastop, 1984
Maruca testulalis (Geyer) (Lepidoptera: Pyralidae)	GT	n,z,	FAO, 1993; PNKTO, 1983

Myzus persicae Sulzer (Homoptera: Aphidae)	GT,US	c,o,y	Blackman and Eastop, 1984; CPC, 1997
Pseudoplusia includens (Walker) (Lepidoptera: Noctuidae)	GT,US	c,o	CPC, 1997; FAO, 1989; Zhang, 1994
Spodoptera frugiperda J.E. Smith (Lepidoptera: Noctuidae)	GT,US	c,m,o	Saunders *et al.*, 1983; Zhang, 1994
Spodoptera sunia (Guenee) (Lepidoptera: Noctuidae)	GT,US	c,o,z_e	Hodges *et al.*, 1983
Spoladea recurvalis (Fabricius) (Lepidoptera: Noctuidae)	GT,US	c,o	Zhang, 1994
Tetranychus yusti McGregor (Acari: Tetranychidae)	CZ[4],US	c,o	Jeppson *et al.*, 1975
Thrips palmi Karny (Thysanoptera: Thripidae)	GT[6]?,US(FL,HI)	n,z_e	EPPO, 1997
Trichoplusia ni Hubner (Lepidoptera: Pyralidae)	GT,US	c,o	Zhang, 1994
Urbanus proteus (L.) (Lepidoptera: Hesperiidae)	GT,US	c,k,o	Zhang, 1994

[1] Distribution legend: CZ = Central America; GT = Guatemala; US = United States; CA = California; FL = Florida; HI = Hawaii; PR = Puerto Rico; TX = Texas; UT = Utah, WA = Washington

[2] Comments:
- a = Pest mainly associated with plant part other than 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 the U.S. and is under official control as follows: pest listed by name in USDA's pest dictionary, offical 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.
- k = Not specifically listed for host, but reported from other hosts in same plant genus/family.
- n = Listed in the USDA catalogue of intercepted pests as actionable.
- o = Organism does not meet the geographic or regulatory definition of a quarantine pest.
- x = Multiple interception records exist.
- y = Pest is a vector of plant pathogens.
- z_e = External pest: is known to attack or infect the commodity 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 infect the commodity and it would be reasonable to expect the pest may remain with the commodity during processing and shipping.

[3] Literature reports indicate a worldwide distribution, however; no reports were found of this organism in Guatemala.

[4] No specific reports were found of this pest in Guatemala.

[5] *Bemisia tabaci* is a vector of Bean Golden mosaic bigeminivirus. This virus is reported to occur in Florida and Puerto Rico (EPPO, 1992).

[6] *Ficus* plants of Guatemala origin were found infested in the Netherlands but the pest is declared absent from Guatemala (EPPO, 1997).

[7] Bromfield's Monograph listed *Pisum* sativum as a host but the articles cited stated there were no reports of spore formation on pea. Dr. Tschanz who worked in Taiwan on soybean rust never saw peas infected in nature although artificial inoculations are successful in the laboratory.

5. List of Quarantine Pests

The list of quarantine pests for commercial shipments of snow peas from Guatemala is provided in Table 3. Quarantine action may be taken should any of these pests be intercepted on commercial (or any other) shipments of *Pisum sativum* var. *macrocarpon.*

Table 3: Quarantine Pests:

Pathogens	*Mycovellosiella phaseoli*
	Phakopsora meibomiae
Arthropods	*Epinotia aporema*
	Liriomyza huidiobrensis
	Maruca testulalis
	Thrips palmi

6. Quarantine Pests Likely to Follow Pathway

Only those quarantine pests that can reasonably be expected to follow the pathway, *i. e.,* be included in commercial shipments of *Pisum sativum* var. *macrocarpon*, 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:

Arthropods	*Epinotia aporema*
	Liriomyza huidobrensis
	Maruca testulalis
	Thrips palmi

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
Epinotia aporema	high	medium	medium	medium	high*	high
Liriomyza huidiobrensis	high	high	medium	medium	high*	high
Maruca testulalis	high	high	medium	medium	high **	high
Thrips palmi[1]	high	high	medium	medium	high***	high

*These pest are known to attack members of the plant genera, *Trifolium, Vicia,* and *Vigna*. In the United States, *Trifolium stoloniferum, Vicia menziesii,* and *Vigna o-wahuensis* are federally listed endangered species.
**This pest is known to attack members of the plant genera, *Canavalia, Crotalaria, Sesbania, Vicia,* and *Vigna.* In the United States, *Canavalia molokaiensis, Crotalaria avonensis, Sesbania tomentosa, Vicia menziesii,* and *Vigna o-wahuensis* are federally listed endangered species.
***This pest is known to attack members of the plant genera, *Amaranthus, Cucurbita, Solanum,* and *Vigna.* In the United States, *Amaranthus pumilus, Cucurbita okeechobeensis* spp. *okeechobeensis, Solanum drymophilum, S. incompletum, S. sandwicense,* and *Vigna o-wahuensis* are federally listed endangered species.

1 There are over 200 records of host plants on which *T. palmi* has been recorded. The potential impact on endangered or threatened species may be greater than the 6 species listed above.

We believe it would be reasonable to assume that this pest may attack these endangered plants. Because of existing legislation regarding endangered plants, we automatically gave these pests a risk rating of "high" for Consequence of Introduction.

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
Epinotia aporema	low	high	high	low	medium	medium	medium
Liriomyza huidiobrensis	low	high	high	low	medium	medium	medium
Maruca testulalis	low	high	high	low	medium	medium	medium
Thrips palmi	low	high	high	medium	medium	medium	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 for the importation of *Pisum sativum* var. *macrocarpon* is provided in Table 7.

Table 7: Pest Risk Potential, Quarantine Pests

Pest	Pest risk potential
Epinotia aporema	high
Liriomyza huidobrensis	high (pest actionable when destined to Florida)*
Maruca testulalis	high
Thrips palmi	high

*Cavey, 1997. Change in quarantine status of the pea leaf miner (Updated September 5).

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 many plant pest interceptions from peas from other areas; however, virtually all external pests listed could be detected by inspection. Some of these same pests occur in Guatemala 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 *Pisum sativum* var. *macrocarpon*, quarantine action may be taken.

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John Lightfield
Biological Assessment and Taxonomic Support
Plant Protection and Quarantine
February 1998

A special thanks to L. Redmond, PPQ, who researched the soybean rust issue and analyzed the risk in relation to peas. .

Reviewed by:
G. Cave, Entomologist*
A. Chawkat, Technical Information Specialist*
E. Imai, Senior Operations Manager*
R. Stewart, Entomologist*
E. Podleckis, Plant Virologist*
L. Redmond, Plant Pathologist*