Importation of Tomato Fruit, *Lycopersicon esculentum* from France into the United States

Qualitative, Pathway-Initiated Pest Risk Assessment

March 1997

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

Table of Contents

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 tomato fruits (*Lycopersicon esculentum*) grown in France**. 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.

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).

Pest risk assessment is one component of an overall pest risk analysis. 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 two (risk assessment).

The Food and Agriculture Organization (FAO, 1996) 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, 1996; Hopper, 1996). 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 the qualitative plant pest risk assessment. The assessment methods or the criteria used to rate the various risk elements are not described in detail. 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 website at www.aphis.usda.gov/ppq/bats.

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 tomato fruits (*Lycopersicon esculentum*) grown in France** 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 tomato, *Lycopersicon esculentum*

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

Table 1: Process for Determining Weediness Potential of Commodity

Commodity: *Lycopersicon esculentum* Mill., tomato (Solanaceae). Native to western South America.

Phase 1: *Lycopersicon esculentum* is widely cultivated in the United States.

Phase 2: Is the species listed in:

Yes	*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 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: *Lycopersicon esculentum* Mill. is listed in the *Geographical Atlas of World Weeds* as a common weed of Taiwan and a weed of unknown importance in Honduras (Belize) and the United States.

3. Previous Risk Assessments, Current Status and Pest Interceptions

3a. Decision history for *Lycopersicon esculentum*

1957 - France: Entry permitted subject to inspection at New York.
1973 - Spain & Canary Islands: Green tomatoes permitted entry into North Atlantic and North Pacific ports subject to inspection. Transshipments to southern ports or California are prohibited.
1984 - Netherlands: Entry permitted subject to inspection.
1987 - Canary Islands: Commercial shipments of green only tomatoes permitted entry subject to inspection.
1987 - Channel Islands: Entry permitted subject to inspection.
1988 - Spain: Commercial shipments of green tomatoes permitted entry into all ports subject to inspection.
1994 - Spain (Almeria Province): Greenhouse-grown red or pink tomatoes are permitted entry subject to special certification.

3b. Interceptions from area for FY 1985-97.

Country	Pest	Host	Tally
MOROCCO	HELICOVERPA ARMIGERA	LYCOPERSICON ESCULENTUM (FRUIT	1
NETHERLANDS	AGROMYZIDAE, SPECIES OF	LYCOPERSICON ESCULENTUM (FRUIT	2
NETHERLANDS	AGROMYZIDAE, SPECIES OF	LYCOPERSICON LYCOPERSICUM (FRU	2
NETHERLANDS	AGROMYZIDAE, SPECIES OF	LYCOPERSICON SP. (FRUIT)	2
ETHERLANDS	ALEYRODIDAE, SPECIES OF	LYCOPERSICON SP. (FRUIT)	1
NETHERLANDS	APHIDIDAE, SPECIES OF	LYCOPERSICON ESCULENTUM (FRUIT	1
NETHERLANDS	APHIDIDAE, SPECIES OF	LYCOPERSICON SP. (FRUIT)	1
NETHERLANDS	LIRIOMYZA SP.	LYCOPERSICON SP. (FRUIT)	1
NETHERLANDS	MACROLOPHUS SP.	LYCOPERSICON SP. (FRUIT)	1
NETHERLANDS	MIRIDAE, SPECIES OF	LYCOPERSICON SP. (FRUIT)	1
NETHERLANDS	NOCTUIDAE, SPECIES OF	LYCOPERSICON ESCULENTUM (FRUIT	1
NETHERLANDS	NOTODONTIDAE, SPECIES OF	LYCOPERSICON SP. (STEM)	1
SPAIN	THEBA PISANA	LYCOPERSICON LYCOPERSICUM (FRU	1

4. Pest List: Pests Associated with *Lycopersicon*

The pests, listed for *Lycopersicon* spp. in Table 2, were 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 - *Lycopersicon* spp.

Scientific Name, Classification	Distribution[1]	Comments[2]	References
Pathogens			
Alternaria alternata (Fr.:Fr.)Keissl. (Fungi Imperfecti: Hyphomycetes)	FR,US	c,o	Farr *et al.*, 1989; Logrieco *et al.*, 1990
Alternaria solani Sorauer (Fungi Imperfecti: Hyphomycetes)	FR,Europe,US	c,o	CMI, 1983 Jones *et al.*, 1991; Veschambre *et al.*, 1976
Botrytis cinerea Pers.:Fr. (Fungi Imperfecti: Hyphomycetes)	FR,US	c,o	Farr *et al.*, 1989; Jones *et al.*, 1991; Nicot and Allex, 1991
Colletotrichum acutatum Simmonds (Fungi Imperfecti: Coelomycetes)	FR,US	o,z_{ti}	EPPO, 1995; Farr *et al.*, 1989
Colletotrichum coccodes (Wallr.) S. J. Hughes (Fungi Imperfecti: Coelomycetes)	FR,US	c,o	Farr *et al.*, 1989; Jones *et al.*,1991; Davet and Ravise, 1976
Colletotrichum dematium (Pers.) Grove (Fungi Imperfecti: Coelomycetes)	FR,Temperate areas	c,o	Farr *et al.*, 1989; Jones *et al.*, 1991; IRAT, 1979
Colletotrichum gloeosporioides (Penz.) Penz. & Sacc. in Penz. (Fungi Imperfecti: Coelomycetes)	FR,US	c,o	Farr *et al.*, 1989; Jones *et al.*, 1991; IRAT, 1978
Didymella lycopersici Kleb. (Loculoascomycetes: Dothideales) Anamorph: *Phoma lycopersici*	FR,Europe,US	a,c,e,o	CMI, 1985; Jones *et al.*, 1991; Laterrot, 1983
Fulvia fulva (Cooke) Cif. (Fungi Imperfecti: Hyphomycetes)	FR,US	o	Farr *et al.*, 1989; Jones *et al.*, 1991; Lemaire *et al.*, 1988
Fusarium oxysporum Schlechtend.:Fr. f. sp. *lycopersici* (Sacc.) W.C. Snyder & H. N. Hans (Fungi Imperfecti: Hyphomycetes)	FR,US	a,c,e,o	Farr *et al.*, 1989; Jones *et al.*, 1991; Lemanceau and Alabouvette, 1991
Macrophomina phaseolina (Tassi) Goidanich (Imperfecti: Coelomycetes)	FR,US	c,o	Farr *et al.*, 1989; Jones *et al.*, 1991; Perron *et al.*, 1990
Phytophthora capsici Leonian (Oomycetes: Peronosporales)	FR,US	c,o,z_{ti}	EPPO, 1995; FAO, 1993; Farr *et al.*,1989
Phytophthora cryptogea Pethybr. & Lafferty (Oomycetes: Peronosporales)	FR,US	a,o	FAO, 1993; Stamps, 1978
Phytophthora infestans (Mont.) de Bary (Oomycetes: Peronosporales)	FR,US	c,o	Farr *et al.*, 1989; Jones *et al.*, 1991; Damiodaux and Laterrot, 1988
Phytophthora nicotianae Breda de Haan var. *parasitica* (Dastur) G.M. Waterhouse (Oomycetes: Peronosporales)	FR,US	c,o,z_{ti}	FAO, 1993; Farr *et al.*, 1989

Pyrenochaeta lycopersici R. Schneider & Gerlach (Fungi Imperfecti: Coelomycetes)	Europe,US	o	Farr *et al.,* 1989; Jones *et al.,* 1991; Lemaire *et al.,* 1988
Pythium aphanidermatum (Edson) Fitzp. (Oomycetes: Peronosporales)	FR,US	c,o	Farr *et al.,* 1989; Jones *et al.,* 1991
Pythium arrhenomanes Drechs. (Oomycetes: Peronosporales)	FR,US	o	Farr *et al.,* 1989; Jones *et al.,* 1991; Messiaen *et al.,* 1980
Pythium debaryanum R. Hesse. (Oomycetes: Peronosporales)	FR,US	c,o	Farr *et al.,* 1989; Jones *et al.,* 1991; Grouet, 1971
Pythium ultimum Trow (Oomycetes: Peronosporales)	FR,US	c,o	Farr *et al.,* 1989; Jones *et al.,* 1991; Lebrun and Viard, 1979
Rhizoctonia solani Kuhn (Fungi Imperfecti: Agonomycetes)	FR,US	c,o	Farr *et al.,* 1989; Jones *et al.,*1991; Vidalie *et al.,* 1980
Sclerotinia sclerotiorum (Lib.) de Bary (Discomycetes: Helotiales)	FR,US	c,o	Farr *et al.,* 1989; Jones *et al.,* 1991; Messiaen *et al.,* 1976
Sclerotium rolfsii Sacc. (Fungi Imperfecti: Agonomycetes)	FR,US	c,o	Farr *et al.,* 1989; Jones *et al.,* 1991; Bedi *et al.,* 1990
Septoria lycopersici Speg. (Fungi Imperfecti: Coelomycetes)	FR,US	a,e,o	Farr *et al.,* 1989; Jones *et al.,* 1991
Stemphyllium botryosum Wallr. (Fungi Imperfecti: Hyphomycetes)	FR,US	o	Farr *et al.,* 1989
Stemphyllium solani G.F. Weber (Fungi Imperfecti: Hyphomycetes)	FR,US	o	Farr *et al.,* 1989
Synchytrium endobioticum (Schilbersky) Percival (Chytridiomycetes: Chytridales)	FR	a,e	FAO, 1993; Weiss and Brierley 1928; Weiss and Orton, 1923
Thielaviopsis basicola (Berk. & Broome) Ferraris (Fungi Imperfecti: Hyphomycetes)	FR,US	c,o	Farr *et al.,* 1989; Jones *et al.,* 1991; Anon., 1983
Verticillium albo-atrum Reinke & Berthier (Fungi Imperfecti: Hyphomycetes)	FR,US	a,c,o	EPPO, 1996; Farr *et al.*, 1989; Guerrier *et al.,* 1985
Verticillium dahliae Kleb. (Fungi Imperfecti: Hyphomycetes)	FR,US	a,c,o	Farr *et al.,* 1989; Jones *et al.,* 1991; Beye & Lafay, 1988

Bacteria

Agrobacterium rhizogenes (Riker, *et al.*) Conn	FR,US	a,c,o	Bradbury, 1986
Agrobacterium tumefaciens (Smith & Townsend) Conn	FR,US	a,c,o	Bradbury, 1986
Clavibacter michiganensis subsp. *michiganensis* (Smith) Davis, Gillaspie, Vidaver & Harris	FR,US	o,z_{ti}	Bradbury, 1986; Jones *et al.*, 1991
Erwinia carotovora subsp. *atroseptica* (van Hall) Dye	FR,US	a,o	Bradbury, 1986
Erwinia carotovora subsp. *carotovora* (Jones) Bergey *et al.*	FR.US	a,o	Bradbury, 1986; Jones *et al.*, 1991
Erwinia chrysanthemi pv. *dianthicola* (Hellmers) Dickey	FR,US	a,o	Bradbury, 1986
Erwinia rhapontici (Millard) Burkhmolder	FR,US	a,o	Bradbury, 1986
Pseudomonas cepacia (ex Burkholder) Palleroni & Holmes	FR,US	o	Bradbury, 1986
Pseudomonas marginalis pv. *marginalis* (Brown) Stevens	FR,US	a,o	Bradbury, 1986
Pseudomonas solanacearum (Smith) Smith	FR,US	c,o	Bradbury, 1986; Jones *et al.*, 1991
Pseudomonas syringae pv. *syringae* van Hall	FR,US	c,o	Bradbury, 1986; Jones *et al.*, 1991
Pseudomonas syringae pv. *tabaci* (Wolf & Foster)	FR,US	c,o	Bradbury, 1986
Pseudomonas syringae pv. *tomato* (Okabe) Young	FR,US	c,o	Bradbury, 1986; Jones *et al.*, 1991
Pseudomonas viridiflava (Burkholder) Dowson	FR,US	o	Bradbury, 1986
Rhodococcus fascians (Tilford) Goodfellow	FR,US	o	Bradbury, 1986
Xanthomonas campestris pv. *vesicatoria* (Doidge) Dye	FR,US	c,o	Bradbury, 1986; Jones *et al.*, 1991

Viruses

Alfalfa mosaic virus	FR,US	o	Jones *et al.*, 1991
Cucumber mosaic virus	FR,US	o	Jones *et al.*, 1991
Potato leafroll virus	FR,US	o	Jones *et al.*, 1991
Potato virus Y	FR,US	o	Jones *et al.*, 1991
Tomato black ring virus	FR,US	o	Brunt *et al.*, 1996; Hemmer *et al.*, 1984
Tomato bushy stunt virus	FR,US	o	Brunt *et al.*, 1996; Jones *et al.*, 1991
Tomato mosaic virus	FR,US	o	Jones *et al.*, 1991
Tomato spotted wilt virus	FR,US	o	Jones *et al.*, 1991; Trottin-Caudal *et al.*, 1987
Tomato vein-yellowing strain of eggplant mottle dwarf virus	FR	d	Brunt *et al.*, 1996; Gebre-Selassie, 1988

Phytoplasmas

Stolbur	FR	d	Cousins & Moreau, 1977
Arthropods			
Acherontia atropos L. (Lepidoptera: Sphingidae)	FR	a	Carter, 1984; Leraut, 1980
Aculops lycopersici (Tryon) (Acari: Eriophyidae)	FR,US	o,e	Baker, *et al.*1966; EPPO, 1995; FAO, 1993; Univ of Calif., 1990
Aedia leucomelas L. (Lepidoptera: Noctuidae)	FR	a	Zhang, 1994
Agriotes lineatus (L.) (Lepidoptera: Elateridae)	FR	e	USDA, 1970s
Agrotis ipsilon Hufnagel (Lepidoptera: Nocutidae)	Europe,US	a,c,o	Carter, 1984; Univ. of Calif., 1990
Agrotis segetum Denis & Schiffermuller (Lepidoptera: Nocutidae)	Europe	a	Carter, 1984
Aphis craccivora Koch (Homoptera: Aphididae)	FR,US	c,o,y	Blackman and Eastop, 1984
Aphis fabae Scopoli (Homoptera: Aphididae)	FR,US	c,o,y	Blackman and Eastop, 1984
Aphis gossypii Glover (Homoptera: Aphididae)	FR,US	a,c,o,y	Blackman and Eastop, 1984; Trottin-Caudal, 1994;
Aulacorthum solani (Kaltenbach) (Homoptera: Aphididae)	FR,US	c,o,y	Blackman and Eastop, 1984
Autographa gamma L. (Lepidoptera: Nocutidae)	FR	a	Carter, 1984
Bemisia tabaci (Gennadius) (Homoptera: Aleyrodidae)	FR,US	a,c,o	EPPO, 1995; FAO, 1993
Brevipalpus obovatus Donnadieu (Acari: Tenuipalpidae)	FR,US	a,o	DPI Files; Jeppson *et al.*, 1975
Bryotropha (*Gelechia*) *plebejella* (Zeller) (Lepidoptera: Gelechiidae)	So. FR	z_1	Leraut, 1980; Zhang, 1994
Cacoecimorpha pronubana Hubner (Lepidoptera: Tortricidae)	FR,OR,WA	a,g	Carter, 1984; EPPO, 1995; Passoa, 1997
Ceratitis capitata (Wiedemann) (Diptera: Tephritidae)	FR,US[3]	z_1	BASS 1985; FAO, 1993; Liquido *et al.*, 1991
Chrysodeixis chalcites Esper (Lepidoptera: Noctuidae)	FR	a	Zhang, 1994
Clepsis spectrana Treitschke (Lepidoptera: Tortricidae)	FR,Most of Europe	a	Carter, 1984; Leraut, 1980
Euxoa tritici L. (Lepidoptera: Noctuidae)	Europe	a	Carter, 1984
Euzophera osseatella Treitschke (Lepidoptera: Pyralidae)	FR	a,e	Carter, 1984; Zhang, 1994
Frankliniella occidentalis (Pergande) (Thysanoptera: Thripidae)	FR,US	a,c,o,y	EPPO, 1995; FAO, 1993; Trottin-Caudal *et al.*, 1987; Univ. of Calif., 1990
Frankliniella schultzei (Trybom) (Thysanoptera: Thripidae)	FR	a,y	France, 1986

Gortyna flavago Denis & Schiffermuller (Lepidoptera: Noctuidae)	FR	a	Carter, 1984; Leraut, 1980
Gymnoscelis rufifasciata Haworth (Lepidoptera: Geometridae)	FR	a	Zhang, 1994
Hauptidia macoccana Melichar (Homoptera: Cicadellidae)	FR	a	Maisonneuve *et al.*, 1995; Quesne *et al.*, 1981
Helicoverpa armigera Hubner (Lepidoptera: Noctuidae)	FR	z_t	Carter, 1984; PNKTO; Poole, 1989a
Heliothis peltigera Denis & Schiffermuller (Lepidoptera: Noctuidae)	FR	z_t	Carter, 1984; Poole, 1989b; Zhang, 1994
Heliothis viriplaca Hufnagel (Lepidoptera: Noctuidae)	FR	z_e	Oakley and Leonard, 1948; Poole, 1989c; Zhang, 1994
Hepialus lupulinus L. (Lepidoptera: Hepialidae)	FR	a	Carter, 1984; Leraut, 1980
Hydraecia micacea Esper (Lepidoptera: Noctuidae)	Europe	a,o	Carter, 1984; CPPR, 1980; Giebink *et al.*, 1984; Rings and Metzler, 1982
Lacanobia (Mamestra) oleracea L. (Lepidoptera: Noctuidae)	Europe	z_t	Carter, 1984; Hill, 1987
Leptinotarsa decemlineata Say (Coleoptera: Chrysomelidae)	FR,US	a,c,o	EPPO, 1995; FAO, 1993
Liriomyza bryoniae Kaltenbach (Diptera: Agromyzidae)	FR	a	EPPO, 1995; Spencer, 1973
Liriomyza huidobrensis (Blanchard) (Diptera: Agromyzidae)	FR,US(Limited)	a,g	France, 1985; Spencer, 1973;
*Liriomyza sativa*e Blanchard (Diptera: Agromyzidae)	FR,US	a,c,o	France, 1985; Spencer, 1973
Liriomyza strigata Meigen (Diptera: Agromyzidae)	Western Europe	a	Spencer, 1973; Villevielle, 1987
Liriomyza trifolii (Burgess) (Diptera: Agromyzidae)	FR,US	a,c,o	EPPO, 1995; FAO, 1993; Univ. of Calif., 1990
Loxostege sticticalis L. (Lepidoptera: Pyralidae)	FR,US	a,c,o	Carter, 1984; Metcalf and Metcalf, 1993
Macrosiphum euphorbiae (Thomas) (Homoptera: Aphididae)	FR,US	a,c,o,y	Blackman and Eastop, 1984; Trottin-Caudal *et al.*, 1996
Mamestra brassicae L. (Lepidoptera: Noctuidae)	FR	a	Carter, 1984
Myzus persicae (Sulzer) (Homoptera: Aphididae)	FR,US	a,c,o	Blackman and Eastop, 1984; Trottin-Caudal and Millot, 1994
Nezara viridula L. (Hemiptera: Pentatomidae)	FR,US	a,o	CIE, 1970; Fullelove, 1992
Noctua pronuba L. (Lepidoptera: Noctuidae)	FR,CT,ME,MD, MA,NY,NH,VT	a,o	Carter, 1984; Passoa & Hollingsworth, 1996

Ostrinia nubilalis Hubner (Lepidoptera: Noctuidae)	FR,US	c,o,z_i	Carter, 1984; Metcalf & Metcalf, 1993
Peridroma saucia Hubner (Lepidoptera: Pyralidae)	FR,US	a,c,o	Carter, 1984; Zhang, 1994
Phlogophora meticulosa L. (Lepidoptera: Nocutidae)	FR	a	Carter, 1984; Zhang, 1984
Phthorimaea operculella Zeller (Lepidoptera: Gelechiidae)	FR,US	c,o,z_i	Carter, 1984; Metcalf & Metcalf, 1993
Phytomyza (*Chromatomyia*) *horticola* Goureau (Diptera: Agromyzidae);	FR	a	CIE, 1987; Spencer, 1973
Spodoptera exigua Hubner (Lepidoptera: Noctuidae)	FR,US	a,o	Carter, 1984; Metcalf and Metcalf, 1993
Spodoptera littoralis (Boisduval) (Lepidoptera: Noctuidae)	FR	z_e	Avidov and Harpaz, 1969; Leraut, 1980; USDA, 1982; Zhang, 1994
Symnthurodes betae Westwood (Homoptera: Aphididae)	FR,US	o	Blackman and Eastop, 1984
Tetranychus ludeni Zacker (Acari: Tetranychidae)	FR,US	a,o	Fullelove, 1982; Jeppson *et al.*, 1975
Tetranychus urticae Koch (Acari: Tetranychidae)	FR,US	a,c,o	Fullelove, 1982; Jeppson *et al.*, 1975
Thrips tabaci Lindeman (Thysanoptera: Thripidae)	FR,US	c,o,y	Grill, 1989; Smith *et al.*, 1992; Univ. of Calif., 1990
Trialeurodes vaporariorum (Westwood) (Homoptera: Aleyrodidae)	FR,US	a,c,o	Malezieux *et al.*, 1995; Metcalf and Metcalf, 1993
Xestia c-nigrum L. (Lepidoptera: Noctuidae)	FR,US	a,c,o	Carter, 1984; Franclemont, 1980; Zhang, 1994

[1] Distribution legend: FR = France; US = United States; CT = Connecticut; ME = Maine; MD = Maryland; MA = Massachusetts; NY = New York; NH = New Hampshire; OR = Oregon, VT = Vermont; WA = Washington,

[2] Comments:
- a = Pest mainly associated with a plant part other than the commodity.
- c = Listed in non-reportable dictionary as non-actionable.
- d = Commodity is unlikely to serve as inoculum source because vector is unknown or does not feed on commodity and/or seed transmission has not been reported.
- 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.
- o = Organism does not meet the geographic or regulatory definition of a quarantine pest.
- y = Pest is a vector of plant pathogens.
- z_e = External pest: is known to attack or infest *Lycopersicon* spp. fruits 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 *Lycopersicon* 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 in the United States on several occasions. Whenever *C. capitata* is detected, a quarantine is established and an eradication program is implemented. *C. capitata* is considered to be a quarantine pest.

5. List of Quarantine Pests

The list of quarantine pests for commercial shipments of tomatoes from France is provided in Table 3. Should any of these pests be intercepted on commercial (or any other) shipments of *Lycopersicon esculentum*, quarantine action may be taken.

Table 3: Quarantine Pests:

Pathogens	*Synchytrium endobioticum*
Arthropods	*Acherotia atropos* *Aedia leuc omelas* *Agriotes lineatus* *Agrotis segetum* *Autographa gamma* *Bryotropha plebejella* *Cacoecimorpha pronubana* *Ceratitis capitata* *Chrysodeixis chalcites* *Clepsis spectrana* *Euxoa tritici* *Frankliniella schultzei* *Gortyna flavago* *Gymnoscelis rufifasciata* *Hauptidia macoccana* *Helicoverpa armigera* *Heliothis peltigera* *Heliothis viriplaca* *Hepialus lupulinus* *Lacanobia oleracea* *Liriomyza bryoniae* *Liriomyza huidobrensis* *Liriomyza strigata* *Mamestra brassicae* *Phlogophora meticulosa* *Phytomyza horticola* *Spodoptera littoralis*

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 *Lycopersicon esculentum,* 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.

Table 4: Quarantine Pest Selected for Further Analysis:

Arthropods	*Bryotropha plebejella*
	Ceratitis capitata
	Helicoverpa armigera
	Heliothis peltigera
	Heliothis viriplaca
	Lacanobia oleraceae
	Spodoptera littoralis

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, by Plant Protection and Quarantine Officers, during inspections of these commodities but would not be expected to be moved 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 was 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. 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.

Table 5: Risk Rating: Consequences of Introduction

Pest	Climate/ Host	Host Range	Dispersal	Economic	Environ-mental	Risk Rating
Bryotropha plebejella	medium	low	medium	low	medium	medium
Ceratitis capitata	high	high	high	high	high	high
Helicoverpa armigera	high	high	high	medium	medium	high
Heliothis peltigera	high	high	high	medium	medium	high
Heliothis viriplaca	high	high	high	medium	medium	high
Lacanobia oleracea	high	high	medium	medium	medium	high
Spodoptera littoralis	medium	high	high	medium	medium	high

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; the result is a risk rating that applies to the commodity and country in question and is the same for all quarantine pest considered. Second, five biological features, *i.e.*, 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. A full description of these elements and rating criteria can be found in 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
Bryotropha plebejella	medium	high	high	medium	high	low	high
Ceratitis capitata	medium	high	high	high	high	high	high
Helicoverpa armigera	medium	high	high	medium	high	high	high
Heliothis peltigera	medium	high	high	medium	high	high	high
Heliothis viriplaca	medium	high	high	medium	high	high	high
Lacanobia oleracea	medium	high	high	medium	medium	high	high
Spodoptera littoralis	medium	high	high	medium	high	high	high

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). The estimated pest risk potential for each quarantine pest selected for further analysis for the importation of *Lycopersicon esculentum* is provided in Table 7.

Table 7: Pest Risk Potential, Quarantine Pests, French Tomatoes

Pest	Pest risk potential
Brytropha plebejella	high
Ceratitis capitata	high
Helicoverpa armigera	high
Heliothis peltigera	high
Heliothis viriplaca	high
Lacanobia oleracea	high
Spodoptera littoralis	high

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

Brytropha plebejella is reported to occur in southern France, there was no mention made of this insect during the last 49 years in the Review of Applied Entomology abstracts. Apparently its pest status has changed over the years..

PPQ has not intercepted any of the lepidopterous pests (with a high PRP) in commercial imports of tomatoes during the past 12 years. Each pest is capable of boring into the fruit and causing significant damage to the fruit, apparently pest management practices in commercial fields keeps the populations low and/or they are culled out during processing.

PPQ has 251 plant pest interceptions from tomato fruits from other areas; however, virtually all external pests listed could be detected by inspection. Some of these same pests occur in France, 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 *Lycopersicon esculentum*, quarantine action may be taken.

C. References

Anonymous. 1983. Report of activities 1981-1982. Avignon-Montfavet experimental station for market garden crops. RPP #61, INRA, Ministry of Agriculture. 103 pp.

Avidov, Z. & I. Harpaz. 1969. Plant Pests of Israel. Israel Universities Press. 549 pp.

Baker, E. W., T. Kono, J. W. Armine Jr., M. Delfinado-Baker, and T. A. Stasny. 1966. Eriophyoid Mites of the United States. Indira Publishing House, West Bloomfield, MI. 394 pp

BASS. 1985. Host List Mediterranean Fruit Fly, *Ceratitis capitata* (Wiedmann). Unpublished document, USDA, APHIS, PPQ. 59 pp.

Bedi, J. S., S. S. Sokhi, G. D. Munshi, Chander-Mohan, and C. Mohan. 1990. Identification of resistance to some diseases in tomato lines. Plant Dis. Res. 5:188-190.

Beye, I. and J. F. Lafay. 1988. *Verticillium* disease of tomato: consequences of interactions between aggressiveness of the pathogen and host resistance at the population level. Agronomie 8:435-439..

Blackman, R. L. and V. F. Eastop. 1984. Aphids on the World's Crops. An Identification Guide. John Wiley & Sons, N.Y. 466 pp.

Bradbury, J. F. 1986. Guide to Plant Pathogenic Bacteria. CAB International Mycological Institute, Surrey, England. 329 pp.

Brunt, A. A., K. Crabtree, M. J. Dallwitz, A. J. Gibbs and L. Watson. 1996. Viruses of Plants Descriptions and Lists from the VIDE Database. CAB International, Wallingford, UK. 1484 pp.

Carter, D. J. 1984. Pest Lepidoptera of Europe With Special Reference to the British Isles. Dr. W.Junk Publishers, Dordrecht, Netherlands. 431 pp.

CIE. 1970. Distribution Maps of Plant Pests. Number 27, *Nezara viridula.* Commonwealth Institute of Entomology, CAB, UK.

CIE. 1987. Distribution Maps of Plant Pests. Number 374, *Phytomyza horticola.* Commonwealth Institute of Entomology, CAB, UK.

CMI. 1983. Distribution Maps of Plant Diseases. Number 89, *Alternaria solani.* Commonwealth Mycological Institute, UK.

CMI. 1985. Distribution Maps of Plant Diseases. Number 324, *Didymella lycopersici.* Commonwealth Mycological Institute, UK.

Cousins, M.T. & J.P. Moreau. 1977. Stolbur diseases of Solanaceae. Phytoma. 29:15-19.

CPPR. 1980. Potato stem borer (*Hydroecia micacea*) - Massachusetts - new state record. USDA, Cooperative Plant Pest Report. 5:33, 619.

Damidaux, R. and H. Laterrot. 1988. The French basis of tomatoes for processing. The research and development effort results in a prime series of adapted varieties. Rev. Horticole #282 p. 41-43.

Davet, P. and A. Ravise. 1976. Inhibition of *Colletotrichum coccodes* (Wallr.) Hughes, *Pyrenochaeta lycopersici* Schneider et Gerlach and their pectinolytic enzymes by substances produced by various *Lycopersicon* Mill. In response to infection by the root parasite complex. Comptes Rendus Hebdomadaires des Seances de l'Academie des Sciences 282:1351-1354.

DPI. Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Gainesville, Florida.

EPPO. 1995. European and Mediteranean Plant Protection Organization (EPPO) Plant Quarantine Retrieval (PQR) System, version 3.0 (Computerized plant pest data base based on: Smith, I. M. 1992. Quarantine Pests for Europe. Oxon, UK: CAB International, Paris: Published in association with the European and Mediterranean Plant Protection Organization).

FAO. 1993. Global plant quarantine information system, Plant Pest Data Base, version 2.1. (Computerized Plant Pest Data Base of the Food and Agriculture Organization (FAO) of the United Nations). IPPC Secretariat FAO/AGPP Viale delle Terme di Caracalla. Rome.

FAO. 1996. International Standards for Phytosanitary Measures. Part 1 - Import Regulations: Guidelines for Pest Risk Analysis (Draft Standard). Secretariate of the International Plant Protection Convention of the Food and Agriculture Organization of the United Nations. Rome, Italy. 21 pp.

Farr, D. F., G. F. Bills, G. P. Chamuris and A. Y. Rossman. 1989. Fungi on Plants and Plant Products in the United States. American Phytopathological Society, St. Paul, MN. 1252 pp.

France. 1985. *Liriomyza* spp. (Agromyzidae). Leaf-mining flies. Fiches Techniques sur les Ravageurs des Cultures Vivrieres Tropicales. Montpellier, France. 2 pp.

France. 1986. The thrips of vegetable crops. Institut de Recherches Agronomiques Tropicales et des Cultures Vivrieres. 2 pp.

Franclemont, J. G. *'Noctua c-nigrum'* in eastern North America, the description of two new species of *Xestia* Hubner (Lepidoptera: Noctuidae: Noctuinae). Proc. Entomol. Soc. Wash. 82:476-585.

Fullelove, G. (ed.). 1992. Totato Pests and Disorders. Queensland Department of Primary Industries, Information Series Q191021. 44pp.

Gebre-Selassie, K. 1988. A new tomato disease: vein yellowing due to a rhabdovirus. PHM Revue Horticole 290:53-58.

Giebink, B. L., J. M. Scriber and J. L. Wedberg. 1984. Biology and phenology of the hop-vine borer, *Hydraecia immanis* Guenee, and detection of the potato stem borer, *Hydraecia micacea* (Esper). Environ. Entom. 13:1216-1224. ESA, College Park, MD.

Grill, D. 1989. The tobacco thrips threatens leeks. Revue Horticole 293:36-38.

Grouet, D. 1971. Problems posed at the present time in France by fungal diseases of chrysamthemum. J. D'Etude sur le Chrysantheme p.45-60.

Guerrier, G., H. Lahlou, and C. Boisson. 1985. Modifications of K+, Na+, and Ca2+ uptake in young tomato plants infected by different strains of *Verticillium albo-atrum.* Plant and Soil 84:11-22.

Gunn, C. R. and C. Ritchie. 1982. 1982 Report of the Technical Committee to Evaluate Noxious Weeds; Exotic Weeds for Federal Noxious Weed Act. (unpublished).

Hemmer, O. and M. Meyer. Structure and expression of the tomato black ring virus satellite RNA. Institute National de la Recherche Agronomique, Paris, France. p. 131-134.

Hill, D. S. 1987. Agricultural Insect Pests of Temperate Regions and Their Control. Cambridge University Press, Cambridge, UK. 659 pp.

Holm, L. G., D. L. Plucknett, J.V . Pancho and J. P. Herberger. 1977. The World's Worst Weeds. University of Hawaii Press, Honolulu. 609 pp.

Holm, L. G., J. V. Pancho and J. P. Herberger and D. L. Plucknett. 1979. A Geographical Atlas of World Weeds. John Wiley and Sons, New York. 392 pp.

Hopper, B. E. 1996. NAPPO Compendium of Phytosanitary Terms. NAPPO Doc. No. 96-027/ North American Plant Protection Organization (NAPPO). NAPPO Secretariate, Ottawa, Ontario, Canada. 25 pp.

IRAT. 1978. Institute de Recherches Agronomiques Tropicales et des Cultures Vivroeres Annual Report, 219 pp.

IRAT. 1980. Institute de Recherches Agronomiques Tropicales et des Cultures Vivroeres Annual Report, 212 pp.

Jeppson, L. R., H. H. Keifer, and E. W. Baker. 1975. Mites Injurious to Economic Plants. Univ. of California Press, Berkeley. 614 pp.

Jones, J. B., J. P. Jones, R. E. Stall, and T. A. Zitter. 1991. Compendium of tomato diseases. American Phytopathological Society, St. Paul, MN. 73 pp.

Laterrot, H. 1983. Genetic control of corky root of tomato. Rev. Horticole #238, p. 23-25.

Lebrun, A. and G. Viard. 1979. Study of the efficacy of two new fungicides used in seed treatment against *Pythium, Phoma* and mildew on beet. Phytiatrie Phytopharmacie 28:29-39.

Lemaire, J.M. H. Lot, D. Blancard, and H. Lecoq. 1988. Diseases in protected crops - relations with integrated crop protection. Eur. Report #9386, p. 134-137.

Lemanceau, P. and C. Alabouvette. 1991. Biological control of *Fusarium* diseases by fluorescent *Pseudomonas* and non-pathogenic *Fusarium*. Crop Protection 10:279-286..

Leraut, P. 1980. Liste Systematique et Synonymique des Lipidopteres de France, Belgique et Corse. Sup. A Revue des Lepidopteristes Francais et au Bulletin de la Societe Entomologique de France. 334 pp.

Liquido, N., L. A. Shinoda, and R. T. Cunningham. 1991. Host Plants of Mediterranean Fruit Fly Diptera: Tephritidae: An Annotated World Review. Misc. Publ. #77, Entomol. Soc. Am. 52 pp

Logrieco, A., A. Bottalico, M. Solfrizzo, and G. Mule. 1990. Incidence of *Alternaria* species in grains from Mediterranean countries and their ability to produce mycotoxins. Mycologia 82:501-505.

Maisonneuve, J. C., J. Blum, and L. R. Wardlaw. 1995. Against the tomato cicadellid under glass. A new beneficial: *Anagrus atomus*. Phytoma 471:24-27.

Malezieux, S., C. Girardet, B. Navez, and J.M. Cheyrias. 1995. Against the greenhouse whitefly on covered tomato crops. The use and development of *Macrolophus caliginosus* with *Encarsia formosa*. Phytoma 471:29-32.

Messiaen, E. M., M. Y. Benkada, and H. Rouhani. 1980. Detection in soil samples of *Pythium* spp. pathogenic on maize roots. Annales de Phytopathologie 12:193-198.

Messiaen, C. M., P. C. Mampouya, and L. Belliard-Alonzo. 1976. Effect of soluble nitrogen compounds on mycelial growth of *Sclerotium rolfsii* Sacc. in soil. Annales de Phytopathologie 8:17-23.

Metcalf, R. L. and R. A. Metcalf. 1993. Destructive and Useful Insects, Their habits and control. McGraw Hill, Inc., NY.

Nicot, P. and D. Allex. 1991. Grey mold of greenhouse-grown tomatoes: disease control by climate management? Bull.-SROP 14:200-210.

Oakley, R. and M. D. Leonard. 1948. Manual of Foreign Plant Pests. USDA,BEPQ. 381 pp.

Passoa, S. and C. S. Hollingsworth. 1996. Distribution, identification and rate of spread of *Noctua pronuba* (Lepidoptera: Noctuidae) in the Northeastern United States. Entomol. News 107:151-160.

Passoa, S. 1997. Personal communications from Lepidopterist specialist to R. Stewart, USDA.

Perron, G. M. Delos, J. Hariot, and C. Gremillon. 1990. Symptoms on sunflower stem: beware of confusions! Phytoma #419, p. 31-33.

PNKTO. Pests not Known to Occur in the United States or of Limited Distribution. Old World Bollworm, *Heliothis armigera*. 8 pp.

Poole, R. W. 1989a. Lepidopterorum Catalogus, Fascile 118, Noctuidae: Vol . 3. E. J. Brikk/Flora & Fauna Publications. N.Y. p. 1122.

Poole, R. W. 1989b. Lepidopterorum Catalogus, Fascile 118, Nocutidae: Vol. 3. E. J. Brill/Flora & Fauna Publications. N.Y. p. 1250.

Poole, R. W. 1989c. Lepidopterorum Catalogus, Fascile 118, Noctuidae: Vol. 3. E. J. Brill/Flora & Fauna Publications. N.Y. p.1310.

Quesne, W. J., K. R. Payne, and W. J. Le-Quesne. 1981. Cicadellidae (Typhlocybinae) with a check list of the British Auchenorhyncha (Hemiptera, Homoptera). Handbooks for the Identification of British Insects Vol. II, Part 2(c). London, UK. 95 pp.

Reed, C. F. 1977. Economically Important Foreign Weeds. Agriculture Handbook No. 498. 746 pp.

Rings, R. W. and E. W. Metzler. 1982. Two newly detected noctuids (*Hydraecia immanis* and *Hydraecia micacea*) of potential econimic importance in Ohio. Ohio J. Sc. 82:299-302.

Smith, I. M., D. G. McNamara, P. R. Scott, and K. M Harris. 1992. Quarantine Pest for Europe.CAB International and European and Mediterranean Plant Protection Organization. 1032 pp.

Spencer, K. 1973. Agromyzidae (Diptera) of Economic Importance, Series Entomologica. Dr. W. Junk Publishers, The Hague, 418 pp.

Stamps, D. J. 1978. CMI Descriptions of Pathogenic Fungi and Bacteria. Number 593, *Phytophthora cryptogea*. Commonwealth Mycological Institute, Surrey, England.

Trotting-Caudal, Y., C. Fourier, and P. Maillot. 1996. Tomatoes under greenhouse: methods for controlling aphids. Info (Paris) No. 123): p. 30-35

Trottrin-Caudal, Y., D. Grasselly, and M. Villevieille. 1987. *Frankliniella occidentalis.* Situation on the pest in France and prospects for integrated control. Info. Paris. 67, 4-10.

Trottin-Caudal, Y. and P. Maillot. 1994. Integrated pest control on greenhouse tomato. Status and prospect in France (*Macrolophus caliginosus*). Bull. Org. Internat. de Lutte Biol.17: 5-13.

University of California. 1990. Integrated Pest Management for Tomatoes. Division of Agriculture and Natural Resources. Publication #3274. 104 pp.

USDA. 1970s. Pathway Studies. *Agriotes lineatus* (L.) Unpublished document. 1 p.

USDA. 1982. Pests not Known to Occur in the United States or of Limited Distribution. Number 25, Egyptian cottonworm. APHIS, PPQ. 14 pp.

USDA. 1995. Pathway-Initiated Pest Risk Assessment: Guidelines for Qualitative Assessments, Ver 4.0. PPQ, APHIS. 15 pp.

Veschambre, D., G. Espanel, J. Touzeau, and A. Grouiller. 1976. Tomatoes and pesticide residues. Pepinieristes Horticulteurs Maraichers. No. 171, p. 25-29.

Vidalie, H., B. Digat, and J. J. Girard. 1980. Production of dahlia tubers and current phytosanitary problems. Rev. Horticole #208, p. 13-25.

Villevieille, M. 1987. La Protection Phytosanitaire des Pepinieres de Tomates. Serv. Protection des Vegetaux. Phytomo No. 384. p. 49.

Weiss, F. and P. Brierley. Factors of spread and repression in potato wart. U.S. Dep. Agric. Tech. Bull. 56.

Weiss, F. and C. R. Orton. 1923. The varietal and species hosts of *Synchytrium endobioticum.* Weiss, F.; Orton, C. R.; Hartman, R. E. Investigations of potato wart. U.S. Dep. Agric. Bull. 1156: 1-16.

WSSA, 1989. Composite List of Weeds. Weed Science Society of America.

Zhang, Bin-Cheng. 1994. Index of Economically Important Lepidoptera. CAB International, Wallingford, UK. 599 pp.

John Lightfield
Biological Assessment and Taxonomic Support
Plant Protection and Quarantine
March 1997

Reviewed by:
G. Cave, Entomologist*
M. Firko, Entomologist
R. Stewart, Entomologist*
E. Podleckis, Plant Virologist*
S. Redlin, Plant Pathologist*
L. Redmond, Plant Pathologist*