Importation of Watermelon Fruit, *Citrullus lanatus* from Brazil and Venezuela into the United States

Qualitative, Pathway-Initiated Pest Risk Assessment

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Agency Contact:

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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 watermelon fruits (*Citrullus lanatus)* grown in Brazil and Venezuela**. This is a qualitative pest risk assessment, that is, estimates of risk are expressed in qualitative terms such as high 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. The 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 2 (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.

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/bant.

The watermelon belongs to the Cucurbitaceae family which consists of about 90 genera and about 700 species existing in the tropical regions with some extending into temperate zones. Both annual and perennial species exist within these rapid-growing frost-tender herbs grown for the edible fruits and for ornaments. The are about 25 species in the genus *Cucurbita* [all supposed to be American (Bailey, 1949)], four recognized species of *Citrullus* one of which is widely grown for its edible fruit, and some 30 species of *Cucumis* a few of which are grown for the edible fruits.

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. In this case, the importation of **fresh watermelon fruits (*Citrullus lanatus)* grown in Brazil and Venezuela** 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 Watermelon, *Citrullus lanatus*

The weediness screening for *Citrullus lanatus* is presented in Table 1. These findings did not require a pest-initiated risk assessment.

Table 1: Process for Determining Weediness Potential of Commodity

Commodity: *Citrullus lanatus* (Thunb.) Matsum & Nakai (Cucurbitaceae)

Phase 1: *Citrullus lanatus* (watermelon) is native to South and Tropical Africa and 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)
YES	Weed Science Society of America list (WSSA, 1989)
YES	Is there any literature reference indicating weediness (*e.g.*, *AGRICOLA*, *CAB*, *Biological Abstracts*, *AGRIS*; search on "species name" combined with "weed").

Phase 3: Conclusion:

The *Geographical Atlas of World Weeds* includes *Citrullus lanatus* as a common weed in Australia. The Weed Science Society of America includes *Citrullus lanatus* in its list of weeds of current or potential importance in the United States. The literature search revealed two articles about *Citrullus lanatus* as a weed in Australia, and one article about wild watermelons as weeds in Texas. This species does not meet the definition of a Federal Noxious Weed because it is not "new to, or not widely prevalent in the United States."

3. Previous Risk Assessments, Current Status and Pest Interceptions

3a. Decision history for *Citrullus lanatus*

1924 - Peru: Approved entry at Northern ports.
1927 - Venezuela: Approved entry at Northern ports.
1949 - Uruguay: Approved entry at Northern ports.
1950 - Colombia: Entry denied because of *Anastrepha grandis* and *Ceratitis capitata.*
1960 - Brazil: Entry denied because of *Anastrepha grandis.*
1964 - Colombia: Entry approved at North Atlantic ports.
1985 - Argentina, Brazil, Colombia, Ecuador, Peru, Uruguay and Venezuela: Entry of all Cucurbits (except honedew melons) is prohibited, hothouse grown seedless cucumbers from Colombia permitted entry.
1992 - Ecuador: Entry approved for precleared product at North Atlantic ports.

3b. Interceptions from South America for FY 1985-97.

Origin	Pest	Host	Total
Brazil	*Microtheca* sp.	Cucurbitaceae(Leaf)	1
Chile	*Microgryllus pallipes*	*Citrullus* sp. (Fruit)	1
Ecuador	*Phenacoccus* sp.	Cucurbitaceae (Leaf)	1
Guyana	Pyralidae, species of	Cucurbitaceae (Fruit)	1
Guyana	Pyraustinae, species of	Cucurbitaceae (Fruit)	1

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

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

Scientific Name, Classification	Distribution[1]	Comments[2]	References
Pathogens			
Alternaria cucumerina (Ellis & Everh.) J.A. Elliot (Fungi Imperfecti: Hyphomycetes)	BR,VE,US	a,c,o	Ellis and Holliday, 1970; Farr *et al.,* 1989; Galli *et al.,* 1968; Holliday, 1980
Botryosphaeria quercuum (Schwein.) Sacc. (Loculoascomycetes: Dothideales)	Worldwide	c,o,v	Farr *et al.,* 1989
Cercospora citrullina Cooke (Fungi Imperfecti: Hyphomycetes)	BR,PE,VE,US	a,c,o	Farr *et al.,* 1989; Wellman, 1977
Choanephora cucurbitarum (Berk. & Ravenel) Thaxt. (Zygomycetes: Mucorales)	BR,Temperate to tropical regions	c,o,v,z_{ei}	Farr *et al.,* 1989; Galli *et al.,* 1968
Cladosporium cucumerinum Ellis & Arth. (Fungi Imperfecti: Hyphomycetes)	BR,CL,US	c,m,o,z_{ei}	CMI, 1978b; Farr *et al.,* 1989; Rocha *et al.,* 1994
Colletotrichum orbiculare (Berk. & Mont.) Arx (Fungi Imperfecti: Coelomycetes)	AR,BR,UY,VE,US	c,o,z_{ei}	Farr *et al.,* 1989; Wellman, 1977

Corynespora cassiicola (Berk. & M.A. Curtis) C. T. Wei (Fungi Imperfecti: Hyphomycetes)	BR,VE,US	c,m,o,z_{xi}	Almeida *et al.,* 1976; Ellis and Holliday, 1971; Farr *et al.,* 1989; Subero, 1975
Didymella bryoniae (Auersw.) Rehm (Loculoascomycetes: Dothideales) Anamorph: *Phoma cucurbitacearum* (Fr.:Fr.) Sacc	BR,CL,VE,US	c,k,o	CMI, 1989b; Farr *et al.*, 1989; Morales, 1979; Wellman, 1977
Erysiphe cichoracearum DC, (Pyrenomycetes: Erysiphales)	BR,Cosmopolitan	c,o,v	Farr *et al.,* 1989; Galli *et al.,* 1968, Wellman, 1977
Fusarium oxysporum Schlechtend.:Fr. f. sp. *niveum* (E.F. Smith) W.C. Snyder & H.N. Hans (Fungi Imperfecti: Hyphomycetes)	AR,BR,CL,US	c,o	Brayford, 1992; Farr *et al.,* 1989; Galli *et al.,* 1986; Holliday, 1970; Wellman, 1977
Lasiodiplodia theobromae (Pat.) Griffon & Maubl. (Fungi Imperfecti: Coelomycetes)	BR,VE,US	c,m,o,z_{xi}	Farr *et al.,* 1989; Galli *et al.,* 1986; Rondon and Guevara, 1984; Wellman, 1977
Macrophomina phaseolina (Tassi) Goldanich (Fungi Imperfecti: Coelomycetes)	BR,VE,US	c,o	CMI, 1985; Farr *et al.*, 1989; Wellman, 1977
Phoma exigua Desmaz. (Fungi Imperfecti: Coelomycetes)	Cosmopolitan	a,c,o,v	Farr *et al.,* 1989
Phoma terrestris E.M. Hans. (Fungi Imperfecti: Coelomycetes)	BR,Worldwide	c,o,v	Farr *et al.,* 1989; Galli *et al.,* 1986
Phytophthora capsici Leonian (Oomycetes: Peronosporales)	AR,BO,BR,PE, VE,US	c,o	CMI, 1990; Farr *et al.,* 1989
Phytophthora citrophthora (R.E. Sm. & E.H. Sm.) Leonian (Oomycetes: Peronosporales)	BR,VE,US	c,o	CMI, 1995; Farr *et al.,* 1989
Phytophthora nicotianae Breda de Haan var. *parasitica* (Dastur) G.M. Waterhouse (Oomycetes: Peronosporales)	BR,VE,US	c,o	CMI, 1989; Farr *et al.,* 1989
Pseudoperonospora cubensis (Berk. & Curt.) Rost. (Oomycetes: Peronosporales)	BR,VE,US	c,o	CMI, 1978; Farr *et al.,* 1989; Wellman, 1977
Pythium acanthicum Drechs. (Oomycetes: Peronosporales)	BR,US	a,m,o	Farr *et al.,* 1989; Valdebonito *et al.*, 1984
Pythium aphanidermatum (Edson) Fitzp. (Oomycetes: Peronosporales)	BR,VE,US	c,o	CMI, 1978a; Farr *et al.,* 1989
Pythium debaryanum Auct. Non R. Hesse (Oomycetes: Peronosporales)	AR,BR,CL,CO, VE,US	c,o	CMI, 1984a; Farr *et al.,* 1989
Pythium hydnosporum (Mont.) J. Schrot. (Oomycetes: Peronosporales)	Cosmopolitan	a,c,o,v	Farr *et al.,* 1989
Pythium irregulare Buisman (Oomycetes: Peronosporales)	BR,Cosmopolitan	a,o,v	CMI, 1986a; Farr *et al.,* 1989; Galli *et al.,* 1986
Pythium periplocum Drechs. (Oomycetes: Peronosporales)	BR,US	a,m,o	Farr *et al.,* 1989; Valdebenito Sanhueza *et al.,* 1984
Pythium ultimum Trow (Oomycetes: Peronosporales)	AR,BR,US	c,o	CMI, 1981a; Farr *et al.,* 1989

Rhizoctonia solani Kuehn (Fungi Imperfecti: Agonomycetes) Teleomorph:*Thanastephorus cucumeris* (A.B. Frank) Donk	BR,SA,US	c,m,o	Almeida *et al.,* 1980; Farr *et al.*, 1989; Subramanian, 1968; Wellman, 1977
Rhizopus stolonifer (Ehrenb.:Fr.) Vuill. (Zygomycetes: Mucorales)	BR,US	c,m,o	Almeida and Landim, 1980; Farr *et al.,* 1989
Sclerotinia sclerotiorum (Lib.) De Bary (Discomycetes: Helotiales)	BR,VE,US	c,m,o	Farr *et al.,* 1989; Pons *et al.,* 1979; Yorinori and Homechin, 1985
Sclerotium rolfsii Sacc. (Fungi Imperfecti: Agonomycetes) Teleomorph: *Athelia rolfsii*	BR,VE,US	c,o	CMI, 1992; Farr *et al.,* 1989; Wellman, 1977
Sphaerotheca fuliginea (Schlecht. Ex Fr.) Pollacci (Pyrenomycetes: Erysiphales)	BR,US	c,k,o	Farr *et al.,* 1989; Holliday, 1980; Reifschneider *et al.,* 1985
Thielaviopsis basicola (Berk. & Broome) Ferraris (Fungi Imperfecti: Hyphomycetes)	Cosmopolitan	c,o,v	Farr *et al.,* 1989
Verticillum dahliae Kleb. (Fungi Imperfecti: Hyphomycetes)	AR,BR,CL,PE,US	c,o	CMI 1986b; Farr *et al.,* 1989
Bacteria			
Agrobacterium tumefaciens (Smith & Townswend) Conn	AR,BO,BR,CO, CL,GY,PE,UY, VE,US	c,o	Bradbury, 1986
Erwinia caratovora subsp. *carotovora* (Jones) Bergey *et al.*	BR,Worldwide	c,o,v	Bradbury, 1986; Galli *et al.,* 1986
Pseudomonas cichorii (Swingle) Stapp	BR,US	o	Bradbury, 1986; CMI, 1987
Pseudomonas solanacearum (Smith) Smith	BR,CO,GF,GY,PE SR,VE,US	c,o	Bradbury, 1988
Pseudomonas syringae pv. *lachrymans* (Smith & Bryan) Young, Dye & Wilkie	AR,BR,CO,VE,US	c,o	Bradbury, 1988
Xanthomonas campestris pv. *cucurbitae* (Bryan) Dye	AR,BR,US	c,o	Alippi, 1989; Bradbury, 1988

Viruses			
Cucumber mosaic virus	VE,US,Worldwide	o,v,z	Daniels and Campbell, 1992; Debrot, 1980; Doolittle and Walker, 1926; Zitter *et al.,* 1996
Papaya ringspot virus	BR,SA,US	o,v,z	Barbosa and Paguio, 1982; Ploetz *et al.,* 1994; Zitter *et al.*, 1996
Squash mosaic virus	US,Worldwide	o,v,z	Provvidenti and Robinson, 1974; Zitter *et al.,* 1996
Watermelon mosaic 1	BR,SA,US	o,v,z	Kuabara *et. al.,* 1987; Zitter *et al.,* 1996
Zucchini yellow mosaic potyvirus	VE,US(CT,NY, FL,CA)	o,z	Hernandez *et al.,* 1989; Provvidenti *et al.,* 1984
Arthropods			
Acalymma pallipes (Oliv.) (Coleoptera: Chrysomelidae)	SA	a,k,v	Oakley and Dohanian, 1954
Acanonious hahni (Stal) (Hemiptera: Coreidae)	AR,BR,UY	e,k	Oakley and Dohanian, 1954
Agrotis repleta Walker (Lepidoptera: Noctuidae)	BR,VE,US	a,c,o	Hodges *et al.,* 1983; Venturi, 1966; Zhang, 1994
Alphitobius laevigatus (F.) (Coleoptera: Tenebrionidae)	VE,US	b,c,o	Arnett, 1985; Preiss, and Davidson, 1970; Venturi, 1966
Anasa guttifera Berg (Hemiptera: Coreidae)	AR,UY	e,k	Oakley and Dohanian, 1954
Anastrepha grandis (Macquart) (Diptera: Tephritidae)	BR,VE	z,	Lima, 1936; Norrbom and Kim, 1988; Whittle and Norrbom, 1987
Aphis craccivora Koch (Homoptera: Aphididae)	AR,CL,VE,US	c,e,o,y	Blackman and Eastop, 1984; CIE, 1983
Aphis gossypii Glover (Homoptera: Aphididae)	BR,VE,US	c,e,o,y	Arcila *et al.,* 1991; Bastos, 1978; Blackman and Eastop, 1984; Lima, 1936
Diabrotica bivittata (Fabr.) (Coleoptera: Chrysomelidae)	BR,VE	e	Lima, 1936; Venturi, 1966
Diabrotica bivittula Kirsch (Coleoptera: Chrysomelidae)	AR,BR,UY	e,k,y	Brunt *et al.,* 1996; Lima, 1936; Oakley and Dohanian, 1957
Diabrotica melanocephala (Fabr.) (Coleoptera: Chrysomelidae)	BR	e	Lima, 1936
Diabrotica melanocephala tripunctata (Fabr.) (Coleoptera: Chrysomelidae)	BR	e	Lima, 1936
Diabrotica significata Gah. (Coleoptera: Chrysomelidae)	AR,BR	e,k	Lima, 1936; Oakley and Dohanian, 1957

Diabrotica speciosa (Germ.) (Coleoptera: Chrysomelidae)	AR,BR,PE,UY,VE	e	Lorenzato, 1984; Oakley and Dohanian, 1954; Venturi, 1966
Diabrotica venalis Er. (Coleoptera: Chrysomelidae)	BR,PE	e,k	Oakley and Dohanian, 1954
Diaphania indica Saunders (Lepidoptera: Pyralidae)	VE,US(FL)	g,z[1]	INKTO, 1958; Whittle and Ferguson, 1987; Zhang, 1994
Diaphania hyalinata (L.) (Lepidoptera: Pyralidae)	BR,PE,VE,US	c,o	Lima, 1936; Paddock, 1978; Zhang, 1994
Diaphania nitidalis (Cram.) (Lepidoptera: Pyralidae)	BR,VE,SA,US	c,o	Fornazier *et al.,* 1982; Lima, 1936; Paddock, 1978; Venturi, 1966; Zhang, 1994
Dysmicoccus neobrevipes Beardsley (Homoptera: Pseudococcidae)	BR,CO,EC,PE,US (PR,VG,FL)	g,k,y,z[1]	Blackburn, 1988; Williams and Willink, 1992
Empoasca fabae (Harris) (Homoptera: Cicadellidae)	BR,VE,US	a,c,o	Lynch, 1990; Panizzi, 1980; Venturi, 1966
Epilachna borealis F. (Coleoptera: Coccinellidae)	BR,VE,US	c,e,o	Blackwelder, 1945; Tallamy, 1985; Venturi, 1966
Epilachna cacica Guerin (Coleoptera: Coccinellidae)	BR	e,k	Almeida and Ribeiro, 1986
Epilachna marginella (F.) (Coleoptera: Coccinellidae)	BO,BR,CO,GF,VE	e,k	Oakley and Rohanian, 1954
Epilachna paenulata (Germar) (Coleoptera: Coccinellidae)	AR,BO,BR,EC,UY	e,k,n,y	Anon., 1962; Brunt *et al.*, 1996; Lima, 1936; Oakley and Rohanian, 1957
Erythrogonia quadriguttata (F.) (Homoptera: Cicadellidae)	VE	a	Venturi, 1966
Feltia subterranea (F.) (Lepidoptera: Noctuidae)	BR,VE,US	a,o	Debolt *et al.,* 1979; Lara and Siveira-Neto, 1978; Venturi, 1966
Gryllus assimilis (F.) (Orthoroptera: Gryllidae)	BR,VE,US	a,c,o	Grodzki, 1973; Nickle and Walker, 1974; Venturi, 1966
Neocurtilla (*Gryllotalpa*) *hexadactyla* Perty (Orthoroptera: Gryllidae)	BR,VE,US	a,c,o	Arnett, 1985; Bastos and Magalhaes-Bastos, 1977; Venturi, 1966
Leptoglossus gonagra (Fabricius) (Hemiptera: Coreidae)	BR,US	k,o	Amaral and Storti, 1981
Liogenys prob. *quadridens* Frab. (Coleoptera: Scarabaeidae)	BR,VE	e	Blackwelder, 1944; Higuera and Rodriguez, 1979
Liriomyza huidobrensis (Blanchard) (Diptera: Agromyzidae)	BR,VE,US(CA,HI,TX,WA)	a,e,g,k	EPPO, 1995a; Gary *et al.*, 1986; Heinz and Chaney, 1995; Malais *et al.,* 1992; Spencer, 1973
Liriomyza trifolii (Burgess) (Diptera: Agromyzidae)	BR,VE,US	a,c,o	EPPO, 1995a; FAO, 1993

Melittia bergii Hy. Edw. (Lepidoptera: Sessidae)	AR	e,k	Oakley and Rohanian, 1954
Melittia pulchripes d'angeloi Khlr. (Lepidoptera: Sessidae)	AR	e,k	Oakley and Rohanian, 1954
Melittia riograndensis Brethes (Lepidoptera: Sessidae)	BR	e,k	Oakley and Rohanian, 1954
Melittia satyriniformis Hbner (Lepidoptera: Sesiidae)	BR,VE,US	e,o	Venturi, 1966; Zhang, 1994
Myzus persicae (Sulz.) (Homoptera: Aphididae)	AR,BO,BR,CL, CO,PE,SR,UY, VE,US	c,e,o,y	CIE, 1979; Blackman and Eastop, 1984
Nezara viridula (L) (Coleoptera: Pentatomidae)	BR,VE,US	c,e,o	Chyen *et al.,* 1992; Corso, 1988; Venturi, 1966
Phthia picta (Drury) (Hemiptera: Coreidae)	BR,VE,US	a,c,e,k,o	Amaral, 1981; Henry and Froeschner, 1988; Venturi, 1966
Pyconderes albicornis Reut. (Hemiptera: Miridae)	VE	a	Venturi, 1966
Rachiplusia nu Guene (Lepidoptera: Noctuidae)	AR,BR,CL,UY	e	Zhang, 1994
Scapteriscus vicinus Scudd. (Orthoroptera: Gryllotalpidae)	BR,VE,US	a,c	Fowler, 1987; Nickle and Castner, 1984; Venturi, 1966
Spodoptera frugiperda (J.E. Smith) (Lepidoptera: Noctuidae)	BR,VE,US	a,c	Lynch, 1990; Saito *et al.,* 1989; Venturi, 1966
Tetranychus ludeni Zacher (Acari: Tetranychidae)	BR,VE,US	a,c,k,o	Anon., 1972; Jeppson *et al.,* 1975; Nakano *et al.,* 1975
Tetranychus telarius Zacher (Acari:`` Tetranychidae)	BR,VE,US	a,k,o	Anon., 1972; Jeppson *et al.,* 1975; Paschoal, 1971
Tetranychus urticae Koch (Acari: Tetranychidae)	BR,VE,SA,US	c,e,o,v	Gonzalez and Viloria, 1991; Jeppson *et al.,* 1975; Swart *et al.,* 1990
Thrips palmi Karny (Thysanoptera: Thripidae)	BR,VE,US(FL,HI)	a,e,g,m	Cermeli and Montagne, 1993; EPPO, 1995b; Monteiro *et al.,* 1995
Thrips tabaci Lindeman (Thysanoptera: Thripidae)	AR,BR,CL,CO, EC,GY,PE,UY, VE,US	c,e,o	CIE, 1969; Fernandez and Lucena, 1990

[1] Distribution legend: AR = Argentina, BO = Bolivia, BR = Brazil, CL = Chile, CO = Colombia, EC = Ecuador, GF =French Guiana, GY = Guyana, PE = Peru, SR = Suriname, UY = Uruguay, VE = Venezuela, SA = South America, US = United States, CA = California, CT = Connecticut, FL = Florida; HI = Hawaii, NY = New York, PR = Puerto Rico, TX = Texas, VG = Virgin Islands, WA = Washington

[2] Comments:
- a = Pest mainly associated with a plant part other than the commodity.
- b = Not likely to be a primary plant pest.
- 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 pests; pest has limited distribution in the 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.
- k = Not specifically listed for host, but reported from other hosts in same plant genus/family.
- 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 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.
y = Pest is a vector of plant pathogens.
z_e = External pest: is known to attack or infest *Citrullus* 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 *Citrullus* spp. and it would be reasonable to expect the pest may remain with the commodity during processing and shipping.

5. List of Quarantine Pests

The list of quarantine pests for commercial shipments of *Citrullus lanatus* from Brazil and Venezuela is provided in Table 3. Should any of these pests be intercepted with shipments of watermelon, quarantine action may be taken.

Table 3: Quarantine Pests:

Arthropods	*Acalymma pallipes*
	Acanonious hahni
	Anastrepha grandis
	Diabrotica bivittata
	Diabrotica melanocephala
	Diabrotica melanocephala tripunctata
	Diabrotica significata
	Diabrotica speciosa
	Diabrotica venalis
	Diaphania indica
	Dysmicoccus neobrevipes
	Epilachna cacica
	Epilachna marginella
	Epilachna paenulata
	Erythrogonia quadriguttata
	Liogenys prob. *quadridens*
	Liriomyza huidobrensis
	Melittia riograndensis
	Pyconderes albicornis
	Rachiplusia nu
	Thrips palmi

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 *Citrullus lanatus* were analyzed in detail (see 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 Likely to Follow the Pathway:

Arthropods	*Anastrepha grandis* (BR and VE)
	Diaphania indica (VE)
	Dysmicoccus neobrevipes (BR)

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 inspection 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 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 presents 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
Anastrepha grandis	high	medium	high	medium	medium	high
Diaphania indica	high	medium	medium	medium	high*	high
Dysmicoccus neobrevipes	low	high	low	medium	medium	medium

*This pest is known to attack members of the plant genera, *Citrullus and Cucurbita*. In the United States, *Cucurbita okeechobeensis* is a Federally listed endangered species. We believe it would be reasonable to assume that this pest would attack this endangered plant. Because of existing legislation regarding endangered plants, we automatically give this pest a risk rating of "high" for consequences 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; the result 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 *i.e.*, risk elements, concerning the pest and its interactions with the commodity are 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 presents 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 detected at port of entry	Likelihood moved to suitable habitat	Likelihood find suitable host	Risk rating
Anastrepha grandis	medium	high	high	high	high	high	high

Diaphania indica	medium	high	high	medium	high	medium	high
Dysmicoccus neobrevipes	medium	high	high	medium	medium	medium	high

9. Conclusion: Pest Risk Potential and Phytosanitary Measures

The measure of pest risk potential (PRP) combines the risk ratings for consequences and likelihood of introduction as described in USDA (1995). The estimated pest risk potential (PRP) for each quarantine pest selected for further analysis is show in Table 7

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Table 7: Pest Risk Potential, Quarantine Pests, *Citrullus lanatus*

Pest	Pest risk potential
Anastrepha grandis	high (BR and VE)
Diaphania indica	high (VE)
Dysmicoccus neobrevipes	high (BR)

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.

PPQ has intercepted 380 pests with watermelon fruits from other areas during the past 11 years. Some of these same pests may occur in Brazil and Venezuela in addition to other quarantine pests and some have been intercepted as hitchhikers with other commodities. Should any of these pests be intercepted on commercial (or any other) shipments of *Citrullus lanatus,* quarantine action may be taken.

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