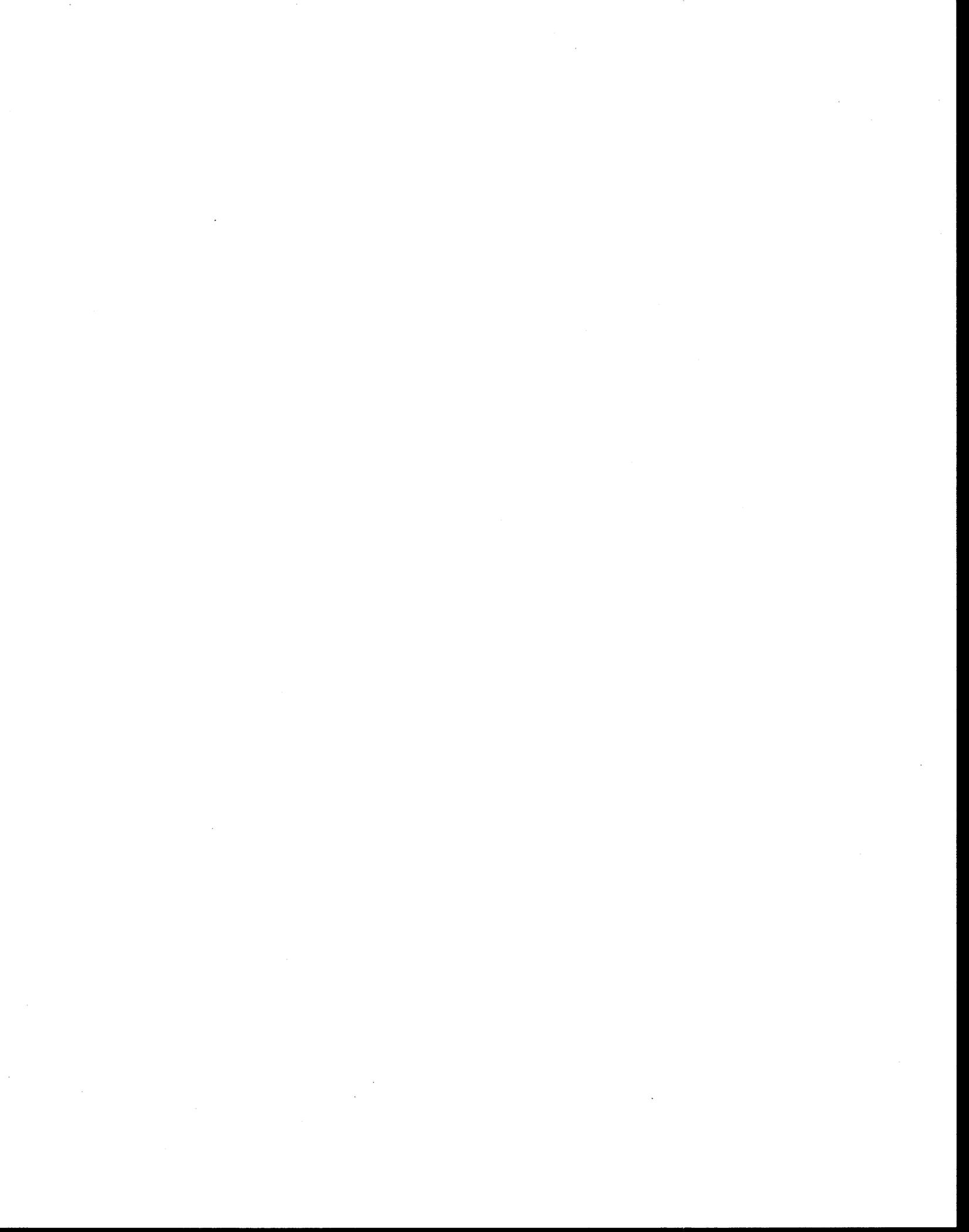


Pathway-Initiated Risk Assessment of  
African Horned Cucumber (*Cucumis metuliferus* E. May.  
ex Naud.) Imported as Fresh Fruits from Chile into the  
Continental United States

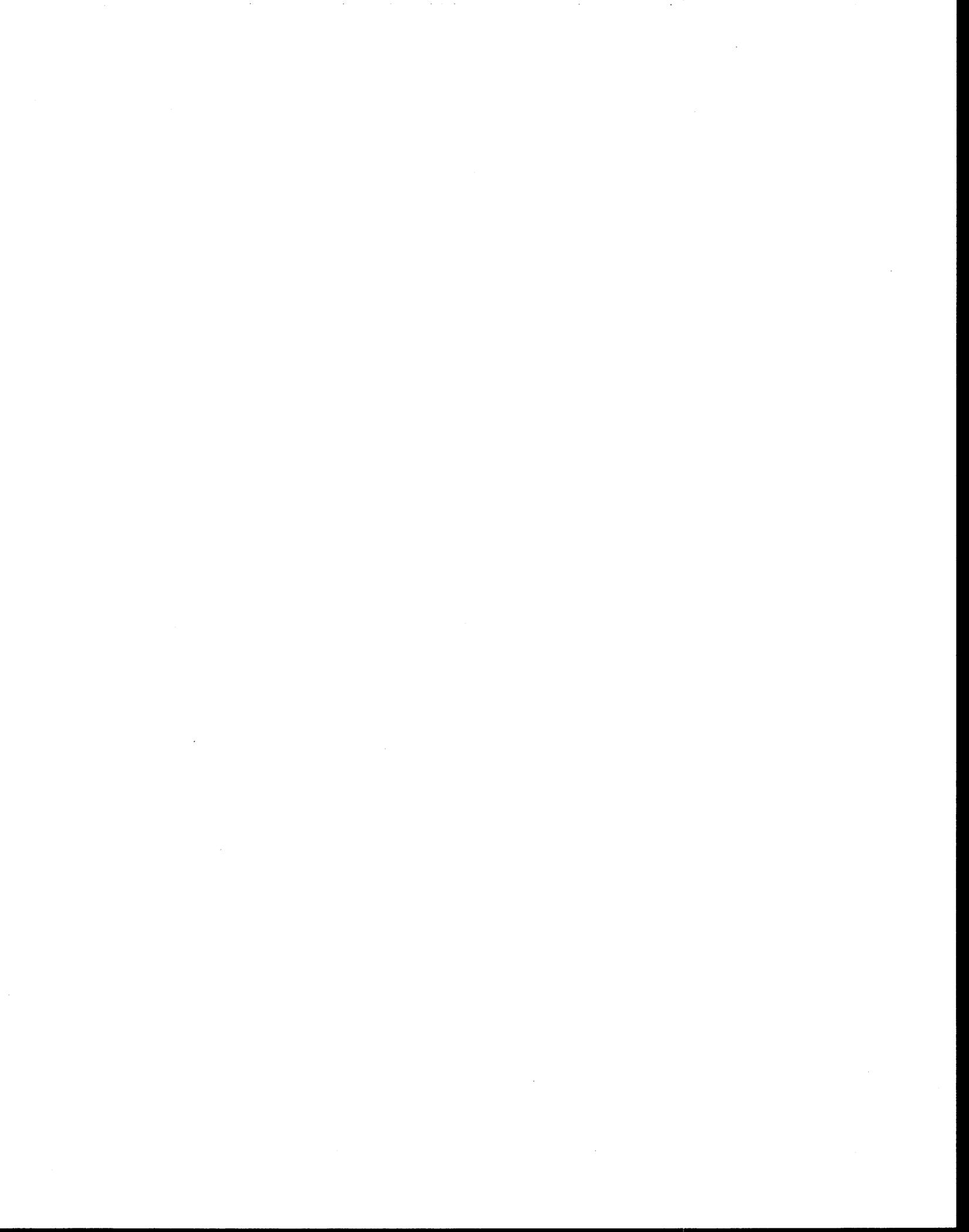
February 27, 2002

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Animal and Plant Health Inspection Service  
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## EXECUTIVE SUMMARY

This risk assessment was initiated to evaluate the pest risks associated with the importation of African horned cucumber (*Cucumis metuliferus* E. May. ex Naud.) fresh fruits for consumption and ornamental and decorative purposes into the continental United States from Chile. This assessment identified five species of arthropod pests and nine pathogens that are associated with the commodity in Chile, but none are expected to be of quarantine concern and follow the pathway.



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## I. INTRODUCTION

This risk assessment was prepared by the Commodity Risk Assessment staff, Plant Protection and Quarantine (PPQ), Animal and Plant Health Inspection Service (APHIS), United States Department of Agriculture (USDA) to evaluate potential pest risks associated with the importation into the continental United States of African horned cucumber, *Cucumis metuliferus* E. May. ex Naud. (Cucurbitaceae), fresh fruits for consumption from Chile. This pest risk assessment is called pathway-initiated because it is based on the risks that may be associated with the importation of this commodity. This risk assessment is qualitative and risk is expressed in descriptive terms (high, medium, and low) rather than in numerical terms (probabilities and frequencies). The methodology and rating criteria are explained in *Pathway-Initiated Pest Risk Assessments: Guidelines for Qualitative Assessments*, Version 5.02 (APHIS, 2000).

International plant protection organizations such as the North American Plant Protection Organization (NAPPO) and the International Plant Protection Convention (IPPC) of the United Nations Food and Agriculture Organization (FAO) provide guidance for conducting pest risk analyses in the Guidelines for pest risk analysis, Section 2 of the International Standards for Phytosanitary Measures (FAO, 2001). Biological and phytosanitary terms follow the Glossary of Phytosanitary Terms, Section 5 of the International Standards for Phytosanitary Measures (FAO, 1999). The methods used in this risk assessment are consistent with the above guidelines. The cited guidelines describe three stages of pest risk analysis: Stage 1 (initiation), Stage 2 (risk assessment), and Stage 3 (risk management). This document satisfies the requirements of Stages 1 and 2.

The genus *Cucumis* includes two major commercial vegetable crops, cucumbers and melons, and two minor ones, the gherkin and the African horned cucumber (= Kiwano<sup>®</sup>, "Cuke-asaurus"<sup>™</sup>, horned cucumber, horned fruit and horned or jelly melon). African horned cucumber is endemic to southern and central Africa (Benzioni, 1997) and is considered a wild relative of cucurbits such as melon and cucumber. Due to the presence of insect and disease resistance genes in the African horned cucumber, crosses of melon and African horned cucumber have been attempted. The failure of classical crossing and protoplast fusion trials and results from DNA and isozyme analyses have led to the conclusion that melons, cucumbers and African horned cucumber are not closely related (Bates, *et al.*, 1990; Kirkbride, 1993). African horned cucumber is a specialty crop that is grown in small quantities. Because information on pests that occur in Chile and attack African horned cucumbers is limited, we tried to determine if close relatives of the African horned cucumber could harbor potential quarantine pests. The lack of close relatives prompted the decision to confine the scope of this assessment to African horned cucumber. Moreover, because this commodity exhibits pest resistance not found in cultivated cucurbits, pests that occur on other cucurbits grown in Chile were not included in the pest list. However, when pests of cucurbit species grown in Chile were identified, they were analyzed for quarantine significance.

African horned cucumber fruits are intended for importation from Chile for both food and ornamental and decorative purposes. African horned cucumber is easy to identify and to

distinguish from other *Cucumis* species due to its distinctive orange-oblong fruit that is studded with spined conical protuberances. The crop is grown in New Zealand, Kenya, Israel, Chile and the United States. Less than 20 acres of the fruit are cultivated in California (University of California-Davis, 1998); and less than 10 acres in Region V (Olmue) and Region X (Osorno) of Chile have been cultivated since 1996. Sustainable methods have been used in production in Chile and the only reported pesticide use has been sulfur as a fungicide for powdery mildew. Fruits are harvested at the near-mature stage. Post-harvest processing includes visual inspection and brushing with customized equipment, presumably to remove soil and debris. Fruit is stored and shipped under low humidity conditions at above 55°F and has a shelf life of up to eight months. Up to two forty-foot containers (equivalent to approximately 32,000 lbs. of fruit) are expected to be shipped annually March through May (letter from Gomberoff to Imai 12 November 2001).

## II. RISK ASSESSMENT

The scope of this commodity risk assessment documents is the first two stages of the FAO risk analysis process (FAO, 2001) which includes initiation and risk assessment. Commodity pest risk assessment documents inform decision-makers on the pest risks associated with commodity importations. These documents are based on the best available scientific evidence. Information sources, assumptions, sources of uncertainty and rationales are stated as they arise.

### A. Initiating Event and Proposed Action

This assessment was initiated in response to a request from a commercial producer for USDA authorization of the African horned cucumber to enter the United States from Chile (letter from Gomberoff to Burnett on 10 May 2000). Importation presents a potential plant pest risk. In this case, the importation of fresh African horned melon fruit from Chile into the United States is a potential pathway for introduction of exotic plant pests. Quarantine 56 (Title 7-Agriculture Code of Federal Regulations § 319.56) provides the general regulatory authority for the importation of fruits and vegetables.

### B. Assessment of Weediness Potential

Table 1. Process for Determining Weediness Potential of African horned cucumber

Commodity: Fresh fruit of African horned cucumber, *Cucumis metuliferus* (Cucurbitaceae), for consumption and/or ornamental use.

Phase 1: African horned cucumber occurs in the United States, but is not widely prevalent. It is grown commercially in Los Banos, California (Benzioni, 1997) and is reported as introduced into two Counties of Florida (Alachua and Pinellas Counties) (Wunderlin and Hansen, 2001; Coile and Dixon, 1994).

Phase 2: Is the species listed in:

- YES Geographical Atlas of World Weeds (Holm, *et al.*, 1979).
- NO World's Worst Weeds (Holm, *et al.*, 1977).
- YES Report of the Technical Committee to Evaluate Noxious Weeds; Exotic Weeds for the Federal Noxious Weed Act (Gunn and Ritchie, 1982).
- NO Economically Important Foreign Weeds (Reed, 1977).
- NO Composite List of Weeds (Weed Science Society of America, 1989).

Other literature and database search indicating weediness:

- YES Biological Abstracts, Google, etc.: One article (Morton, 1987).
- NO AGRICOLA, CABI, AGRIS
- NO World weeds: natural histories and distributions (Holm, *et al.*, 1997).
- NO Synonymized checklist of the vascular flora of the United States online database, BONAP, updated July 1998 (Kartesz, 1998).
- NO World Economic Plants (Wiersema and León, 1999)
- NO Noxious Weeds of Australia (Parsons and Cuthbertson, 1992)
- NO Western Weeds, A Guide to the weeds of Western Australia online (Hussey, *et al.*, 1997)
- YES Western Australia Dept. of Agric. Online Weed List (Randall, 1998).
- NO Weeds Australia Database, National Weeds Strategy Executive Committee (Thorp, 2001).
- NO Florida's Invasive Species List, Florida Exotic Pest Plant Council (FLEPPC, 2001).
- NO CalFlora (California flora) (Dennis, 2001).
- NO Crop Protection Compendium Database, CAB International (CABI, 2001).
- NO National PLANTS database, USDA (NRCS, 2001).

Phase 3: Conclusion

The range, distribution and weediness potential of the African horned cucumber meets criterion 4 of Phase 3 (APHIS, 2000) which states that the species is not widely prevalent in the United States and the species is indicated to have weediness potential in some references. The species has naturalized in Queensland, Australia where it is an agricultural weed in some areas (Morton, 1987). Currently, African horned cucumber is prohibited from entry into Western Australia and is characterized as a serious weed (not "noxious") for Australia (Randall, 1998). The remainder of Australia does not regulate the species (Thorp, 2001) nor does it appear on State noxious weed lists in the United States (ARS, 2001a; NRCS, 2001).

The marketing and availability of seeds, plants and fresh fruit of this specialty crop in the United States began in the mid-1980's by companies both in the United States and abroad. Introductions have not been reported in growing areas in California (Molinar, 2001; Dennis, 2001), however, the species is reported as introduced into two counties in Florida (Wunderlin and Hansen, 2001; Coile and Dixon, 1994). Florida's climate is suspected to be suitable for the species (Morton, 1987). When climatic parameters were compared between areas in Australia where the species is reported as introduced and locales in the United States (Sutherst, *et al.*, 1999), the corresponding locations were only Tampa, Florida and Brownsville, Texas.

African horned cucumber's estimated potential range of establishment is in three Plant Hardiness Zones (ARS, 1990), 9b – 10b, in Florida and Texas. The small potential range of invasion and establishment and lack of spread despite seed, plant and fresh fruit availability indicates that there is a low potential risk of impact on native and agricultural ecosystems throughout the contiguous United States.

### C. Previous Risk Assessments, Decision History and Pest Interceptions

#### Previous Risk Assessments

This document incorporates the results of a recent risk assessment of African horned cucumber conducted by government of Chile Servicio Agrícola y Ganadero (SAG) (letter from Royo to Billak on 25 April 2000).

#### Decision History

This is the first consideration of the importation of the commodity into the United States from Chile. There is no history of entry of commercial African horned cucumber fruit from Chile.

Entry of the commodity from New Zealand was approved in 1986 if an accompanying phytosanitary certificate affirmed that the commodity was grown in an area free of the red-legged-earth mite, *Halotydeus destructor* (Tucker) (Acari: Pentheleidae), or treatment based on findings of the pest was done (USDA, 1986).

#### Pest Interceptions from Chile

One interception of a specimen of an undetermined genus and species of Gelechiidae (Lepidoptera) from stores (food for passengers or crew) at an airport occurred in 1988 (PPQ, 2001). Because this interception represented an isolated incident that occurred during the period 1985-2001, the pest is not considered in the pathway and it is not analyzed further.

### D. Pest Categorization

Table 2 presents information about geographic distribution, host associations and regulatory data and serves as a basis for selecting pests for risk assessment. Table 2 includes the pest list provided by the government of Chile (letter from Royo to Billak 25 April 2000). The arthropod and pathogen lists within this Table identify: (1) the presence or absence in the U.S. of pests present in Chile, (2) the generally affected plant part or parts, (3) the quarantine status of the pest in the United States, (4) whether the pest is likely to follow the pathway into the United States on African horned cucumber fruit, and (5) pertinent citations for either the distribution or the biology of the pest. Many organisms are eliminated from further consideration as sources of phytosanitary risk on African horned cucumber from Chile because they do not satisfy the definition of a quarantine pest based on their biology or distribution (FAO, 1999).

Table 2: Pests associated with African horned cucumber in Chile.

Organism Scientific Name (Classification)	Geographic Distribution <sup>1</sup>	Plant Part Affected <sup>2</sup>	Quaran- tine Pest <sup>3</sup>	Follow Pathway	Comments	References
<b>Arthropods</b>						
<i>Aphis</i> sp. (Homoptera: Aphididae) aphid	CL	L	Y	Y	SAG survey, I to X Regions	SAG, 2000
<i>Ceratitis capitata</i> (Wiedemann) (Diptera: Tephritidae) Mediterranean fruit fly	CL, US (HI)	F	Y	N	Larvae occur in fruit; Eradicated from CL Regions V and X	Letter from Reszczyński to Hennessey 28 November 2001; Tasmania Plant Quarantine Manual, 2001
Genus and species undetermined (Acari: Tydeidae) tydeid mite	CL	L	N	N	SAG survey reported as saprophagous	PPQ, 2001; SAG, 2000
Genus and species undetermined (Lepidoptera: Gelechiidae) leafblotch miner	CL	F	Y	N	Larvae of some species may bore into Fruits	PPQ, 2001; Povolny, 1979
<i>Thrips tabaci</i> Lindeman (Thysanoptera: Thripidae) onion thrips	CL, US	L, F	N	Y	SAG Risk Assessment, I to XII Regions	SAG, 2000
<b>Fungi</b>						
<i>Alternaria cucumerina</i> (Ellis & Everh.) Elliot [ <i>Macrosporium cucumerinum</i> Ellis & Everh.] (Fungi Imperfecti: Hyphomycetes)	CL, US	F, L, SE	N	Y		ARS, 2001a; Farr, <i>et al.</i> , 1989; SAG, 2000; Horst, 1990
<i>Cladosporium</i> sp. (Fungi Imperfecti: Hyphomycetes)	CL	W	N	Y		SAG, 2000
<i>Erysiphe orontii</i> Castagne emend. U. Braun [= <i>Erysiphe cucurbitacearum</i> Zheng & Chen] (Pyrenomycetes: Erysiphales)	CL, US	L	N	N		ARS, 2001a; Braun, 1995; Koike, 1999
<b>Nematodes</b>						
<i>Aphelenchoides</i> sp. (Aphelenchida: Aphelenchoididae)	CL	R	Y	N		SAG, 2000
<i>Aphelenchus</i> sp. (Aphelenchida: Aphelenchoididae)	CL	R	Y	N		SAG, 2000
<i>Ditylenchus</i> sp. (Tylenchida: Anguinidae)	CL	R	Y	N		SAG, 2000

Organism Scientific Name (Classification)	Geographic Distribution <sup>1</sup>	Plant Part Affected <sup>2</sup>	Quaran- tine Pest <sup>3</sup>	Follow Pathway	Comments	References
<i>Meloidogyne</i> sp. (Tylenchida: Meloidogynidae)	CL	R	Y	N		SAG, 2000
<i>Pratylenchus</i> sp. (Tylenchida: Pratylenchidae)	CL	R	Y	N		SAG, 2000
Viruses						
<i>Zucchini yellow mosaic virus</i> (Potyviridae: Potyvirus)	CL, US	W	N	Y		Adlerz <i>et al.</i> , 1983; CPC, 2001; SAG, 2000

<sup>1</sup> CL = Chile, US = United States

<sup>2</sup> F = Flowers, L = Leaves, R = Roots, SE = Seeds, W = Whole Plant

<sup>3</sup> N = No, Y = Yes

The risk of importation of organisms not identified to the species level was not identified. Lack of species identification may be due to the limits of the current taxonomic knowledge, the organism's life stage at the time of identification, or the quality of the specimen. By necessity, pest risk assessments focus on the organisms for which biological information is available. The lack of identification at the specific level does not rule out either the possibility that a high risk quarantine pest was intercepted or that the intercepted pest was not a quarantine pest. Conversely, development of detailed assessments for known pests that inhabit a variety of ecological niches, such as the surfaces or interiors of fruit, stems or roots, allow effective mitigation measures to eliminate the known organisms as well as similar but incompletely identified organisms that inhabit the same niche.

#### E. List of Quarantine Pests

Table 3 lists the quarantine pests for African horned cucumber from Chile. Should any of these pests be intercepted on fruits, quarantine action will be taken.

Table 3: Quarantine Pests: African horned cucumber imported from Chile	
Arthropods	<i>Aphis</i> sp. Lepidoptera: Gelechiidae (Genus and species undetermined)
Nematodes	<i>Aphelenchoides</i> sp. <i>Aphelenchus</i> sp. <i>Ditylenchus</i> sp. <i>Meloidogyne</i> sp. <i>Pratylenchus</i> sp.

#### F. Quarantine Pests Not Selected for Further Analysis

Quarantine pests in the pathway are excluded from further analysis if they lack species identification or there is insufficient documentation.

The aphid (*Aphis* sp.) and leaf blotch miner designated in Table 2 as quarantine pests in the pathway are not analyzed further because they are not identifiable to species and their identity is uncertain. Unidentified *Aphis* species and leafblotch miners may require treatment if intercepted on any commodity (PPQ, 2001). The PPQ Treatment Manual (USDA, 2001) lists treatments for surface pests and hitchhikers of melons and cucumbers that may be used for African horned cucumber from Chile if treatment is warranted.

#### G. Quarantine Pests Selected for Further Analysis

Because there are no identified quarantine pest species in the pathway of introduction, further risk assessment is unnecessary.

#### H. Conclusions

There are five arthropod pests and nine pathogens that are associated with the commodity in Chile but none are expected to be of quarantine significance and follow the pathway of introduction.

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