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Poster #74

Likelihood of Hitchhiker Pests Being Moved into and within the Greater Caribbean Region

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ABSTRACT.
A "hitchhiker" pest is defined as an agricultural pest organism moving in or on a commodity which is not one of its hosts or moving in or on a conveyance (airplane, ship) or shipping container. Our objective was to examine the movement of plant pests as hitchhikers in trade. We examined USDA data and the scientific literature to address the frequency of hitchhiking pests arriving at airports and maritime ports in the Greater Caribbean Region. We concluded that most insects, mollusks, weed seeds, and plant pathogens are likely to survive shipping conditions. Of the 6.2 million cargo containers entering maritime ports within the Greater Caribbean Region, more than 1.4 million were estimated to have arrived with contaminants. The immense number of conveyances and containers circulated in international trade make this a pathway that presents a high risk, but is difficult to control.

KEYWORDS: contaminating pest, trade-mediated pest movement, hitchhiker

INTRODUCTION

Hitchhiker pests may get into or onto a commodity, conveyance, or container either by pure chance (*e.g.*, nematodes in soil on truck tires) or because they are attracted by certain conditions or characteristics. For example, flying insects may be attracted by airplane lights during nighttime loading (Caton, 2003), or insects or mollusks may find shelter on or in cargo containers. Furthermore, pests originally associated with a shipment of a host commodity (fruit, seed, whole plant, *etc.*) may be left behind in a container or conveyance after unloading of the commodity, thus becoming hitchhiker pests. The scientific literature mentions numerous cases of hitchhiker pests arriving at ports in cargo holds, aircraft cabins, or shipping containers (Dale and Maddison, 1984; Gadgil *et al.*, 2000; Gadgil *et al.*, 2002; Smith and Carter, 1984; Takahashi, 1984).

Aircraft holds. In the United States, live pests have been intercepted in aircraft holds, stores, and quarters. Between 1997 and 2007, over 1,900 live pest interceptions, including insects, weeds, a mollusk, and a mite, were recorded from aircraft holds (Table 1) (USDA, 2007a). The majority (87%) of the pest interceptions in aircraft holds were made at Miami International Airport (MIA) in Miami, FL. Between 2005 and 2007, 677 records of live pests requiring mitigation in Florida were intercepted at MIA in aircraft holds (USDA, 2007a). Although 89,270 of the foreign aircraft arriving at MIA were inspected between 2005 and 2007 (USDA, 2007b), we were unable to calculate pest approach rates because aircraft inspections are not uniform (*i.e.*, an inspection does not

necessarily include an inspection of the holds). Due to limitations in the dataset, we also were unable to calculate contamination rates of aircraft arriving from a particular origin.

Sea cargo containers. Gadgil *et al.* (2000) estimated an approach rate of 23% for sea cargo containers arriving at New Zealand ports with external contamination with plant pests, pathogens, or soil containing plant pests or pathogens. Using this approach rate, we calculated the number of contaminated sea cargo containers entering countries within the Greater Caribbean Region (Table 2). The majority of ports in the Greater Caribbean Region report container traffic in twenty-foot equivalent units (TEU), not by actual number of container boxes. To convert TEUs to containers, we first estimated the ratio of twenty-foot and forty-foot containers arriving at a port (other container sizes exist, but twenty-foot and forty-foot containers are most common). Based on those ports in the region that reported the number of each type of container, an estimated 80% of the containers were forty-foot containers and the remaining 20% were twenty-foot containers. Based on this, we estimated that of the 6.2 million containers arriving annually at ports within the Greater Caribbean Region, ca. 1.4 million arrive with contaminants.

Maritime vessels. Maritime vessels, including ship decks, holds, and stores, may be contaminated with live pests, soil, or other debris. Inspections of maritime vessels, including ship holds and stores, at U.S. ports-of-entry have resulted in interceptions of live pests, including pests of agricultural importance (Table 1) (USDA, 2007a).

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Table 1. Important[1] pest families intercepted at U.S. ports-of-entry on maritime vessels (including holds and stores), aircraft cargo holds, or containers (USDA, 2007a).	
Arthropods	
Coleoptera	Bostrichidae, Buprestidae, Cerambycidae, Chrysomelidae, Curculionidae, Dryophthoridae, Elateridae, Meloidae, Platypodidae, Scarabaeidae, Scolytidae, Tenebrionidae
Diptera	Agromyzidae, Chloropidae, Tephritidae
Hemiptera	Achilidae, Aleyrodidae, Alydidae, Aphididae, Aphrophoridae, Aradidae, Cercopidae, Cicadellidae, Cicadidae, Cixiidae, Cydnidae, Delphacidae, Diaspididae, Lygaeidae, Membracidae, Miridae, Oxycarenidae, Pachygronthidae, Pentatomidae, Psyllidae, Pyrrhocoridae, Rhopalidae, Rhyparochromidae, Scutelleridae, Tingidae
Hymenoptera	Apidae, Formicidae, Siricidae
Isoptera	Termitidae
Lepidoptera	Acrolophidae, Agryresthiidae, Arctiidae, Crambidae, Ctenuchidae, Elachistidae, Gelechiidae, Geometridae, Gracillariidae, Hesperiidae, Limacodidae, Megalopygidae, Noctuidae, Notodontidae, Nymphalidae, Oecophoridae, Psychidae, Pyralidae, Saturniidae, Sesiidae, Sphingidae, Tineidae, Tortricidae
Orthoptera	Acrididae, Gryllidae, Gryllotalpidae, Pyrgomorphidae, Romaleidae, Tetrigidae, Tettigoniidae
Weeds	
	Asteraceae, Solanaceae
Mollusks	
Pulmonata	Achatinidae, Agriolimacidae, Arionidae, Bradybaenidae, Cochlicellidae, Helicidae, Limacidae, Pleurodontidae, Succineidae
Stylommatophora	Hygromiidae

[1] All of these families contain many species that are pests of agricultural importance and are capable of active dispersal.

Table 2. Number of containers and estimated number of contaminated containers arriving at ports-of-entry in the Greater Caribbean Region.
(Data obtained from port authority websites, trade websites, and publications.)

Country	**Containers arriving**[1]	**Containers contaminated**
Aruba[2]	8,830	2,066
Bahamas[2]	415,758	97,287
Barbados[2]	27,752	6,494
Belize[2]	12,258	2,868
Cayman Islands[2]	18,002	4,212
Costa Rica[2]	418,835	98,007
Cuba[3]	95,132	22,261
Curaçao[2]	27,638	6,467
Dominica[2]	3,329	779
Dominican Republic[3]	107,109	25,063
El Salvador[2]	39,433	9,227
Guatemala[2]	227,409	53,214
Guadeloupe[3]	46,961	10,989
Haiti[4]	166,647	38,995
Honduras[3]	176,498	41,300
Jamaica[3,5]	543,633	127,210
Netherland Antilles[5]	481,522	112,676
Nicaragua[2]	15,073	3,527
Panama[2]	1,190,592	278,512
Puerto Rico[3]	518,217	121,263
St. Lucia[2]	12,368	2,894
St. Martin[5]	132,111	30,914
Trinidad and Tobago[3,4]	126,440	29,587
United States (Alabama, Florida, Louisiana, Mississippi, Texas)[2,3]	1,461,171	341,915
Regional total[6]	**6,272,718**	**1,467,727**

[1] Containers entering include only those arriving at the port. The number may be the actual number reported or may be estimated from the number of TEUs reported.
[2] Based on 2006 data.
[3] Based on 2005 data.
[4] Based on 2004 data.
[5] Based on 2003 data.
[6] Data for some ports and countries or territories were not available.