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**MEETING HOST:**



**Poster #72**

**Wood Packaging Material as a Pathway for the Movement of Exotic Insect Pests into and within the Greater Caribbean Region**

*Heike E. Meissner, Thomas W. Culliney, Andrea V. Lemay, Leslie P. Newton, and Christie A. Bertone, United States Department of Agriculture (USDA), Raleigh, North Carolina 27606, USA. Contact: Heike.E.Meissner@aphis.usda.gov*

**ABSTRACT.**

Pallets, crates, and dunnage made of wood are commonly used packaging materials in international trade. Our objective was to use data collected by the United States Department of Agriculture (USDA) to discuss the current role of wood packaging material (WPM) in the movement of pest species into and within the Greater Caribbean Region. For both maritime and air cargo, significant differences were found between countries of origin in terms of the percentage of shipments that contain WPM. A list of species intercepted on WPM at U.S. ports-of-entry after full enforcement of the international standard ISPM 15, as well as a list of species associated with WPM that have the potential to establish in the Greater Caribbean Region, are presented.

**KEYWORDS:** Wood packaging material, pest interception, pallets

**INTRODUCTION**

Wood packing material (WPM), such as pallets, crates, and dunnage, is used worldwide in agricultural and non-agricultural shipments. WPM has been recognized as a pathway for the spread of exotic pests, including arthropods, nematodes, mollusks, weeds, and plant pathogens (Pasek, 2000; Allen and Humble, 2002). WPM is often produced from low-grade wood of multiple species (Clark *et al.*, 2001), often with bark still attached. WPM is routinely re-used and re-conditioned (Clarke *et al.*, 2001; Bush *et al.*, 2002), making it difficult to determine its origin. Countries that have adopted the standard ISPM 15 of the International Plant Protection Convention (IPPC, 2006) now require WPM to be either fumigated or heat-treated prior to import. The United States began full enforcement of its requirements based on ISPM 15 on July 5, 2006.

**MATERIALS AND METHODS**

Agricultural Quarantine Inspection Monitoring (AQIM) data on maritime and air cargo, collected between Sept. 16, 2005 and Aug. 15, 2007, were used to estimate the proportion of maritime and air cargo shipments that contain WPM. The data were collected at several ports throughout the United States according to the USDA AQIM Handbook (USDA, 2006). Maritime shipments were selected randomly, and the presence or absence of WPM was recorded.

The samples were divided into two categories: 1) perishable, agricultural cargo and 2) non-agricultural cargo (excluding Italian tiles). On air shipments, samples were randomly collected from perishable agricultural cargo, including cut flowers. The

following commodities were specifically excluded from both air and maritime cargo: a) commodities which were pre-cleared at foreign sites; b) commodities admissible under the National Agricultural Release Program; c) frozen commodities; d) commodities which undergo mandatory treatment other than cold treatment (*e.g.*, fumigation, irradiation, hot water treatment) at work locations; and e) oil, salt, iron ore, coal, and similar bulk materials. The USDA PestID database was consulted for pest interception records at U.S. ports-of-entry.

## RESULTS AND DISCUSSION

The percentage of cargo that contained WPM differed among countries of origin. (Only countries of origin with sample sizes of 30 or higher are discussed here.) In terms of maritime cargo (Figure 1), several Caribbean countries (Costa Rica, Guatemala, and the Dominican Republic) had high percentages of export cargo with WPM. Other countries with a high incidence of WPM in export cargo were New Zealand and several European countries. Cargo from Honduras, Nicaragua, Venezuela, and Panama had comparatively lower incidences of WPM. Shipments from China had the lowest incidence of WPM, significantly lower than that from most other countries. This was true for both agricultural and non-agricultural maritime cargo, confirming results reported by MAF (2003) (Figures 2, 3). In the air cargo samples, far fewer countries were represented. Notably, imports from The Netherlands had by far the highest incidence of WPM in air cargo (Figure 4). In contrast to maritime cargo, air cargo shipments from Costa Rica and the Dominican Republic had a low incidence of WPM.

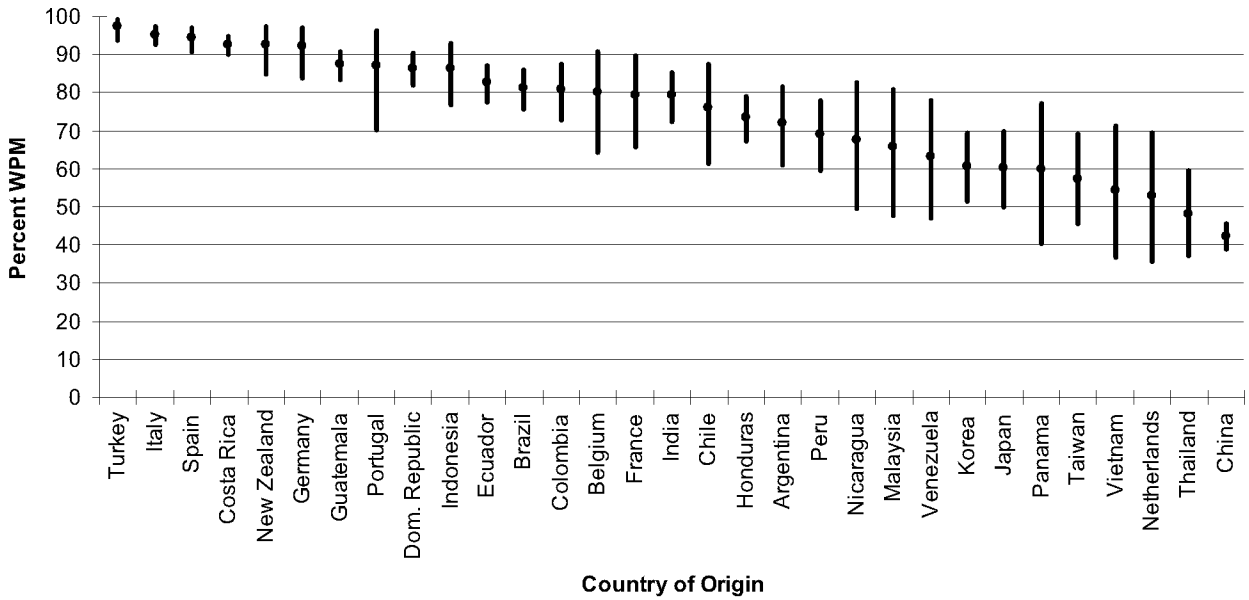
Obviously, the phytosanitary hazard is not presented by the WPM itself, but by pest organisms that may be associated with it. Unfortunately, there is little published data available on the incidence of pests associated with WPM. The New Zealand Ministry of Agriculture and Forestry found that, of 1,517 maritime containers with WPM inspected, about 16% had contaminations that resulted in phytosanitary action, such as fumigation or incineration (MAF 2003). Among the organisms detected on the WPM were a large number of fungi and insects, as well as isopods, millipedes, mites, plant materials, spiders, mollusks, and reptiles. A 2006 study carried out at several U.S. ports-of-entry resulted in an estimate of 0.1% of all marked WPM being infested with live wood-boring beetles (Haack *et al.*, 2006).

**Table 1** lists organisms associated with wood intercepted at U.S. ports-of-entry between July 5, 2006 (date of full enforcement of ISPM #15) and January 1, 2008. The large majority of the interceptions were wood-boring beetles of the families Scolytidae, Cerambycidae, and Curculionidae. A variety of other insect orders were also found, in addition to weeds and mollusks. These data suggest that live pests are entering with WPM in spite of ISPM #15. It is unknown whether the presence of pests is due to ineffectiveness of the required treatments, incorrectly applied treatments, re-infestation of the wood after effective treatment, or fraudulent use of the stamp/seal.

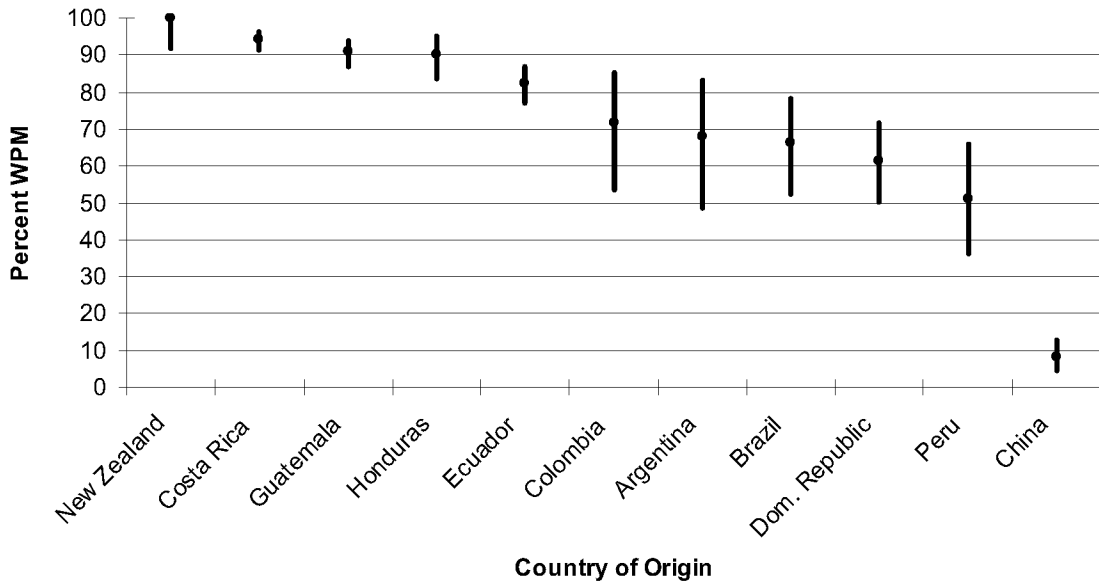
**Table 2** lists some examples of insect species commonly associated with WPM that have the potential to become established in the Greater Caribbean Region or to spread within the region if they already are established in some Caribbean countries.

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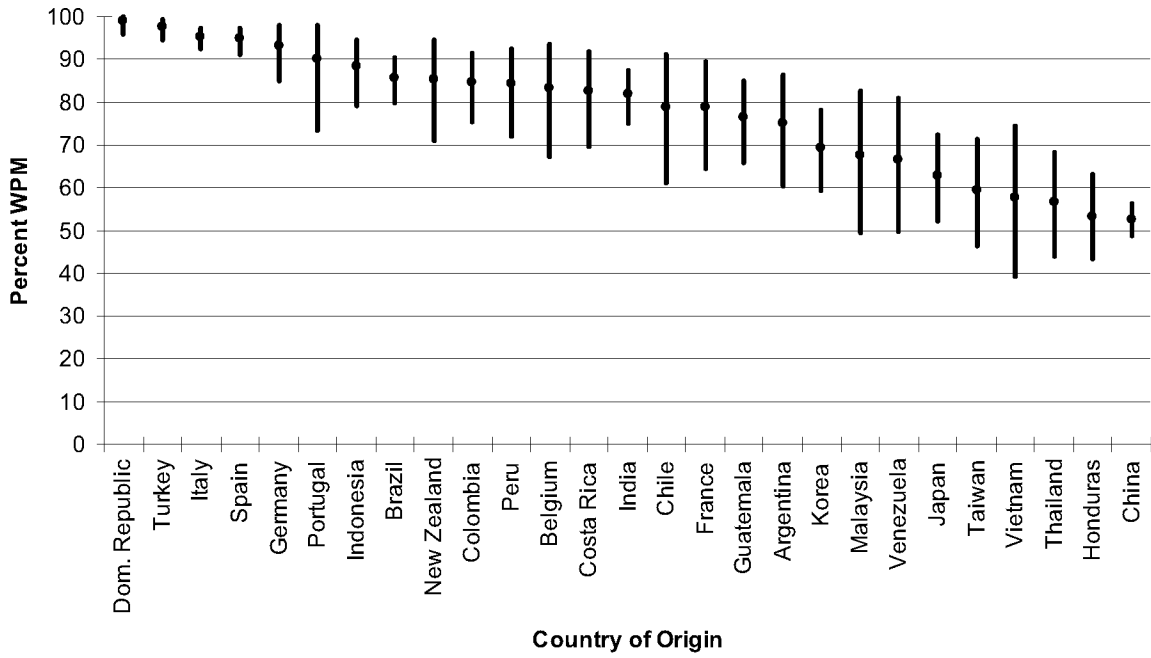
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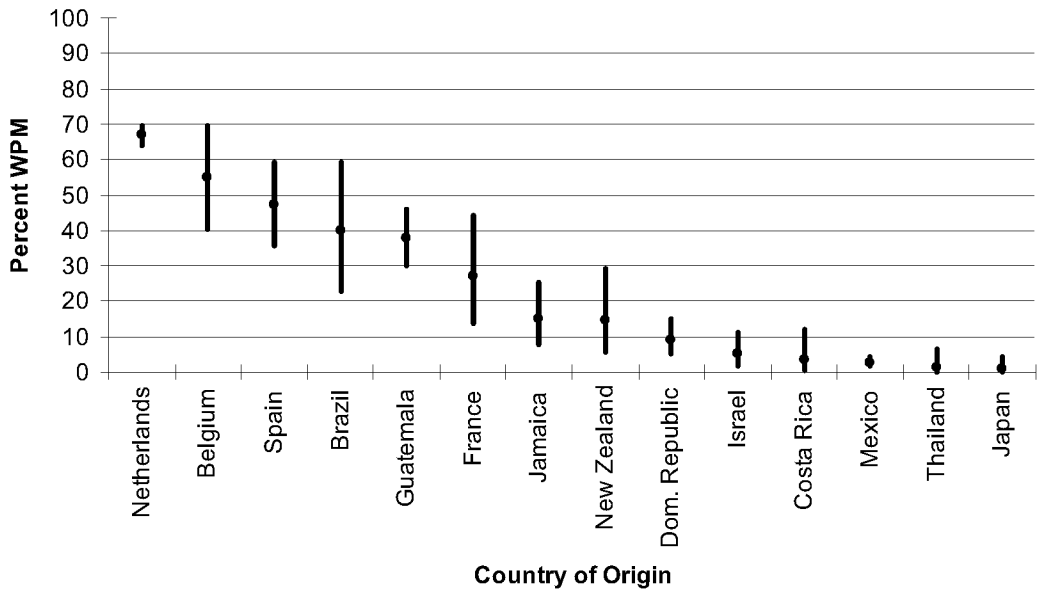
**Figure 1.** Percentage (and 95% binomial confidence interval) of maritime cargo (both agricultural and non-agricultural) imported into the United States that contained WPM (Data source: AQIM data, Sep 16, 2005 - Aug 15, 2007).



**Figure 2.** Percentage (and 95% binomial confidence interval) of maritime agricultural cargo imported into the United States that contained WPM (Data source: AQIM data, Sep 16, 2005 - Aug 15, 2007).



**Figure 3.** Percentage (and 95% binomial confidence interval) of maritime non-agricultural cargo imported into the United States that contained WPM (Data source: AQIM data, Sep 16, 2005 - Aug 15, 2007).



**Figure 4.** Percentage (and 95% binomial confidence interval) of agricultural air cargo imported into the United States that contained WPM (Data source: AQIM data, Sep 16, 2005 - Aug 15, 2007).

**Table 1.** Pest taxa intercepted on or in wood materials at U.S. ports-of-entry between July 5, 2006 and January 1, 2008. (Data source: PestID database).

<b>Order</b>	<b>Family</b>	<b>Interceptions</b>	<b>Specimens</b>
Coleoptera	Anobiidae	2	2
	Bostrichidae	9	32
	Buprestidae	15	16
	Cerambycidae	38	49
	Chrysomelidae	1	3
	Cleridae	3	17
	Corticariidae	1	5
	Cryptophagidae	3	3
	Curculionidae	40	131
	Histeridae	1	1
	Laemophloeidae	1	1
	Mycetophagidae	1	1
	Nitidulidae	2	8
	Platypodidae	8	13
	Scarabaeidae	2	2
	Scolytidae	247	788
	Silvanidae	5	13
	Staphylinidae	1	1
	Tenebrionidae	2	3
Diptera	Scatopsidae	1	4
Hemiptera	Aradidae	1	1
	Cixiidae	1	1
	Coreidae	1	1
	Miridae	1	1
	Reduviidae	1	1
	Rhyparochromidae	1	1
Hymenoptera	Apidae	1	1
	Formicidae	8	78
Isopoda	unknown	1	3
Isoptera	Rhinotermitidae	4	135
	Termitidae	1	4
Lepidoptera	Geometridae	2	2
	Pyralidae	3	4
	Tineidae	1	1
Mollusks	Cochlicellidae	1	3
	Helicidae	2	12
Orthoptera	Gryllidae	2	2
	Tettigoniidae	1	2
<b>TOTAL</b>		<b>424</b>	<b>1,346</b>



**Table 2.** Examples of insects that have been intercepted on WPM and have the potential to be introduced into one or more countries of the Greater Caribbean Region.

<b>Coleoptera: Bostrichidae</b>
<i>Heterobostrychus brunneus, Sinoxylon anale, Sinoxylon crassum, Xylothrips flavipes</i>
<b>Coleoptera: Buprestidae</b>
<i>Buprestis haemorrhoidalis, Melanophila cuspidata</i>
<b>Coleoptera: Cerambycidae</b>
<i>Callidiellum rufipenne, Monochamus alternatus, Plagionotus christophi, Pyrrhidium sanguineum, Stromatium barbatum, Xylotrechus grayi, Xylotrechus magnicollis</i>
<b>Coleoptera: Curculionidae</b>
<i>Pissodes pini</i>
<b>Coleoptera: Scolytidae</b>
<i>Carphoborus minimus, Carphoborus pini, Cryphalus asperatus, Cryphalus piceae, Crypturgus cinereus, Crypturgus mediterraneus, Crypturgus numidicus, Dryocoetes autographus, Dryocoetes villosus, Euwallacea validus, Gnathotrichus materiarius, Hylastes angustatus, Hylastes ater, Hylastes attenuatus, Hylastes cunicularius, Hylastes linearis, Hylastes opacus, Hylesinus varius, Hylurgops glabratus, Hylurgops palliates, Hylurgus ligniperda, Ips acuminatus, Ips amitinus, Ips cembrae, Ips mannsfeldi, Ips sexdentatus, Ips typographus, Orthotomicus erosus, Orthotomicus laricis, Orthotomicus proximus, Orthotomicus suturalis, Phloeosinus rudis, Phloeotribus scarabaeoides, Pityogenes bidentatus, Pityogenes bistridentatus, Pityogenes calcaratus, Pityogenes chalcographus, Pityogenes quadridens, Pityogenes trepanatus, Pityokteines curvidens, Pityokteines spinidens, Pityophthorus pityographus, Polygraphus poligraphus, Polygraphus subopacus, Pteleobius vittatus, Scolytus intricatus, Scolytus ratzeburgi, Scolytus scolytus, Taphrorychus bicolor, Taphrorychus villifrons, Tomicus minor, Tomicus piniperda, Trypodendron domesticum, Trypodendron signatum, Xyleborinus alni, Xyleborus californicus, Xyleborus eurygraphus, Xyleborus glabratus, Xyleborus pfeili, Xyleborus similis, Xylechinus pilosus, Xyloterinus politus</i>
<b>Hymenoptera: Siricidae</b>
<i>Sirex noctilio</i>
<b>Hymenoptera: Xiphydriidae</b>
<i>Xiphydria prolongata</i>
<b>Isoptera: Rhinotermitidae</b>
<i>Coptotermes crassus</i>