

Adopted standards for pest management in export of wood and wood packaging material**Deepak, S and Rashmi, M.A***Regional Plant Quarantine Station, Directorate of Plant Protection Quarantine and Storage,
Bengaluru, Karnataka 560024, India**Corresponding author: deepakshimoge@gmail.com***Abstract**

Wood packaging materials (WPM) provide a suitable habitat for pests which enable them to spread globally in transit. Major pests associated with WPM belong to different orders of insect viz., Coleoptera, Lepidoptera, Isoptera, Diptera, Hymenoptera and others. In order to manage the risks associated with WPM due to these pests, International Plant Protection Convention (IPPC) has developed International Standards for Phytosanitary Measures with the goal to eliminate the risk of quarantine pests and other pests by means of either heat treatment or methyl bromide fumigation of WPM. Complete avoidance of introduction or spread of pests is impossible while, the risk of pests has to be minimized within the least possible delay by following these approved phytosanitary measures.

Introduction

The increasing international trade has been responsible for the inadvertent introduction of many exotic (non-native invasive) insect pests and plant pathogens, of which several have become highly invasive and causes serious environmental and economic impacts to multiple habitats worldwide. For instance, emerald ash borer (*Agrilus planipennis*; Buprestidae) introduced to North America from Asia in the 1990s has killed millions of ash trees (*Fraxinus*) with economic impacts in the billions of dollars (Kovacs *et al.*, 2011). The phytosanitary measures play major role in relation to possible introductions. Phytosanitary measures are not only applied to exported timber, wood products, but also to wood packaging materials that are used for moving commodities. In 2019, global services trade was valued at US\$6.1 trillion, recording a slight increase of two per cent on 2018, and of almost 70 per cent on ten years earlier. With this scenario there is lot of chances for introduction of invasive pests through dunnage mainly wood if proper mitigating measures are not taken. In recent years, introductions of several, particularly damaging wood-infesting insects and pathogens have focused public and regulatory attention on the pathways that transport these pests (FAO, 2018). Wood-feeding

insects commonly associated with wood packaging material includes items such as pallets crates and dunnage (wood used to brace cargo). Packaging for overseas shipments is commonly made from wood as they are relatively inexpensive, generally abundant, renewable and, easily manufactured and repaired.

Unfortunately, wood used to construct WPM can be infested with a wide variety of bark and wood pests and thereby serve as a pathway for pest movement. As international trade volumes soared in recent decades, many countries became concerned about repeated introductions of invasive forest insects and disease organisms such as Asian longhorned beetle, *Anoplophora glabripennis* (Coleoptera: Cerambycidae), which is believed to have entered the United States in solid wood packing material from China. The pinewood nematode, *Bursaphelenchus xylophilus* (Nematoda: Aphelenchidae) is a causal agent of pine wilt diseasecausing death of million pines in Japan, Korea, China and Portugal introduced from North America (Futai, 2013).

Pest Association with Wood Packaging Material

Pests commonly associated with WPM include beetle (Coleoptera) families viz., Buprestidae, Cerambycidae, Curculionidae, Platypodinae and Scolytidae, the wood wasp (Hymenoptera) family Siricidae, and the moth (Lepidoptera) families viz., Cossidae and Sesiidae. Elsewhere, in the world there are many other wood pests of concern to specific countries, including species of powderpost beetles (Bostrichidae, including Lyctinae), wood boring flies (Diptera), termites (Isoptera), as well as wood-decay fungi and nematodes. It is important to note that many powder post beetles and termites are secondary colonizers of treated wood and therefore are rarely the target pests when ISPM 15 treatments are applied to newly constructed WPM.

Nature of the Problem

The risks associated with the movement and introduction of quarantine pests in WPM are well documented. The introduction of destructive tree pests associated with the international movement of WPM may present the following risks:

1. Exotic pests with limited distribution in the country may spread to new areas.
2. Native pests with limited distribution may spread to new areas increasing environmental stressors, which in turn may make native forests more susceptible to these pests.
3. Pathogens vectored by established exotic or native insects may spread to new areas.

Phytosanitary Measures

In response, members of the International Plant Protection Convention (IPPC) developed and adopted International Standards for Phytosanitary Measures No. 15 (ISPM 15) in 2002, which provided details on approved phytosanitary treatments for WPM used in International trade. A core value of these international standards is ‘Harmonization of national regulations, which facilitates trade the original stated goal of ISPM 15 in 2002 was to “practically eliminate the risk for most quarantine pests and significantly reduce the risk from a number of other pests” by means of either heat treatment or methyl bromide fumigation WPM. ISPM 15 was slightly revised in 2006, and in 2009 the IPPC adopted several important changes such as lengthening the fumigation exposure time, requiring WPM to be made from debarked wood, requiring debarking prior to fumigation, and specifying tolerance limits on the maximum allowable size for individual patches of residual bark. In addition, the goal of ISPM 15 was revised in 2009 “to reduce the significant risk of introduction and spread of most quarantine pests” associated with WPM. The next version of ISPM 15 was established in 2011, but consisted of simple changes in the text formatting. The newest version of ISPM 15 (Fig. 1) was approved in 2013 and formally adopted heat treatment using dielectric heating (e.g. microwave). This standard has been adopted by over 177 countries. The material which has undergone the treatment will have a ISPM mark (Fig.2) which is universal over all the adopted countries.

Approved treatments associated with Wood Packaging Material

The approved treatments may be applied to units of wood packaging material or pieces of wood packaging material or to pieces of wood that are to be made into wood packaging material.

1. Heat treatment:

Various energy sources or processes *viz.*, conventional steam heating, kiln-drying, heat enabled chemical pressure impregnation and dielectric heating (microwave, radio frequency) may be suitable to achieve the required treatment parameters.

a. Conventional steam or dry kiln heat chamber:

When conventional heat chamber technology is used, the fundamental requirement is to achieve a minimum temperature of 56°C for a minimum duration of 30 continuous minutes throughout the entire profile of the wood including its core.

Alternatively, when using kiln-drying heat chambers or other heat treatment chambers, treatment schedules may be developed based on a series of test treatments during which the core temperature of the wood at various locations inside the heat chamber has been measured and correlated with chamber air temperature, taking into account the moisture content of the wood and other substantial parameters such as species and thickness of the wood and air flow rate and humidity. The test series must demonstrate that a minimum temperature of 56°C is maintained for a minimum duration of 30 continuous minutes throughout the entire profile of the wood.

b. Dielectric heating

Where dielectric heating (e.g. microwave) is used, wood packaging material composed of wood not exceeding 20cm when measure across the smallest dimension of the piece or the stack must be heated to achieve a minimum temperature of 60°C for 1 continuous minute throughout the entire profile of the wood including its surface. The prescribed temperature must be reached within 30 minutes from the start of the treatment.

c. Methyl Bromide Treatment

Wood packaging material containing a piece of wood exceeding 20 cm in cross section at its smallest dimension must not be treated with methyl bromide. The fumigation of wood packaging material with methyl bromide must be in accordance with a schedule specified that achieves the minimum concentration-time product (CT) over 24 hours at the temperature. This CT must be achieved throughout the profile of the wood, including its core, although the

concentrations would be measured in the ambient atmosphere. The minimum temperature of the wood and its surrounding atmosphere must not be less than 10°C and the minimum exposure time must not be less than 24 hours. Monitoring of gas concentrations must be carried out at a minimum at 2, 4 and 24 hours from the beginning of the treatment. In the case of longer exposure times and weaker concentrations, additional measurement of the gas concentrations should be recorded at the end of fumigation.

These treatments described are significantly effective against most pests of living trees associated with wood packaging material used in international trade. These treatments described are combined with the use of debarked wood for construction of wood packaging, which also acts to reduce the likelihood of re-infestation by pests of living trees. These measures have been adopted based on consideration of “the range of pests that may be affected, efficacy of the treatment and the technical and / or commercial feasibility.”

Secure disposal of non-compliant wood packaging material

Secure disposal of non-compliant wood packaging material is a risk management option that may be used when an emergency action is either not available or is not desirable.

1. Incineration, if permitted
2. Deep burial in sites approved by appropriate authorities (The depth of burial may depend on climatic conditions and the pest intercepted, but is recommended to be a least 2 m. The material should be covered immediately after burial and should remain buried. The deep burial is not a suitable disposal option for wood infested with termites or some root pathogens.).
3. Processing (Chipping should be used *only* if combined with further processing in a manner approved for the elimination of pests of concern, e.g. the manufacture of oriented strand board.)
4. Other methods endorsed as effective for the pests of concern.
5. Returning to exporting country, if appropriate.

Conclusions

Approved phytosanitary measures that significantly reduce the risk of pest introduction and spread via wood packaging material should be followed such as the use of debarked wood and the application of approved treatments. The application of the recognized ISPM mark ensures that wood packaging material subjected to the approved treatments and is readily identifiable. In order to minimize the risk of introduction or spread of pests, secure disposal method, required should be carried out within the least possible delay. Still it is likely to be very challenging to set the treatment standards for WPM that were acceptable and achievable by most of the countries, given that tree species, pest species and the availability of the phytosanitary treatment facilities vary from country worldwide.

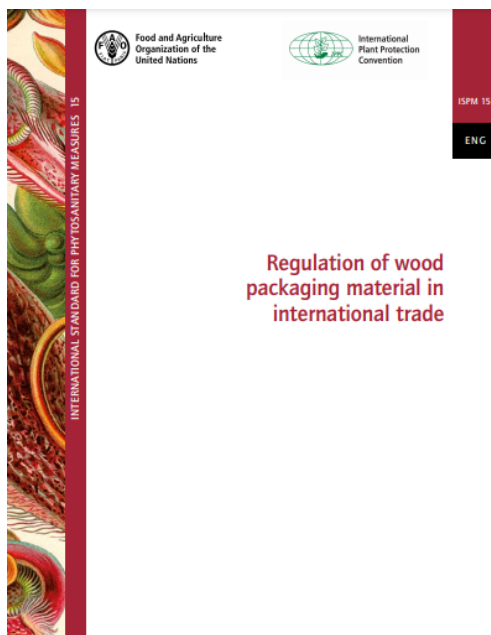


Fig. 1

Fig. 1 ISPM 15, Regulation of wood packaging material in international trade

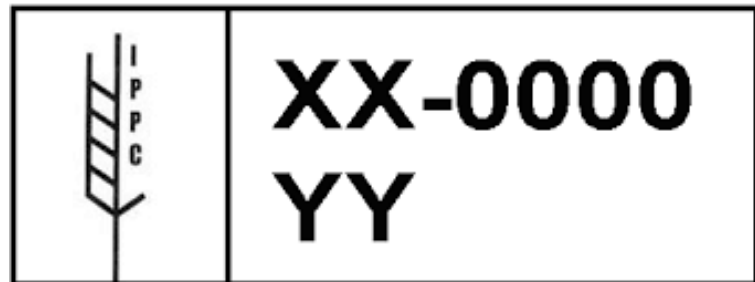


Fig.2

Fig.2, ISPM Mark IPPC certification symbol (this is a registered trade mark).

XX- represents the two letter ISO country code where the wood was treated, 0000- represents the unique certification number (which ensures that the wood packaging material can be traced back to the treatment provider and/or manufacturer),

YY- is the treatment abbreviation where:

HT: is the code for heat treatment using conventional steam or dry kiln heat chamber to a minimum of 56° C for a minimum of 30 minutes

MB: is the code for methyl bromide fumigation

DH: is the code for heat treatment using dielectric heat

SF: is the code for sulphuryl fluoride fumigation

References

International plant protection convention, 1997, FAO, Rome.

Guidelines for regulating wood packaging material in International Trade, 2002, ISPM-15, AO, Rome.

Export certification system, 1997, ISPM – 7, FAO, Rome. ISO 3166-1-ALPHA-2-CODE ELEMENTS (http://www.din.de/gremien/nas/nabd/iso3166ma/codlstp1/en_listpl.html).

Guidelines for regulating export of solid wood packaging material, 2004. Dte. of PPQS, Ministry of Agriculture, Government of India.

PPQ Treatment Manual, 2002, USDA, APHIS, USA.

FAO. 2018. Regulation of Wood Packaging Material in International Trade. International Standards for Phytosanitary Measures (ISPM) no. 15. Italy, Food and Agriculture Organization of the United Nations and IPPC Secretariat. 28 pp.

Futai, K., 2013. Pine wood nematode, *Bursaphelenchus xylophilus*. *Annual Review of Phytopathology*, 51: 61-83.

Kovacs, K. F., Mercader, R. J., Haight, R. G. 2011. The influence of satellite populations of emerald ash borer on projected economic costs in US communities, 2010–2020. *J. Environ. Manage*, 92:2170–2181.