



Optimizing Container Design to Mitigate Risks of Pest Contamination

Assistant Director Cindy Pretty, International Collaborations, Plant Systems and Strategies, Biosecurity Plant and Science Services, Department of Agriculture, Fisheries and Forestry, Australia

Issues/challenges

The movement of sea containers and imported goods presents a significant risk for the spread of hitchhiker pests. These risks are costly: an outbreak of khapra beetle in Australia alone is estimated to cost **AUD 15.5 billion** over 20 years through eradication efforts and lost market access.

Given the high volume of global trade, the diversity of goods and the complexity of shipping routes, preventing pest spread without disrupting trade or increasing costs is a major challenge. Under the International Plant Protection Convention (IPPC), regulatory authorities and industry are working together to identify practical solutions that reduce phytosanitary risks while maintaining efficient trade.

Evidence shows that pest contamination is strongly linked to specific container design features. Most external contamination occurs on container understructures, while internal contamination is primarily associated with floorboards, where cracks and crevices provide refuge for pests such as stored grain insects.

Actions taken

In 2022, the Australian Government commissioned Murdoch University's Harry Butler Institute to research improvements to sea container design and generate statistical evidence on their effectiveness in reducing pest risks. The project aimed to minimise pest spread by:

- removing common pest hiding locations;
- improving ease of cleaning and inspection;
- maintaining container functionality and cost-efficiency.

A comprehensive survey and examination of containers in circulation was conducted, focusing on potential pest refuge areas, including:

- under-floor spaces;
- external undersides;
- vents and access ports.

Modified container designs were trialled and compared with standard containers to assess contamination rates and operational impacts.



Key results

Research demonstrated that container design changes can significantly reduce pest contamination:

- **90 percent** of external pest contamination was linked to container understructures;
- internal contamination was mainly associated with floorboards;
- **8 percent** of standard containers showed signs of contamination, compared with only **1.45 percent** of modified containers.

Key outcomes of the trial included:

- lower overall contamination rates in modified containers;
- substantially reduced contamination on container undersides;
- shorter inspection times due to improved inspectability.

These results provide strong evidence that design improvements can reduce phytosanitary risks associated with container movements.

Conclusions

Optimising container design offers a practical, preventive approach to reducing the global spread of hitchhiker pests. The research confirms that relatively modest design changes can deliver substantial phytosanitary benefits while supporting efficient inspection and trade facilitation.

Building on this work, the IPPC Secretariat, in partnership with the Bureau International des Containers, the Container Owners Association and the World Shipping Council, convened the **International Symposium on Optimising Container Design to Mitigate Risks of Pest Contamination** in Rotterdam in November 2024.

A working group has since been established to develop proposals for the IPPC Sea Container Focus Group. These proposals, including recommendations for floor designs without gaps or crevices, will be presented to the Commission on Phytosanitary Measures as potential global measures to reduce pest risks associated with sea container movements.

