

Vacuum-steam treatment for invasive snails proves promising

January 7 2015, by Lynn Davis



Zhangjing Chen holds a small cheesecloth bag containing snails.

The U.S. East Coast and some port areas such as Houston, Texas, are being invaded by snails that hitchhike in containers shipped from the Mediterranean.

A 45-minute treatment in a portable chamber where vacuum and then

steam is applied to pallets full of infested goods offers a promising solution.

Researchers in Virginia Tech's College of Natural Resources and Environment demonstrated their treatment technology can kill [snails](#), using a load of Italian tile inoculated with the invasive Mediterranean snail *Ceruella cisalpine*.

The snails crawl onto pallets stored at weedy locations adjacent to Mediterranean tile facilities, said Ron Mack, a commodity treatment specialist with the U.S. Department of Agriculture's Animal and Plant Health Inspection Service, who was present for the demonstration.

Once the pallets are loaded with 1,500 pounds of packaged tile or marble, the snails crawl under the wrapping material. After shipment to the U.S., the snails escape from pallets that have been unloaded at ports and at various other locations in the distribution chain.

"They eat all kinds of stuff," said Zhangjing Chen, a research scientist at the Brooks Forest Products Center in the college's Department of Sustainable Biomaterials and one of the inventors of the vacuum-steam treatment.

"Snails can also be intermediate hosts for all kinds of parasites," said Mack.

Chen harvested snails that were hanging under a railroad track in Baltimore, secured them in containers, and stored them at a quarantine lab at Virginia Tech to use in testing the treatment process. In an effort to approximate a natural infestation but also keep the snails from escaping, he put them in cheesecloth bags and placed them underneath the wrapping on a pallet full of Italian tile that was being held in the treatment chamber.

"The treatment cycle is to draw a vacuum, then inject steam, bring the temperature to 56 C (133 F), and hold it for 30 minutes," said Professor Emeritus Marshall White, co-inventor of the process.

That temperature and time schedule is adapted from International Standards for Phytosanitary Measures No. 15, developed by the International Plant Protection Convention for the treatment of solid wood packing material.

"That is where we decided to start because that temperature and time does not harm the material but kills pests," said Mack, whose agency is funding Chen and White's research. "Part A of the test is to look at the efficacy of the chamber treatment against snails at a temperature and energy level that will not be burdensome for industry. Part B is to look at the effect on packaging."

Laszlo Horvath, director of Virginia Tech's Center for Packaging and Unit Load Design, and his team also received funding to test the treatment's effect on packaging.

"These guys at the Brooks Forest Products Center are the perfect choice for doing that because of their experience working with packaging materials," Mack added.

During the tests, the vacuum-steam process killed all the snails on the packaging material.

The USDA Animal and Plant Health Inspection Service has funded Chen and White's vacuum-steam process research for several years and invested in the portable chamber earlier this year. "We think vacuum and steam has the most application with durable goods like tile and whole logs," said Mack.

According to Mack, his agency initially funded their research in 2011 on whole logs that are used for veneer—namely, black cherry, American walnut, pignut hickory, tulip poplar, and red oak—which are exported.

"If the vacuum-steam process damages the product, industry does not want it," Mack explained. "Dr. Chen conducted vacuum and steam tests to establish a thermal profile in test logs, and then looked at the impact on sawn veneer by evaluating the color and checking after treatments. The process passed those tests."

The USDA Animal and Plant Inspection Service wants to have treatment chambers in port locations to treat both logs being exported and tile being imported, Mack said.

Based on Chen and White's success with the vacuum-steam process, the agency is considering other applications for it.

"Next, we are looking at schedules for thousand canker disease on black walnut and oak wilt on oak logs," said Mack. "This is a huge deal because the treatment for oak wilt now is methyl bromide at the single highest rate recommended in the U.S. Department of Agriculture Treatment Manual. Methyl bromide is also being phased out internationally because it is an ozone-depleting chemical."

Chen and White first tested a vacuum-steam [treatment](#) to control insects, fungi, and mold in wood used for pallets in 2006. They applied the technique to treat firewood infested with the invasive emerald ash borer earlier this year. Both of those studies were funded by the USDA Forest Service.

Provided by Virginia Tech

Citation: Vacuum-steam treatment for invasive snails proves promising (2015, January 7)
retrieved 20 April 2024 from
<https://phys.org/news/2015-01-vacuum-steam-treatment-invasive-snails.html>

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