

Termite Colony Elimination System: Termite Control Without Using Toxic Insecticides

University of Florida



Taking advantage of termites' own biology and behavior, this innovative method of termite control uses small amounts of an insect-specific agent to kill the whole colony, reducing pesticide use by an estimated 6,000 metric tons since it was commercially introduced in 1995.

They live underground, they eat wood, and every year they cause billions of dollars in damage to wooden buildings and other structures worldwide. Subterranean termites. "You can't see them. You can't find them. They are somewhere in the soil," says Nan-Yao Su, Ph.D., professor of Entomology at University of Florida, Fort Lauderdale Research and Education Center. Su invented an environmentally sound treatment for subterranean termites that can eliminate whole termite colonies without the use of conventional insecticides. It is effective against both the common subterranean termite and the Formosan "super termite."

Recognizing the value of Su's research, Dow AgroSciences LLC, Indianapolis, Ind., licensed this pest-control technology and developed the Sentricon® termite colony elimination system, available through authorized pest control operators.

The Sentricon system has found wide acceptance, and Dow AgroSciences has continued to support Su's work. "The Sentricon system represents one of University of Florida's most successful technology transfers," says John Byatt, Assistant Director for Life Sciences in the Office of Technology Licensing at University of Florida, Gainesville. "This is due not only to the commercial success of the technology, but also due to the good working relationship that has developed between the University and Dow AgroSciences."

This approach to termite control uses subterranean termites' own biology and behavior to wipe out a whole colony that is attacking a house or other structure. It is based on a simple concept of monitoring an area for termite activity, and then providing bait that the termites themselves carry back to their colony. This allows control of termites without the use of conventional insecticides.

In commercial use since the mid-1990s, the Sentricon system has protected more than two million structures, including the White House, the Statue of Liberty, Independence Hall, the Alamo, and houses in the French Quarter of New Orleans, as well as buildings throughout the world. In 2000, the Sentricon system won the U.S. government's Presidential Green Chemistry Challenge Award. Also, the bait used in the system was the first to be registered under the U.S. Environmental Protection Agency's Reduced Risk Pesticide Initiative.

"When I was in graduate school studying termites," says Su, "we found out that if you have a house infested with subterranean termites, what you're seeing in your house is really the tip of the iceberg. Underneath [the ground] is the nesting structure, which may stretch up to 300 feet away from your house." "So you spray a couple of hundred gallons of pesticide and pray, 'Please, termites, stay away from my house.' They will come back. If you spray the soil, you're treating a symptom, you're not treating the disease." "When I found this out, I said, 'This is ridiculous.' I thought maybe there is a way to kill the colony. If we can kill the colony, we have a real, final solution. My basic idea was to try to use the termite to do the job for us. These termites are social insects. The nest is a network of small nests, connected with tunnels. There are several million termites in there. And sometimes they exchange food with each other."

In a subterranean termite colony, the workers leave the nest and forage for food – wood or other sources of cellulose. They may travel as far as 300 feet underground in their search. When they find wood, they chew it up and bring it back to the nest to feed the other termites in the colony: soldiers and reproductive termites.

When a worker termite discovers a food source, it leaves a scent trail as it returns to the colony, so other workers can also find their way to the food.

"So, when I was a student, I thought if we can find some chemical that would not kill them right away when they come and eat, they wouldn't die right away, so they would go back and give the chemical to everybody else. Give them several weeks or several months, maybe that would be enough to spread the poison to the entire colony and wipe it out."

When Su came to the University of Florida in the late 1980s, he contacted companies asking if they had any compounds that would do what he wanted. Dow Chemical responded that it had a chemical, hexaflumuron, that might work. Hexaflumuron is not a typical insecticide. It is a chitin synthesis inhibitor. Chitin is the main component of the exoskeleton (skin) of insects. Hexaflumuron prevents proper formation of chitin. It affects insects, but it is not toxic to most other animals.

“Insects have to molt every now and then, to shed their skin so they can grow. This hexaflumuron keeps them from making a new skin. They will try to molt– the old skin is shedding, but the new skin is not coming out. It takes a while, but it kills them.”

Initially, Su put wooden stakes in the ground and monitored them periodically. When he found termites had started eating the stakes, he replaced the stakes with bait made from wood material laced with the hexaflumuron. “When I tried this, it actually worked. I found that I was able to wipe out quite a few colonies of Formosan and native termites.” Su refined the process, using slotted plastic cylinders placed in the ground to hold the wood and the bait material.

After the initial research, Dow AgroSciences licensed the technology and developed it into the Sentricon termite colony elimination system. Since then, Dow AgroSciences has supported Su’s research. Additional work has included an electronic monitoring technique for the in-ground stations, an above-ground bait station for use where termites are found inside a structure, and use of a more potent, faster-acting chitin inhibitor.

Twelve U.S. patents for Su’s inventions have been licensed to Dow AgroSciences, says Byatt. The university also applies for foreign patents in areas where subterranean termites are active and Dow AgroSciences markets termite control products.

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