RESEARCH in Progress

Coalition for Advanced Wood Structures
a university, industry, government partnership

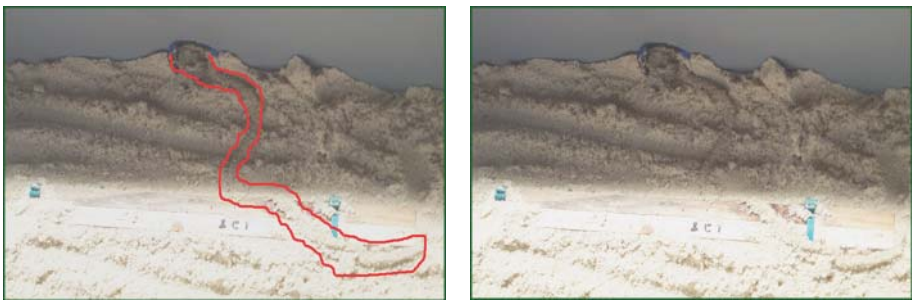
Positive Directed Movement of *Coptotermes formosanus* to Low-Level Electronic Fields

Coptotermes formosanus, the Formosan subterranean termite, has been found in eleven states since being introduced in the United States in the late 1950s and early 1960s. This termite is projected to spread throughout the southeastern states northward to approximately 35° N latitude (the border between Mississippi and Tennessee). The large colony size of *C. formosanus* (10 times larger than that of our native subterranean termites) and variant social structure result in an aggressive foraging and defensive behavior unseen in our native termites. The Formosan subterranean termite causes an estimated billion dollars annually in repairs and treatment, which accounts for a third of the total U.S. subterranean termite control and repair costs.

Background

Although electronics have been used in conjunction with other technologies to kill insects (e.g., "bug zappers"), no one has used low-level electronic fields to influence the behavior of subterranean termites. Field observations of natural populations of *C. formosanus* at the Lualualei Naval facility, Oahu, Hawaii, indicated that movements of this subterranean termite

Foraging shelter tubes (in red in the left photo) are directed toward the electrical source in a laboratory test unit (middle photo). Far right *C. formosanus* soldier.



Foraging shelter tubes (in red in the left photo) are patterns over a laboratory test unit without electrical sources (right photo).

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are directed toward certain wavelengths of energy. These observations form the basis for U.S. Patent Application No. 98-0727-16 that was recently allowed. It is anticipated that using the behavior studies that constitute this research, the attraction of subterranean termites to low-level electronic fields can be integrated in other technologies, such as bait stations, to create termite control strategies that are more effective than those currently in use.

Objectives

The objective of the current research is to define specific electronic frequencies and intensities that have a positive influence on the foraging behavior of *C. formosanus* and on the movements of our native subterranean termite, *Reticulitermes flavipes*. Results will be used to determine if the technology can be used in conjunction with termite baiting systems to direct foraging termites to specific sites where limited quantities of termiticides can be used to eliminate them.

Approach

C. formosanus behavior will be observed in controlled, replicated laboratory foraging situations while being subjected to various low-level frequencies and intensities of electronic energy. These tests will be conducted at the Mississippi State University Formosan Termite Field Research Facility located at the Mississippi Agricultural and Forestry Experiment Station, McNeill, Mississippi. The directed movement will be measured by length of foraging, area occupied, branching variances, and foraging rates. Formosan and native termites will be used in separate experiments that will be replicated to determine frequencies and intensities that significantly direct the termites to the electronic energy source. Results of laboratory tests will be used to determine electronic frequencies and intensities to use in later field tests.

Expected Outcomes

We anticipate that foraging of *C. formosanus* will be directed to a specific site where a low-intensity electronic field is being generated. We further anticipate that small battery-operated motors that generate the desired frequencies can be used to increase the dependability and efficacy of termite bait stations. Frequencies that influence termite movements may differ when testing our native species, *R. flavipes*, but similar results are expected. Successful implementation of this technology could significantly reduce the quantities of termiticides used as soil treatments under and around structures. Rather than periodically applying termiticides around the perimeter of structures, professional pest control firms may offer services such as ensuring that electric motors are operating properly, changing batteries at regular intervals, and maintaining appropriate levels of termiticides in the limited areas to which termites are attracted.

Timeline

Laboratory tests will begin in the fall of 2004 and continue throughout the spring, summer, and fall of 2005 using *C. formosanus* and *R. flavipes*. As results of laboratory tests are obtained, data will be evaluated to determine electronic frequencies and intensities to use in later field tests.

Cooperators

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