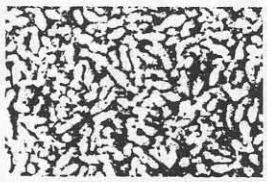


Formosan subterranean termite colonies can consist of millions of individual termite workers.

By J. Kenneth Grace, Ph.D.

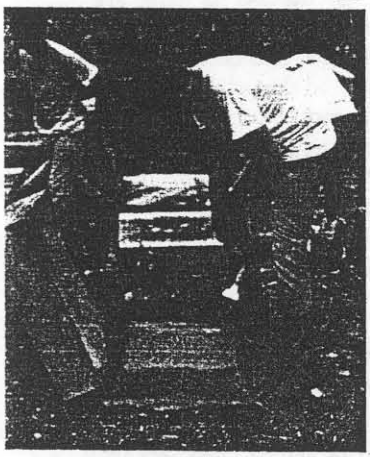
PEST CONTROL IN PARADISE

An update on possible termite control techniques.

When most people think of Hawaii, they imagine beaches, sunsets and palm trees swaying gently in the tropical breeze. However, as plantation agriculture has become less profitable in modern-day Hawaii, new housing developments have begun to pop up where pineapple and sugarcane grew just a few years ago. In fact, approximately 89 percent of the state's residents now live in areas classified as urban by the Census Bureau. Of course, Hawaii still has plenty of pineapples and beautiful tropical scenery, but managing population growth has become an important concern in the Aloha State.

As pest control operators (PCOs) all know, where there are people, there are also pests. Hawaii's position in the middle of the Pacific trade routes has resulted in the introduction of numerous insect pests, and the mild tropical climate of the islands has encouraged most of them to stay and flourish. Today, for example, Hawaii is home to about 20 species of introduced cockroaches and about 40 different ant species.

Two of the most damaging termites in the world, the West Indian (or powderpost) termite, *Cryptotermes brevis*, and the Formosan subterranean termite, *Coptotermes formosanus*, also call Hawaii home. The Formosan subterranean termite, in particular, is considered to be the most aggressive and damaging pest of wooden structures wherever it occurs in the tropics and subtropics.



Dr. Ken Grace and colleagues testing soil insecticides against the Formosan subterranean termite. Hawaii's tropical climate and many different soil types create difficult conditions for termiticides applications.

Now, consider the high cost of housing in Hawaii, where the median price of single-family homes is

Development of effective wood preservatives to use against the Formosan subterranean termite is an important part of Grace's research program. Most buildings in Hawaii are built with treated wood to help prevent termite infestation.

$350,000. It is certainly no surprise that more than 80 local pest control firms service the residents of the Aloha State, nor that urban entomology research at the University of Hawaii (UH) emphasizes termite biology and control.

Moreover, on an island state in the middle of the Pacific Ocean, potential groundwater contamination or other ecosystem damage by pests or ill-thought out pest control measures are also serious concerns. So, UH researchers have targeted the development of both effective and environmentally acceptable termite control techniques.

Since termite control research was initiated at UH in the 1950s and 1960s by Entomology Professors Henry Bess and Minoru Tamashiro, Hawaii has produced some distinguished alumni, including well-known termite researchers Nan-Yao Su of the University of Florida and Timothy Myles of the University of Toronto. Today, Dr. Ken Grace and Dr. Julian Yates direct urban pest management research and extension activities, respectively, at the UH.

Drywood termites are generally considered lesser

pests than the Formosan subterranean termite in Hawaii, but they also pose significant risks to structural lumber, utility poles and trees. Research on drywood termite control has focused on alternatives and enhancements to current structural fumigation practices, including the use of carbon dioxide and heat treatments.

Termite Proofing

Preservative treatments of susceptible lumber are important tools for protecting Hawaii's costly structures from both drywood and subterranean termites. UH research on the efficacy of wood preservatives provides the basis for local government and contractor specifications, and has led to the introduction of several new treated wood products in Hawaii.

Greater concentrations of preservatives are often required to protect wood in Hawaii's tropical environment than would be the case in the mainland United States. The potential for using naturally-resistant woods grown locally, or, like teak or Alaska cedar, shipped in for building construction is another active area of research.

Preservative-treated or naturally resistant wood is really the last line of defense against termites attacking a building, and should definitely be considered "termite resistant" rather than "termite proof." The newer wood preservatives do not immediately repel foraging termites, and will eventually sustain at least minimal feeding damage if attacked by several million voracious Formosan subterranean termites. Moreover, as PCOs know, but builders tend to forget, even concrete and steel buildings have plenty of wood and paper materials inside that termites will attack. Wood trim, carpet strips, books and even electrical insulation can sustain termite damage. Thus, soil insecticides or physical barriers are important to keep termites outside of the structure in the first place.

Currently, termiticide field tests are ongoing at UH field sites at six different locations on the islands of Oahu, Kauai, Maui and the Big Island of Hawaii. Insecticide-treated soils are weathered in the field beneath poured concrete slabs, then sampled annually by lifting the concrete slabs and removing soil cores. These soil cores are brought back to the laboratory and each of the more than 1,000 samples are individually bioassayed for termite penetration and mortality (see *Pest Control*, July 1993).

Although this procedure is more labor-intensive than traditional termiticide field tests, it is necessary to accommodate the fact that Formosan subterranean termites do not forage evenly throughout field sites. Rather, they confine their activity to certain areas and do not venture into others, which could result in a biased appraisal of soil insecticide efficacy.

In addition to experimental and commercial soil insecticides, natural products such as venom compounds produced by ants may also have potential as termite repellants. UH researchers are even exploring the possibility that ant species that tend to invade termite galleries in Hawaii could be useful as biological control agents. If their presence could be encouraged without creating a pest control problem themselves, these ants could theoretically, become an aggressive living barrier to foraging termites.

Road Blocks

Physical barriers to foraging subterranean termites are also subjects of ongoing UH research. The Basaltic Termite Barrier is a commercial product developed at UH and made up of gravel particles that are too large for termites to move, but too small and tightly packed for them to squeeze between.

This physical barrier is now used extensively in new buildings (and even utility poles) in Hawaii, and there is interest in increased use of remedial termite control around existing structures. A fine steel mesh, developed in Australia, also looks promising as a way to "build termites out."

Dr. Ken Grace is an associate professor of entomology at the University of Hawaii, and a frequent speaker to pest control associations and technical conferences. His research is concerned with the biology and control of urban insects, particularly the Formosan subterranean termite.

The ultimate barrier, of course, is an effective quarantine program. Recent surveys of the genetic and chemical characteristics of Hawaiian termite populations have helped to develop methods that will be used to map the patterns of termite distribution in the Pacific. Such population markers would be very useful in quarantine efforts to limit the further distribution of these severe pests.

Bait Technology

Finally, in Hawaii, as well as elsewhere, new "baiting" techniques to actually reduce or eliminate termite colony populations within a given area are the subjects of research and development efforts. Both laboratory and field studies are investigating the best methods of delivering slow-acting insecticides, insect hormone mimics, or insect pathogens to foraging Formosan subterranean termites. Insect pathogens, such as fungi, that have the potential to be transmitted throughout the termite nest and trigger a lethal disease epidemic are being studied at UH, since these might be ideal bait agents.

If research efforts at the UH and other university programs are on target, PCOs and the urban public can look forward to both improvements in current termite control technology, and to new baiting and "trap and treat" techniques. These latter approaches will certainly require consumer education in order to be accepted, and a shift on the part of termite control technicians from one-shot application to long-term monitoring of termite activity around buildings. However, in the very near future, baits, soil insecticides, physical barriers and preservative-treated or naturally resistant building materials will likely be used together for integrated termite management programs. ■