



MUSHROOMS AS AN INSECT CONTROL

by Bernadell Larson, HCMG

Mushrooms and insects share a close and ancient relationship. Last month we discussed using mushrooms as bio-remediators and we all know about the culinary benefits of mushrooms. This article will discuss using mushrooms as an insect control.

The mushroom *TERMITOMYCES* is well known to native peoples in Africa as a delicious food source cultivated by “white ants”, also known as termites. They live in its mycelium where they produce a honeycomb like structure from which mushrooms later grow. There is an interspecies symbiosis and the termites are dependent on these fungi. Insects, fungi, and microbes have coevolved successfully over great periods of time without wiping each other out, and all have much to teach us.



Several big corporations, such as Monsanto and Dow, had an idea to develop biological controls using fungal spores to kill termites and other insect pests. Their premise was that fungi use spores to infect insects, which then become launching pads for dispensing more spores. But there was a problem. The natural world is excellent at sensing danger, communicating about it, avoiding it, and making adaptations. Commercially designed bait traps house lethal spores that would kill insects coming into contact with them. But, the insects sense the danger and instead of going into the bait traps, they head the other way.

Termitomyces medius with the termite nest in Ouagadougou, Burkina Faso* ©JHP

A mycologist, Paul Stamets, needed to rid his house of carpenter ants but did not want to use commercial pesticides. He started researching whether there might be fungi that are nontoxic to humans and other mammals but would target specific insects such as carpenter ants. He became aware of the ineffectiveness of commercial applications of biological control and felt that the key was to find the precise fungal species that has evolved as a parasite to a specific insect. Simply, the mushroom has developed chemical compounds that attract the insect and entice the insect into eating the mycelium in its pre-spore producing phase. He focused on species that delay sporulation (production of spores). In his experiment, he put out about 50 kernels of rice that contained mycelium prior to sporulation. The ants took away all the kernels of rice and one week later there were no carpenter ants in the house. As it turns out some fungi, prior to sporulation, develop properties attractive to a specific insect species. The fungi entice the insects to ingest the mycelium and take some back to the nest for the rest of the colony. When sporulation occurs, the entire insect colony is killed.

Termitomyces reticuloatus with termite nest in Ouagadougou, Burkina Faso* ©JHP

Research has also shown that beneficial insects, such as Phorid flies, can be attracted to certain mycelia. Phorid flies are a known predator of fireants. Mycelia emit a fragrance that can attract Phorid flies from long distances. Placing the mycelia close to fire ant colonies can direct the Phorid flies to the colony and the fly will exterminate the colony.



There are many more examples of pairings of insects and mushrooms that are being researched. The Stamets group has a series of patent pending technologies that have been tested at Texas A & M University. To date, the tests have shown that their techniques are 100% effective against Formosan termites and eastern subterranean termites, and 98% effective against fire ants. In the future we may have other choices for dealing with insect infestations that allow us to help keep nature in balance.