

Low Resource Control of Leaf Cutter Ants

Jason Weigner



Figure 15. Leaf cutter ant with plant fragment. *Source:* Jason Weigner

Few things are as devastating as surveying your full garden one day only to wake up the following morning to find every leaf stripped from your crops with nothing but a trail of a few semi-circular fragments of your precious plants leading away from your garden. I am not sure there is any other creature that I find incredibly fascinating and also loathe as much as the leaf cutter ant (*Atta* and *Acromyrmex* species; Figure 15).

Biology

The first step to controlling leaf cutter ants is to understand their biology. They are not your average ant and require different control methods than most other ants. There are around 50 different *Atta* and *Acromyrmex* species known as leaf-cutter ants native to the tropics and subtropics of the Americas. They are named for their habit of cutting leaves into manageable slices to carry back to their colonies (Figure 16). This activity can be devastating to agriculture because their colonies may contain up to 10 million ants. One may assume that they are eating the leaves but in fact they are fungus gardeners, feeding the leaves they collect to their carefully

manicured fungus gardens (Figure 17) below ground. While there are several leaf cutter ant species, as far as I am aware, they all cultivate the same fungi *Leucoagaricus gongylophorus*. The ants feed on the fungus. This is why traditional ant baits that depend on the ant consuming the bait are mostly ineffective. Chemical control methods must instead target the fungal gardens or be toxic enough on contact to kill.

If you spend a little bit of time observing leaf cutter ants, you will be able to easily identify them from other ants. They typically come in varying shades of red, with a few species appearing more of a chocolate brown color. They have three (*Atta* sp.)

to four (*Acromyrmex* sp.) pairs of spines protruding from their thorax, a feature that makes them stand out from most other ant species in their native range. The most tell-tale sign is of course the carrying of leaves to their colonies.

5I never would have noticed them as leaf cutter ants if it was not for my 8-year-old budding entomologist who showed me the miniature colonies. I mistook them for other ant species until I looked close enough to see they were hauling smaller leaf cuttings and had the classic pile of rejected organic matter outside of the colony, just in miniature.

The sheer size of a mature leaf cutter ant colony, spanning up to 600 m² below ground, is another reason they are extremely hard to control. Once mature, in most cases, control will look like striking a balance with the colony rather than eradicating it. Even chemical controls seem to only temporarily set a colony back rather than eradicate it. If you are able to find a colony in an early stage of development you have a better

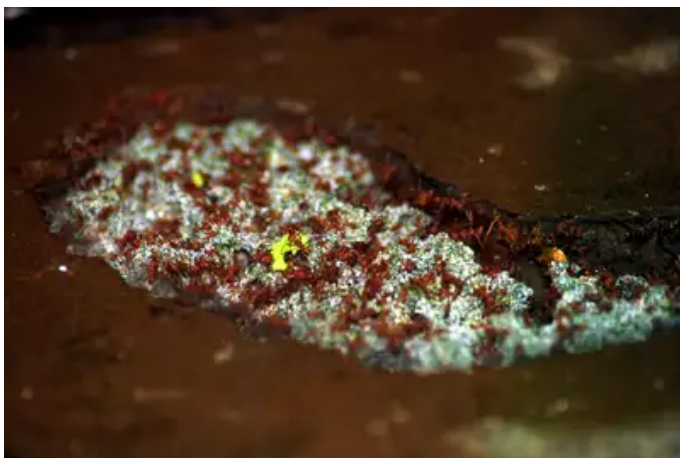


Figure 17. A leaf cutter ant fungus garden. *Source:* Jason Weigner

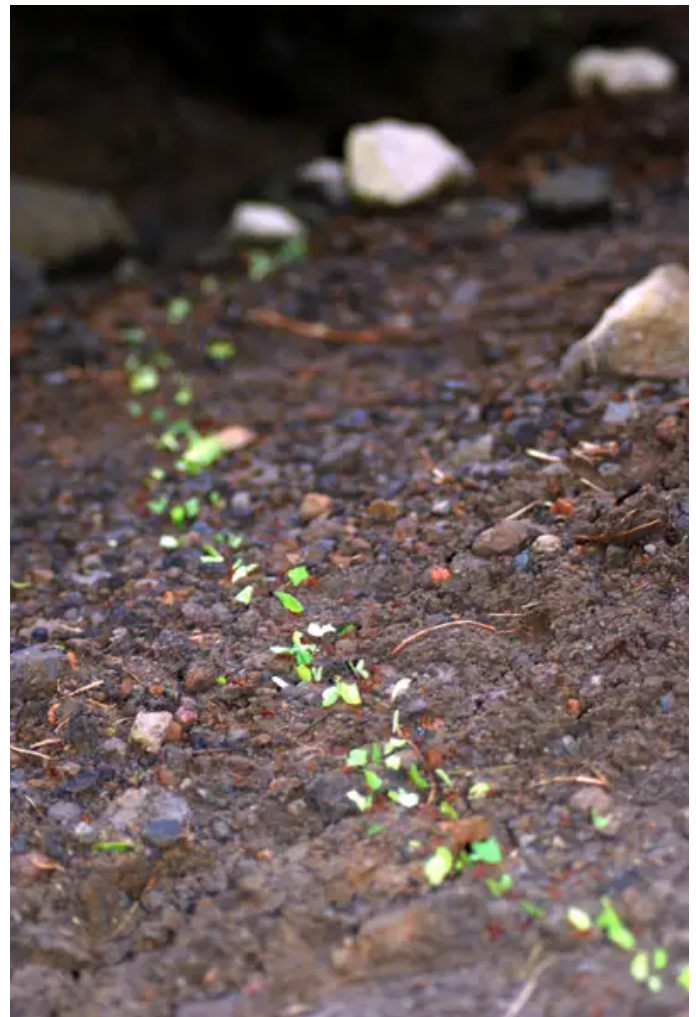


Figure 16. A long column of leaf cutter ants between the plants they are harvesting and their colony. *Source:* Jason Weigner

chance at eradication. When new queens strike out from their home to form a new colony, they carry a small fungal culture with them to start their own fungi gardens. The initial pioneer colony can be extremely hard to find because the workers start out much smaller than workers in a mature colony.⁵ The middle phase is large and easily identifiable as a leaf cutter ant colony however there are only one to two entrances to the colony. Once a colony has more than two entrances, it is generally too large to eradicate easily.

Defensive or preventative measures

Mulch

Leaf cutter ants clear highways between their colony and leaf collecting areas, removing any debris in their trail. Knowing their desire for a clean path to your plants, keeping your soil covered with thick, fibrous mulch will often deter them. Woodchips seem to work best. Grass mulch is not as effective as it mats down quickly, making it easier for the ants to cross. The method requires frequent reapplication as the mulch breaks down, to keep the ants from finding a path to your plants.

Cotton fiber



Figure 18. Cotton fiber around the stem of plants in the field. Source: Jason Weigner

The hook shape of an ant's foot makes the fibers of cotton or other fibrous materials challenging to cross. Leaf cutter colonies thrive off of speed and efficiency. Trying to cross cotton slows ants down too much to make it worth the effort. I wrap a band of cotton fiber around the stem or trunk of plants several inches above the ground (Figure 18). This is generally used for perennials such as fruit trees but it can also be used to protect annuals in a small-scale garden. Keeping the cotton off the ground helps the barrier to last longer and reduces the risk of debris creating a bridge across the cotton.

Other natural fibers also work, such as the seed pod fibers of the silk floss trees (*Ceiba* sp.) that are often found in the same range as leaf cutter ants. I have found a combination of mulch and cotton barriers to be one of the most effective defenses against the ants.

Moats

One of the first defensive measures I tried in Bolivia was clay rings designed to hold water and create a moat around your plant. While somewhat effective, they are not practical or cost effective on a large scale. They constantly need to be refilled and the ants will sometimes make tunnels under them or build bridges over them. They can also be a breeding ground for mosquitoes. Adding some soap to the water can help discourage bridge building and mosquito breeding. Moats are best suited for protection of a few precious plants.

Feed the enemy

One method of protecting your crops is to feed the colony rather than fight it. Keeping a compost pile of kitchen scraps near your garden will often distract a leaf cutter ant colony from your crop for a time. Planting a trap crop is another way of distracting them from your garden. Moringa (*Moringa oleifera*) and cranberry hibiscus (*Hibiscus acetosella*) are two plants that seem to be irresistible to the ant species in my area.

Neem oil

Neem (*Azadirachta indica*) oil effectively repels leaf cutter ants from crops. The only downside is that it needs to be frequently applied, especially after rain, and if you miss an application, the leaf cutter ants may make quick work of your crop. Interestingly, leaf cutter ants love to defoliate young neem trees but won't touch mature trees, suggesting that the potency of neem against insects is influenced by the age of the trees (Mondali *et al.*, 2009). I have heard that some essential oils can be used to repel leaf cutter ants but I have yet to test them due to my success with neem oil.

Healthy Ecosystems

I recently moved into an intact native forest. About 30 m from one of my gardens is a massive leaf cutter ant colony. During the rainy season, I have no leaf cutter damage in my garden. During the dry season it is more work to keep the ants out but it is nothing compared to when I lived in more deforested areas. In disturbed areas where human habitat or farmland has replaced local ecosystems, the leaf cutter ant pressure is year-round and intense. Without the density and diversity of a healthy ecosystem they turn to decimating gardens and landscaping. The ants will circumvent many defensive measures when they are desperate for organic matter. Maintaining or restoring local ecosystems will greatly reduce the agricultural damage caused by leaf cutter ants as well as provide many other benefits, such as native pollinators and habitat for predators of pests. Farming with a great density and diversity of crops will also help reduce the ant pressure on any one crop.

Diatomaceous earth and wood ash

Diatomaceous earth (DE) has become popular as a pest control option. It works by slicing through the protective armor of insects, causing them to dehydrate and die. As an offensive measure, it would likely take a large amount of DE to inflict significant damage on a large colony. One can also use DE as a defensive measure around plants similarly to mulch and cotton. I would, however, use this with caution as inhaling DE can be harmful to one's lungs, and there is still some debate on the long-term health of soil from frequent use of DE.

Wood ash similarly can irritate ants and can create a barrier the ants do not wish to cross. However, we should use ash in moderation as too much can negatively impact soil and plant health.

Offensive or suppressive measures

Chemical control

Many of the pesticides readily available for leaf cutter ants state in the instructions that they need to be frequently applied due to the fact it is very hard to kill a mature colony. Most pesticides will temporarily knock the population back but not cause total colony collapse in a mature colony. Colonies will often learn to avoid baits once they realize they are toxic to their fungus garden or the colony. While one of the easiest ways to control leaf cutter ants, frequent application of chemicals means more financial inputs for the farmer and potential buildup of toxic chemicals in the environment with possible long-term consequences for human and ecological health.

Boiling Water

Loosening the soil and pouring water into a pioneer phase colony is usually enough to destroy it. One can often eradicate a second phase colony by pouring a large pot of water down its main entrance two days in a row. If this doesn't cause direct collapse, often we inflict enough damage to encourage predator species such as other ants to raid the colony and finish it off. Alternatively, this much damage can encourage the colony to move to a new location which can then be easily eradicated with one or more pots of boiling water since the colony is not very deep yet. The tricky side of this technique is that mature colonies will create tunnels up to 80 m from the main colony to satellite colonies that will appear as medium phase colonies. If the colony seems to return repeatedly no matter how many times you pour boiling water on it, odds are it is a satellite of a much larger colony.

Jack bean and sesame plants

Fungus gardens are the lifeblood of leaf cutter ant colonies. If you are able to kill their fungus garden then the colony will collapse. There are a number of plants with natural fungicidal properties. Two that have been shown effective against *Leucoagaricus gongylophorus* are jack bean (*Canavalia ensiformis*) and sesame (*Sesamum indicum*) plant leaves (Mullenax, 1979; Pagnocca *et al.*, 1990). This is most effective during late dry season when the colony is most desperate for plant matter. Jack bean and sesame plants can be cut in the evening and dropped along leaf cutter ant trails to encourage them to collect them. It is not recommended to try this during rainy season because they are less likely to take it or if they do, may only take a little and quickly learn it is toxic to their fungus. The goal is to get them to take a large number of the leaves to their fungus before they learn it is toxic. Leaf cutter

ants have the ability to learn what is toxic to their fungus and will never touch it again. I have successfully knocked back several colonies with jack bean but only once caused complete collapse. You will know if you effectively damaged their fungus colony if within a few days you notice the ants piling up pieces of the gray spongy mycelium of their damaged fungus garden. The ants quickly try to remove the damaged fungi in hopes of saving their garden.

Dry rice and crushed fish bones.

I recently learned of local control of leaf cutter ants from Renato Reyes, my friend who also works in sustainable agriculture in the area. He told me how his grandmother would put dry rice or broken dry fish bones around a leaf cutter ant colony. In the humidity below ground they become toxic to the ant colony. I have yet to try this but he has had some success with this method. My suspicion is that the rice and fish bones quickly become host to other bacteria or fungi that is toxic to the ants' fungus garden.

Natural predators

Cordyceps fungi

Cordyceps fungi are a type of fungus that parasitizes and takes over the body of various insect species. It has also been called the "Zombie Fungus" because it takes over their brain and controls their behavior in favor of the fungus' needs. Research has been done to use their spores to control certain insect pests. A perk of this approach is that the fungi tend to be species specific, meaning if you find a fungus that attacks your particular pest, you don't have to worry about it also attacking beneficial species in the area. I am unaware of Cordyceps spores being widely available yet but if you are fortunate enough to have access to spores of a species that attacks leaf cutters, this could be a very effective control. You may be able to grow your own leaf cutter preying Cordyceps if you are fortunate enough to stumble on a dead leaf cutter ant that has strange finger-like growth emerging from its body. You could collect live ants and intentionally expose them to the contaminated ant in an enclosure to get enough of the fungus to spread it to the colony.

Phorid flies

If you watch a trail of leaf cutter ants from a mature colony, you may notice tiny ants riding on the leaves carried by the larger ants. The small ants help protect the ant column against attacks from above by Phorid flies, one of the main parasites of leaf cutter ants. While some studies have shown there is potential for the flies to be reared and used as a biological control, I am unaware of these flies being

commercially available. If they are, it is unlikely to be a viable option for rural small-scale farmers unless someone finds an easy way to raise them in a small farm context.

Armadillos and ant eaters

While many consider armadillos pests due to their tendency to dig up gardens, the reason they dig is that they are in search of insects and are very effective at keeping pest insects under control, including ants.

Anteaters as their name suggests, feed mostly on ants, making them an excellent natural control for leaf cutter ants. They will not completely destroy an ant colony because they want to keep coming back for meals, but they will help keep ant numbers down. Both animals should be welcome on the farm as ant-control helpers.

Reptiles and amphibians

A number of amphibians feed on leaf cutter ants. In my experience, granulated toads (*Rhinella* spp.) are especially fond of leaf cutter ants. Narrow-mouth frogs also love termites and ants (Figure 19). I have on occasion collected large numbers of granulated toads and placed them in the garden. The sudden increase of predator pressure seemed to cause ant colonies to relocate their efforts elsewhere for a time.

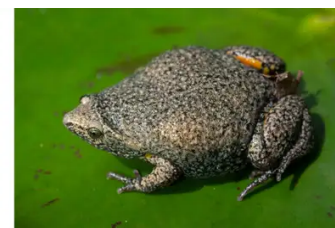
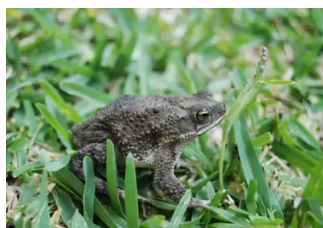


Figure 19. Chaco granulated toad (left) and narrow-mouth frog (right) both consume leaf cutter ants. *Source:* Jason Weigner

Two unusual, giant worm-like creatures known as Amphisbaenas (Reptile) and Cecelian (Amphibians) are avid ant feeders (Figure 20). They live underground near or in ant colonies, helping to keep their numbers down by feeding on their eggs and larvae. They are rarely seen above ground but when they are spotted they often strike fear into the hearts of those that see them due to their snake or worm-like appearance. Fortunately, they pose no threat to humans and are beneficial to the farmer and should be a welcome sight in the garden.

Conclusion

Like most issues in agriculture, there is not one easy solution to the challenge of living with leaf cutter ants. While it is possible to eradicate smaller colonies, in most cases you will have to find a mix of preventative and suppressive techniques that work in your context and on your species of leaf cutters to mitigate the damage caused to your crops.



Figure 20. Amphisbaena (left) and caecilian (right) predators of leaf cutter ants. *Source:* Jason Weigner

The challenge tends to be greatest when you are first starting out your agriculture projects but in time, if you work towards a healthy and diverse ecosystem, the damage diminishes and the ants seem to fade into the local ecosystem. Defending my plants with cotton, mulch, and neem oil are my regular methods these days. I will aggressively attack younger colonies that are in close proximity to my

gardens but I have found directly fighting larger colonies almost a lost cause.

It is often hard to find good information on leaf cutter ant control but I know there are many unique local control methods throughout the American Tropics. I would love to see this information gathered so it can be used by others. If you have a technique that works in your context, please share it with the ECHO Community.

References

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