

Biological Control of Imported Fire Ants

In 1998, two natural enemies of fire ants were introduced in Alabama. These organisms should provide a natural, biological control of fire ants. For the next few years, these natural enemies will be studied on an experimental basis. If they are successful at controlling imported fire ants, they can then be distributed throughout the state. It is hoped that eventually the overall number of fire ants in Alabama can be reduced through biological control methods. While we will never be able to eradicate imported fire ants, we can make them easier to live with.

This publication provides information about a group of decapitating flies, called phorid flies (*Pseudacteon* spp.), that parasitize imported fire ants and also provides information about a small microsporidian, *Thelohania solenopsae*, that causes the fire ant queen to lay fewer eggs.

Background

Imported fire ants were accidentally brought to the U.S. by ships coming into the port of Mobile. The black imported fire ant, *Solenopsis richteri*, arrived in 1918 from southern Brazil or northern Argentina. Between 1930 and 1940, a second species, the red imported fire ant, entered the U.S. through Mobile. The red imported fire ant, *Solenopsis invicta*, is native to Argentina and to the Paraguay River drainage in Paraguay and Brazil. Several native fire ant species were already in the South, so little attention was paid to these new ones. However, by the 1950s, it was obvious that the imported fire ants occurred in much higher densities than the

native fire ants and that the area infested with imported fire ants was increasing at an alarming rate. The imported fire ants, particularly the red ones, were more competitive than other ant species and quickly displaced them. Today, imported fire ants are present throughout Alabama. Most of these ants are the red imported fire ant or a hybrid between the red and the black species.

In South America, the density of red and black imported fire ants is about 20 percent of what it is in the U.S. This population difference is attributed primarily to natural enemies that are in South America but not in the United States. When the imported fire ants arrived in the U.S., they left their natural enemies behind. The absence of biological control allowed the imported fire ants to be very successful competitors. We hope that the natural enemies discussed here will help make the imported fire ants less competitive in the United States so that their overall population will decrease.

The Decapitating Flies

In June of 1998, a parasitic fly called *Pseudacteon tricuspis* was released in Talladega County, Alabama (Figure 1). This fly, originally from Brazil, was imported by the USDA Agricultural Research Service. Extensive testing in South America and in quarantine facilities at the USDA-ARS, CMAVE lab in Florida showed that this species is not harmful to humans, mammals, or other insects.

Pseudacteon tricuspis, also called phorid fly, is one of eighteen species of decapitating flies that attack fire ants in South America. The flies are small—



Figure 1. County Agent Henry Dorough (right) receives training from Dr. Sanford Porter on how to release and sample for decapitating flies in Talladega County.



Figure 2. Decapitating fly attacking a fire ant worker

barely visible with the naked eye. Flies attack worker ants during the day as the ants look for food outside the nest. The female decapitating fly attacks an ant and lays her eggs one at a time on the ant (Figure 2). When the parasite egg hatches, the tiny larva burrows into the head of the fire ant, where it feeds on the ant's internal tissues (Figure 3). When the larva is ready to begin turning into a fly, it releases a chemical that causes the fire ant's head to fall off (Figure 4). The new fly emerges from the ant's head, and the cycle begins again (Figure 5).



Figure 3. A full-grown decapitating fly larva dissected from a fire ant head



Figure 4. A decapitated fire ant

Figure 5. Decapitating fly emerging from a fire ant head



In South America, decapitating flies directly parasitize approximately 1 percent of fire ant workers. However, the flies have their greatest effect by terrorizing the fire ant workers and preventing them from going out for food during the day. If a fire ant is out on a food trail and perceives that a decapitating fly is about, the ant will freeze, or, if possible, it will retreat to the nest. The reduced foraging makes the fire ant less competitive and makes more food available for other predators and scavengers.

Different species of decapitating flies specialize in different sizes of fire ant workers. Entomologists envision that a number of different species of decapitating flies can be introduced, thus maximizing their effectiveness against all sizes of fire ants.

The Microsporidian Pathogen

The microsporidian *Thelobania solenopsae* is a microbial pathogen (disease-causing agent). It infects all growth stages of the fire ant but has its most debilitating effect on the fire ant queen. The pathogen grows in the queen's ovaries and reduces her egg production. It appears that an infected queen will die prematurely instead of living out her normal life-span of 5 to 7 years.

The microsporidian is spread by spores (Figure 6) and can be spread from the queen to her eggs. The spores germinate and begin to grow inside the developing fire ant. The pathogen is concentrated in infected fat bodies called cysts (Figure 7).

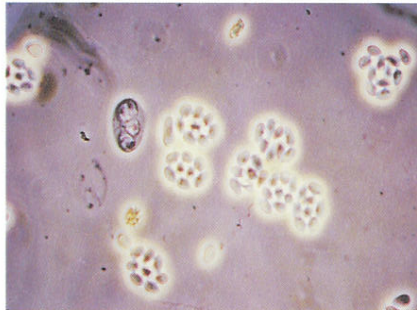


Figure 6. Microscopic view of *Thelobania solenopsae* spores



Figure 7. Fire ant with infected fat bodies (cysts)

This pathogen was first discovered in South America in the 1970s. It was then discovered in fire ant colonies in Florida in 1996, and since then, it has been found in two other states. The pathogen infects fire ants only and is not harmful to humans, mammals, or other insects.

Thelobania solenopsae was released in Macon County, with the cooperation of USDA-ARS, CMAVE (Figure 8). Immature fire ants that had been infected with the pathogen were placed in existing fire ant colonies. These colonies, and those surrounding, are being monitored to determine whether the pathogen has become established.



Figure 8. Infected brood (in small plastic dish) is introduced into fire ant mounds in Macon County

The Future

At the time of writing, Extension entomologists do not know whether these two natural enemies can survive and reproduce in Alabama. If they do well, they have the potential to substantially reduce, but not eradicate, imported fire ants.



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