

TOPIC: Invasive Species

Area-wide Suppression of Invasive Fire Ant Populations

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The fire ants, *Solenopsis invicta* and *Solenopsis richteri*, were inadvertently introduced into the United States in the early 1900s and currently inhabit over 150 million ha in Puerto Rico and twelve southern states from Texas to Virginia. Imported fire ants have also become established in isolated sites in California, Arizona, New Mexico, and Maryland. They have also widened their invasive character by accidental importation and establishment in Australia and Taiwan.

Fire ant colonies (single queen) can contain up to 250,000 workers and reach infestation rates of over 130 mounds per hectare. More recently, multiple-queen colonies have proliferated in the southern states with even greater population densities. The fire ant's large numbers, resource requirements, aggressive behavior, and potent sting have resulted in many negative interactions with man and the ecosystem.

Many ground inhabiting arthropods and other small animals are destroyed, yields of several agricultural crops are reduced, and ca. 1% of the population is at risk from hypersensitivity to fire ant venom. The population densities in the US are 5-10 times higher than in South America, most likely due to their escape from natural enemies.

Chemical Control:

Several commercial insecticide baits have been developed for fire ant control; however, they are costly, many are not registered for large acreage, and most have adverse environmental impact when used in environmentally sensitive locations.

Biological Control:

At least 22 species of parasitic *Pseudacteon* flies have been found attacking fire ants in South America. These flies have been shown to stop fire ant foraging and shift the local competitive balance to other ant species, thus limiting resources to the fire ant. There are also two Protozoan pathogens, *Thelohania solenopsae*, and *Vairimorpha invictae* that naturally infect *S. invicta* in South America. Both have been shown to cause reductions of field populations, and *T. solenopsae* increases the susceptibility of fire ants to bait insecticide treatments.

Field host range studies conducted in Argentina indicated that both *T. solenopsae* and *V. invictae* were specific to *Solenopsis* ants. A combination of chemical and biologically-based control could form the basis of an integrated management system to suppress fire ant populations over large areas, while possibly requiring less chemical control.

Area-wide Suppression of Fire Ant Populations in Pastures:

Project proposal was funded by USDA/ARS Headquarters to demonstrate control of fire ant populations over large areas using integrated management methods. The objectives of this project are to: (1) maintain low fire ant populations using a combination of self-sustaining fire ant biological control agents (the phorid fly, *P. tricuspis*, and the pathogen, *T. solenopsae*) and bait toxicants, (2) assess the economic impact associated with fire ants and the benefits of area-wide fire ant control, (3) assess the environmental impact of fire ants and the effects of their control on native ant fauna, (4) develop educational materials for the public on fire ants and their control, and (5) a research component that focuses on new methodologies that can enhance bait and/or biocontrol effectiveness.

The Project team includes USDA-ARS & APHIS personnel and state cooperators from Texas A&M University, Oklahoma State University, Clemson University, South Carolina, and the University of Florida. Control and treatment demonstration sites (120 ha + periphery) were set up in each of five states (Florida, Oklahoma, Texas, South Carolina, and Mississippi).

The control site had bait applications, but no biocontrol around the periphery. The treatment site had bait applications plus biocontrol agents (phorid flies and *T. solenopsae*) were applied to the periphery around the bait treated areas, to prevent, limit, or slow reinfestation of the chemically treated area. Insecticide applications consisted of a combination of hydramethylnon and methoprene baits, chosen because they were registered for use in pastures and have little impact on non-target fauna.

After 3.5 years phorid fly parasites have been successfully established at the demonstration sites. The disease *T. solenopsae* is established in all sites except Mississippi, where the disease has been recently detected. Fire ant populations have been reduced by 85-99% in the treatment demonstration sites. An agricultural economist has determined the overall economic loss due to fire ants (control & damage) to be over a billion USD in Texas alone.

Environmental assessment has demonstrated that bait toxicants do affect non-target ant species that would otherwise play a role in decreasing fire ant reinfestation rates. Educational outreach activities have resulted in informative brochures, the establishment of a programme website (<http://www.ars.usda.gov/fireant/>), videos, and general information on fire ants. The research component has responded with additional biocontrol organisms, better detection methods, and more specific baits.

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