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# IMPORTED FIRE ANT: HISTORY, IMPACT AND MANAGEMENT

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## HISTORY

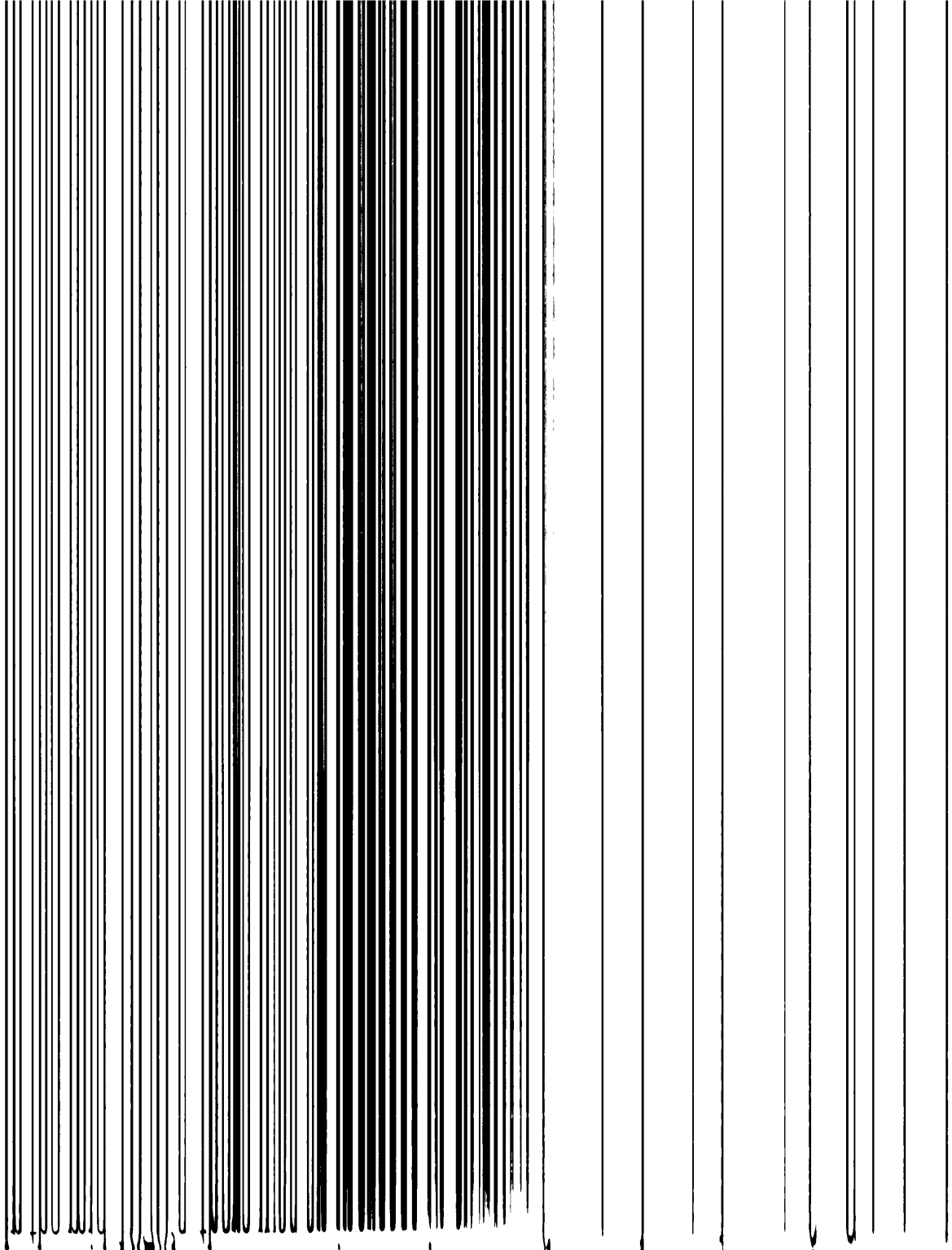
The red imported fire ant, *Solenopsis invicta* Buren, was probably introduced in the port of Mobile, AL around 1930's. The first collections were obtained in Mobile and the 1st identification was made as *S. saevissima* var. *richteri* in 1930. In 1930, the infestation was limited to the Mobile area. The red imported fire ant continued to spread by means of mating flights, the movement of colonies and newly mated queens on flood waters, movement of nursery stock, bee hives, construction equipment, railroad cars and open truck beds. In 1949, a survey found 14 Mississippi, 12 Alabama and 2 Florida counties infested and then in 1953, a four year survey by the USDA showed that this ant had spread to 102 counties in 10 states. The increased range of the red imported fire ant is now over 321 million acres in southern U.S. and Puerto Rico. The principal areas of expansion include Oklahoma, Arkansas, Tennessee, Texas, North Carolina, and Virginia with recent infestations occurring in California, New Mexico, and Arizona.

## IMPACT

The impact of *S. invicta* is extensive and occurs on human health, crops, livestock, wildlife, biodiversity, utilities, recreation, tourism, transportation (roadways), and environmental quality. The most noticeable problem caused by fire ants is stinging of humans which in some cases cause serious injuries and can even result in death. *S. invicta* is also responsible for damage to farm products such as soybeans, okra, potatoes, corn, and young citrus trees. It also impacts on the nursery industry because of the federal quarantine requirement that all nursery stock and grass sod moving out of the fire ant infested areas be treated with approved insecticides. In addition, *S. invicta* is a threat to domestic animals causing economic losses to farmers and can cause an overall reduction in biodiversity in many areas. The overall impact from *S. invicta* infestations across the southern U.S. is over $1 billion dollars annually.

## MANAGEMENT

There are several reasons why *S. invicta* are difficult to control. For example, they have large populations, produce large numbers of reproductives, lack natural enemies, have little competition, are very aggressive and sting, and thrive in a wide range of habitats. During the World War II years (1940-1947) all control programs for *S. invicta* were halted and this ant continued to spread. In 1948, Mississippi, Alabama, & Louisiana appropriated funds for control programs using 5% chlordane dust. In 1957, the U.S. Congress appropriated $2.4 million to USDA to initiate a federal/state cooperative control and eradication program. In November, 1957, heptachlor and dieldrin were applied by air and ground equipment and within one year, environmental concerns began because of high mortality seen in birds. During the 1960's, mirex bait was developed by the USDA-ARS and in 1962, mirex bait replaced heptachlor as the treatment for *S. invicta*. Mirex was applied from 1962-1978 using converted World War II



In the mid-1970's, there was an increase in surveys for natural control agents for *S. invicta* in South America. Self-sustaining biological control agents could become a major factor in providing long term suppression of fire ant populations, something that chemicals do not offer. Also, fire ant densities are more than 5 times higher in the U.S. than in their native South America and the only differences appear to be the natural enemies in South America. With more than 30 natural enemies of fire ants having been discovered in South America, several investigators began concentrating their research efforts towards searching for potential biological control agents for use against *S. invicta*.

Several biological control agents are presently being studied such as the parasitic ant, *Solenopsis daguerrei,* decapitating phorid flies, *Pseudacteon tricuspis*, *P. curvatus*, and *P. littoralis* , and

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aircraft over more than 140 million acres. Total treatment cost was 30 cents per acre which included the bait and application. In the late 1960's, mirex residues were detected in nontarget organisms and all registrations of mirex were cancelled in 1978. The other reasons for cancellation were persistence in the environment, accumulation in nontarget organisms, toxicity to estuarine organisms and its potential as a carcinogen. Following the ban of mirex, political pressure on Congress for finding a replacement was intense, thus, Congress appropriated funds for the USDA-ARS to begin an intensified search for new chemicals for use in fire ant baits. This allowed an increase in the number of chemicals evaluated for *S. invicta* baits by USDA-ARS. During 1958-1976 (18years), 2,678 chemicals were evaluated, however, from 1977-1988 (11 years), 4,432 products were tested. The historical development of chemicals for fire ant control is as follows:

-1937 calcium cyanide dust
-1947 chlordane dust
-1957 heptachlor and dieldrin granulars
-1962 - 1978 mirex
-1980's hydramethylnon, fenoxycarb, and abamectin
-1990's pyriproxyfen, methoprene, and spinosad
-2000's fipronil

Baits for *S. invicta* consists of the following components, (1) attractants (oils, sugars, proteins, and insects), (2) toxicants (metabolic inhibitors—i.e. hydramethylnon; IGR's—i.e. fenoxycarb; reproductive inhibitors—i.e. abamectin; chitin synthesis inhibitors—i. e. teflubenzuron), and (3) carriers—(corn grits, sawdust, clay or mineral granules, and insects). The criteria needed for optimum chemical use in *S. invicta* baits are:

-Delayed Toxicity
-Effective over wide dosage range
-Formulates with food and carriers easily
-Not repellent to ants
-Environmentally safe

The present control of *S. invicta* consists mainly of using chemicals. The chemical control options are the use of baits, contact insecticides (sprays, drenches, dusts, granules, etc.) and combinations of these two. Present-day fire ant baits generally give 80-95% control within 2 wks – 3 months and last 4 – 12 months after application. Most baits are applied at 1 – 1.5 lbs per acre and the costs of the bait products range from about $7.00 - $12.00 per lb.

In the mid-1970's, there was an increase in surveys for natural control agents for *S. invicta* in South America. Self-sustaining biological control agents could become a major factor in providing long term suppression of fire ant populations, something that chemicals do not offer. Also, fire ant densities are more than 5 times higher in the U.S. than in their native South America and the only differences appear to be the natural enemies in South America. With more than 30 natural enemies of fire ants having been discovered in South America, several investigators began concentrating their research efforts towards searching for potential biological control agents for use against *S. invicta.*

Several biological control agents are presently being studied such as the parasitic ant, *Solenopsis daguerrei,* decapitating phorid flies, *Pseudacteon tricuspis*, *P. curvatus*, and *P. littoralis* , and

protozoans, *Thelohania solenopsae, Vairimorpha invictae,* and *Mattesia* sp. In addition, studies have also been conducted with the fungus, *Beauveria bassiana.*

SUMMARY

The red imported fire ant, *S. invicta*, infest over 321 million acres in the U.S., and are an increasing problem having a considerable impact. Chemicals are still the most effective method of control but self-sustaining biological control agents could provide long term suppression of fire ant populations. Future control should involve multiple strategies of chemical, biological, behavioral, molecular, physical, and cultural methods. Research and education are important keys and will play vital roles in the future management of this pest.