

*Solenopsis invicta* Buren

# The Red Imported Fire Ant

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Insects have long fascinated man. For example, the ancient Egyptians used a scarab, a beetle, as a sacred symbol, and ants were referred to often in Biblical parables and later in Grecian fables. Today most people react to insects only to the extent that they cause problems by infesting their homes (cockroaches), biting them (mosquitoes), or eating their crops (caterpillars, grasshoppers, etc.). They are frequently unaware of the role insects play in food production, crop damage or public health.

In fact, awareness today of insects is shaped largely by the media. We see movies and TV programs about giant grasshoppers, products of nuclear radiation; flies that can be interchanged with humans, and so on. Documentaries tell us of "killer bees" and a recent paperback novel about fire ants frightens everyone by having the ants mutate and become a "swarm of stinging horror". To the nonentomologist, fiction becomes fact, heresay become gospel.

**"RESPONSES TO THE VENOM RANGE FROM NO EFFECT TO ANAPHYLACTIC REACTION AND SOMETIMES DEATH"**

The Southeastern United States is presently infested with an aggressive, imported pest, aptly called the fire ant. Scientifically, it is known as *Solenopsis invicta*, the unconquered fire ant. This ant, which has the common name, the red imported fire ant, is light to dark brown in color and was introduced into the Mobile, Alabama, area from South America more



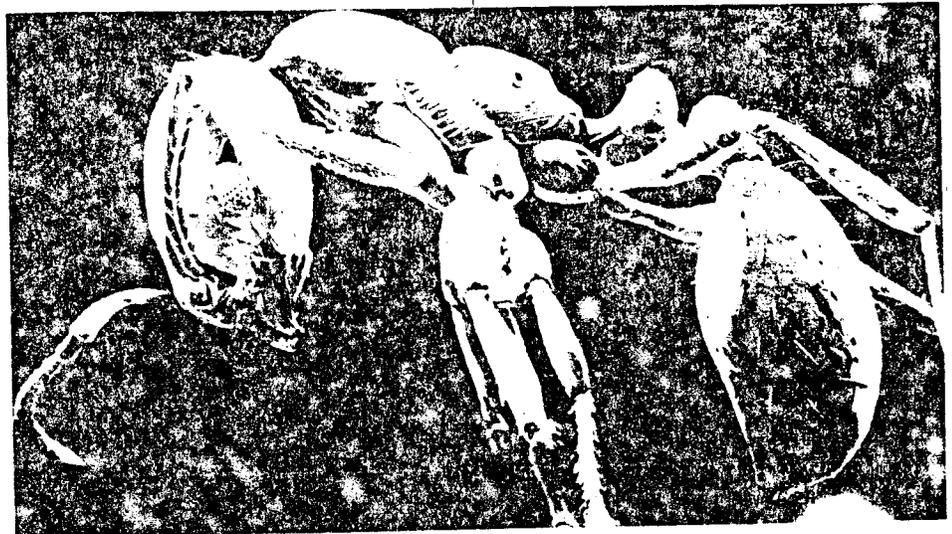
than 37 years ago. There is another imported fire ant, *S. richteri* Forel, the black imported fire ant, that occupies a very limited area in north Mississippi and Alabama. This species is believed to have been imported before the red form, but it did not achieve habitat success like the red form.

There are few insects in the United States today that are a source of as much controversy as the imported fire ant. Some consider them the number one public health nuisance, others class them as nuisance pests only, still others feel they are beneficial. The assessment is difficult because these ants affect a broad spec-

trum of "things" but are not pests of any one thing.

The medical aspects of fire ant stings are of particular concern. Some recent medical studies indicate the ants have greater importance as public health hazards than at first thought. There is the immediate effect of the venom, but also there are secondary complications, such as bacterial invasion. Responses to the venom range from no effect to anaphylactic reaction and sometimes death. The venom produces a sterile pustule that is unique and characteristic of a fire ant attack. The immediate reaction is an intense burning sensation. Then a wheal appears at the site of the sting and presently, after a few hours, a superficial vesicle appears that contains a clear fluid. The next day, the fluid becomes purulent as a result of the necrotizing properties of the venom. The pustule is sterile and may persist as long as a week provided it is not broken. During this time, the pus is absorbed, and a small scab is formed that, in some cases, particularly with elderly people, may develop into scar tissue. Individuals who have systemic reactions have typical symptoms such as nausea, vomiting, dizziness, perspiration, cyanosis and asthma.

The venom of the fire ant is of particular interest to immunologists and aller-

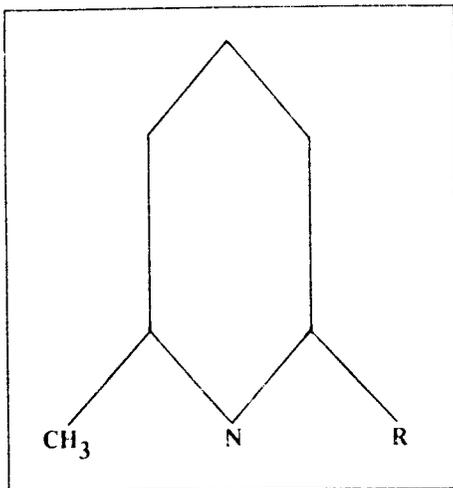


*Electron Micrograph of Solenopsis invicta.*

## *"SCIENTIFICALLY, IT IS KNOWN AS SOLENOPSIS INVICTA, THE UNCONQUERED FIRE ANT."*

gists because it is not protenaceous like the venom of most poisonous arthropods and vertebrates. Instead, it is an alkaloid and is thus unique. In fact, the alkaloids found in the venom of the fire ant are found nowhere else in the animal world. Mass spectrometry of the venom has shown the structure to consist of a piperidine nucleus with a methyl group in the 2 position and a 12 to 16 carbon aliphatic chain in the 6th position.

Research has shown the venom to be hemolytic, insecticidal, bactericidal and fungicidal. There is some evidence that the venom may cause suppression of acetyl choline sensitivity in muscle tissue and may also cause activation of an alternate complement pathway. In spite of its potency, physicians have been successful in using hyposensitization therapy to treat patients sensitive to the fire ant sting.



### *Current Research*

In Gainesville, Florida, Agricultural Research, SEA, of the U.S. Department of Agriculture maintains a laboratory for research on insects affecting man and animals including the imported fire ant. The research carried on by this group encompasses a number of approaches:

(1) Chemical control. A screening program is in progress to seek new toxicants that might be used in baits against the ant; over 5,000 chemicals have been tested so far, but none have been as effective as mirex. Research is underway to determine whether toxicants can be bound to polymer backbones that, when con-

sumed by the ants, will release the toxicant by subsequent enzymatic hydrolysis and become active.

(2) Biological control. Research indicates that there are no known agents present in the U.S. that will successfully control fire ants. Plans are being made to establish a laboratory in South America in hopes of isolating effective pathogens, parasites and predators in the ants' homeland.

(3) Physiology and behavior. The presence of at least 2 pheromones in the fire ant, a brood pheromone and a queen recognition pheromone, has been demonstrated. It is possible that more of these chemicals will be found. Hopefully they can be used to disrupt the colony, alter certain behavioral responses or increase the attractiveness of formulation of bio-control agents or insecticides.

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***"RESEARCH INDICATES THAT THERE ARE NO KNOWN AGENTS PRESENT IN THE U.S. THAT WILL SUCCESSFULLY CONTROL FIRE ANTS"***

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(4) Biology, ecology. Studies are underway to determine: effects of the fire ant, good or bad, on existing native ant population; effects of control measures on non-target organisms; and the basic ecology of the fire ant.

(5) Juvenile hormone effects. Juvenile hormones regulate the growth and molting of insects. There are indications that several JH analogs may have potential as control agents. These compounds cause

malformation of the brood, sterility, and incomplete metamorphosis of brood.

(6) Economic impact. Research is underway to determine the effect of the ant on crops such as soybeans and sugarcane and on people, that is, the numbers of people stung, money spent on treatments, death, etc.

In summary, fire ants, which infest a large part of the Southeastern United States, often cause serious agricultural and medical problems. These problems may become more serious because there is presumably no area-wide method of controlling this pest. Since there are suitable habitats for the species throughout the South, including California, it is important that new, effective control measures be developed. Hopefully, the research on fire ants at the USDA laboratory in Gainesville, Florida, will be able to meet this challenge through a well-rounded research program.

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