

Imported Fire Ants on Lawns and Turf¹

David H. Oi, Roberto M. Pereira and Philip G. Koehler²

Imported fire ants are aggressive, reddish brown to black ants that are 1/8 to 1/4 in long. They construct nests which are often visible as dome-shaped mounds of soil, sometimes as large as 3 feet across and 1 1/2 feet in height (Figure 1). In sandy soils, mounds are flatter and less visible. Fire ants usually build mounds in sunny, open areas such as lawns, pastures, cultivated fields, and meadows, but they are not restricted to these areas. Mounds or nests may be located in rotting logs, around trees and stumps, under pavement and buildings, and occasionally indoors. When their nests are disturbed, numerous fire ants will quickly run out of the mound and attack any intruder. These ants are notorious for their painful, burning sting that results in a pustule and intense itching, which may persist for 10 days. Infections may occur if pustules are broken. Some people have allergic reactions to fire ant stings that range from rashes and swelling to paralysis, or anaphylactic shock. In rare instances, severe allergic reactions cause death.



Figure 1. Fire ant mound on grass.

In addition to stinging humans, imported fire ants can sting pets, livestock, and wildlife. Crop losses are also reported due to fire ants feeding on seedlings and even citrus trees. Harvesting machinery used on farms can be damaged by hitting hard fire ant mounds often found in clay soils. Electrical equipment and utility housings may serve as fire ant nest sites, sometimes resulting in short circuits.

1. This document is ENY226 (LH059), one of a series of the Entomology and Nematology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date: February 1991. Revised October: 2008. Visit the EDIS Web Site at <http://edis.ifas.ufl.edu>.

2. David H. Oi, research scientist, USDA-ARS, Medical and Veterinary Research Laboratory; Roberto M. Pereira, associate research scientist, Entomology & Nematology Department; Philip G. Koehler, professor, Entomology and Nematology Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

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The term **imported fire ants** generally refers to two species of ants: the black imported fire ant, *Solenopsis richteri* Forel, and the red imported fire ant, *Solenopsis invicta* Buren. The black imported fire ant was accidentally introduced from South America into Mobile, Alabama around 1918, and now infests a small area in northern Alabama and Mississippi and parts of Tennessee. The red imported fire ant entered the United States probably in the 1930s. It was most likely introduced with cargo or in the soil used as ballast in ships from South America that were unloaded in the Mobile area. In the 1940s and early 1950s the red imported fire ant spread to Florida and other southern states in nursery stock and sod. Fire ants currently infest over 320 million acres in Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Puerto Rico, as well as portions of California and New Mexico (Figure 2). They have the potential to establish in other areas where average minimum temperatures are above 5°F and rainfall is greater than 20 inches a year, or in irrigated areas. Localized infestations have also been reported in Arizona, Virginia, and other areas outside the quarantine area in Figure 2.

To limit the spread of imported fire ants, a federal quarantine restricts the movement of soil, potted plants, plants with soil attached, grass sod, hay, and used soil-moving equipment to uninfested areas of the United States. These items must be certified that they are free from infestation. While there are no restrictions on the movement of regulated articles within Florida and other quarantine areas, any shipments outside the quarantine areas require inspection and certification from the Florida Department of Agriculture and Consumer Services, Division of Plant Industry (FDACS-DPI). Information on specific laws and regulations may be obtained from any local office of the FDACS-DPI or the U.S. Department of Agriculture Animal and Plant Health Inspection Service/Plant Protection and Quarantine (USDA-APHIS/PPQ).

Biology

Red imported fire ants live in colonies that contain cream-colored to white immature ants, often called brood. The brood is comprised of the eggs,

larvae, and pupae. Also within the colonies are adult ants of different types, or castes. The castes include winged males, winged females (which are unmated queens), workers of varying size, and one or more mated queens. The winged males and females fly from nests, usually in the spring and early summer, to mate in flight. Upon landing, mated females will shed their wings after finding a suitable nesting site. All the males die after mating. While thousands of winged males and females can be produced per year in large colonies, they do not sting, and fewer than 10% of the females will survive to produce a colony. Newly-mated queens can fly as far as 12 miles from the nest (or even farther in the wind), but most land within a mile.

New colonies do not make conspicuous mounds for several months. Once a colony is established, a single queen can lay over 2,000 eggs per day. Depending on temperature, it can take 20 to 45 days for an egg to develop into an adult worker. Workers can live as long as 9 months at 75°F, but life spans usually are between 1 and 6 months under warmer outdoor conditions. Queens live an average of 6 to 7 years.

Fire ants are omnivorous feeders, feeding on carbohydrates (e.g. honeydew, plant exudates, sugars, syrups), proteins (e.g. insects, meats), and lipids (e.g. grease, lard, oils from seeds). Their food preferences change depending on the nutritional requirements of the colony. In the spring and summer, when food is abundant, the colony produces new offspring, and the protein needs of the colony increase. Adult ants require carbohydrates and/or lipids to sustain themselves throughout the year. Adults are only able to ingest liquids. Solid proteinaceous foods are liquified by placing them on a depression in front of the mouth of the oldest larvae (the fourth instar stage), which then regurgitate digestive enzymes onto the food. Once liquified, the fourth instar larvae suck up the protein and regurgitate it to the workers, which pass it on to the rest of the colony.

Workers will forage for food more than 100 feet from the nest. They can forage during both the day and the night, generally when air temperatures are between 70° and 90°F. When a large food source is

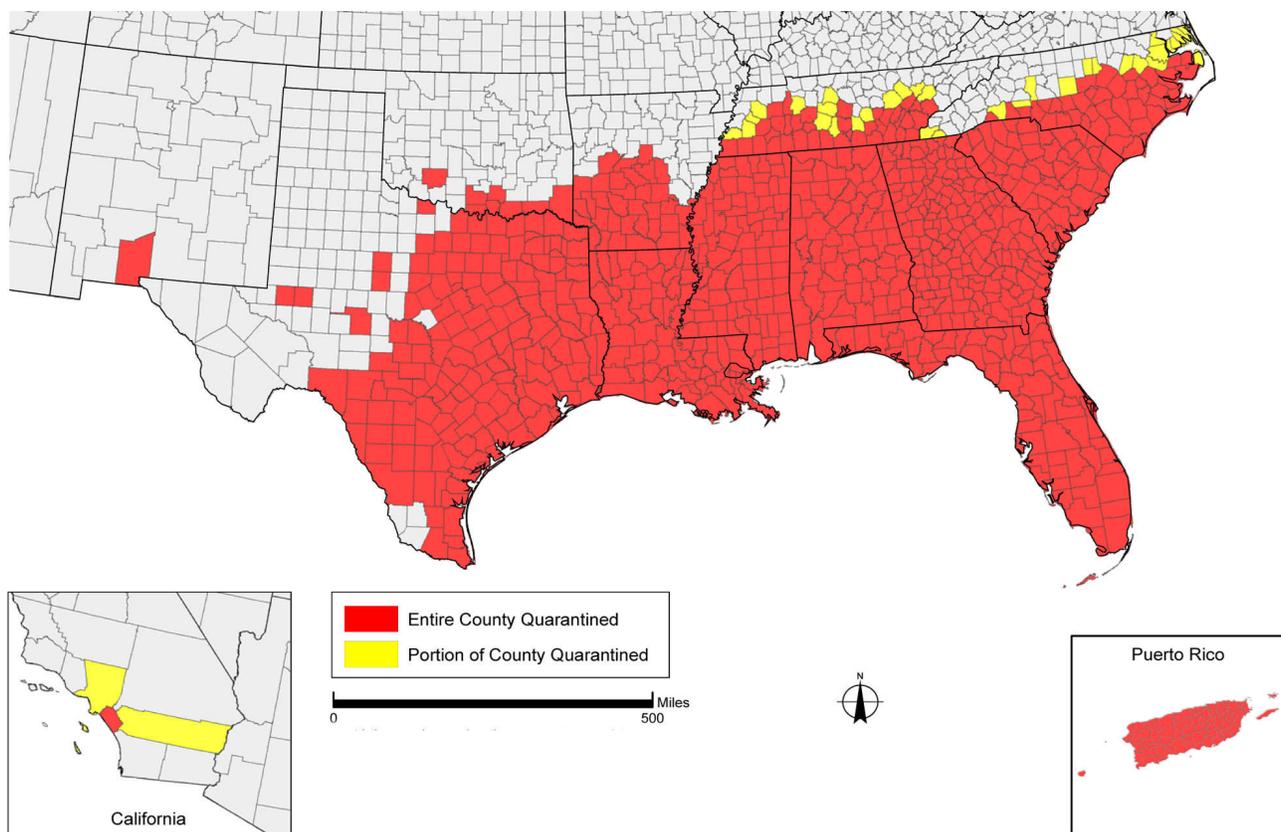


Figure 2. Imported Fire Ant Quarantine Map (Source: http://www.aphis.usda.gov/plant_health/plant_pest_info/fireants/). Credits: USDA-APHIS-PPQ

found, fire ants recruit other workers to help take the food back to the colony. Liquids are ingested at the food source, and stored within the ants until they are regurgitated to other ants within the colony. Liquids from solid foods are extracted at the source, or are carried back as solid particles. Large solids may be cut into smaller pieces so they can be carried back to the colony.

There are two types of fire ant colonies:

- single-queen, or monogyne, colonies, and
- multiple-queen, or polygyne, colonies.

Single-queen colonies have only one egg-laying queen, and may contain as many as 100,000 to 240,000 workers. Multiple-queen colonies have many egg-laying queens (usually 20 to 60), with 100,000 to 500,000 workers. Single-queen colonies fight with other fire ant colonies. Because of this antagonistic behavior, colonies are farther apart, resulting in a maximum of 40 to 150 mounds per

acre. Multiple-queen colonies generally do not fight with other multiple-queen colonies. Consequently, mounds are closer together, and can reach densities of 200 to 800 mounds per acre. Multiple-queen mounds may also be inconspicuous, often times being clusters of small, flattened excavations, in contrast to the distinct dome-shaped mounds of single-queen colonies. Workers from single-queen colonies vary in size, ranging in length from 1/8 to 1/4 in, and are usually reddish brown to black in color. Workers of multiple-queen colonies are generally smaller (1/8 to 3/16 in), have only a few large workers, and are lighter in color (orangish-brown) than single-queen colony workers.

The large colony sizes, and the presence of numerous queens makes multiple-queen colonies more difficult to eliminate than single-queen colonies. Since 1973, multiple-queen colonies have been found in many fire ant infested states, including Florida. Multiple-queen colonies produce fewer winged, or alate, queens that will start new colonies

after a mating flight than single-queen colonies. However, multiple-queen colonies can establish new colonies by budding, where a portion of the queens and workers splits off from a colony.

The spread of fire ants into new areas depends on many factors, such as climate, surrounding fire ant populations, and the native predators and competitors in the areas. Areas with an abundance of natural enemies and competing ant species may hinder colony establishment because the enemies prey upon newly-mated queens and compete for resources. However, if an area is disturbed, for example, by clearing land for pastures or urban development, natural enemies or competitors may be adversely affected and fire ants may colonize the area more rapidly.

It may take as long as 11 years for single-queen fire ant colonies to become the dominant ant species in a new area which has been disturbed by urbanization, and has not been treated with insecticides to control ants. Multiple-queen colonies may become dominant in new areas at a slower rate because they spread more by budding than by establishing numerous new colonies scattered throughout an area after mating flights.

In areas where native ants and fire ant populations have been reduced or eliminated with insecticides, reinfestation by fire ants may be noticeable within a month after treatment. Fire ants reinfest these areas more rapidly and outcompete other ant species because of their tremendous reproductive capacity and faster colony development. If fire ant control is not maintained, the subsequent reinfestation of an area may result in even greater fire ant populations than existed before the application of insecticides.

Control Strategies and Techniques

Imported fire ants have been the target of innumerable methods of control. Unfortunately, there are no control methods that will permanently eliminate fire ants from an area. Five strategies are currently being used to control fire ants:

- broadcast bait applications;

- broadcast contact insecticide applications
- individual mound treatments;
- a combination of broadcast baiting and individual mound treatments; and
- barrier and spot treatments.

The following discussion provides general descriptions of these strategies and guidelines for employing them. Suggestions for using these strategies in lawns and ornamental turf follow this section.

Broadcast Bait Applications

This strategy attempts to reduce fire ant populations by applying insecticides incorporated into an attractant, or bait, on an area-wide basis. Most bait products contain slow-acting toxicants dissolved in soybean oil, which is a food source for fire ants. The toxicant-laden oil is then absorbed into corn grits, which makes the product easier to handle and apply, and more available to the ants. The small size of the corn grit allows the ants to either carry the grit back to the colony and extract the toxic oil within the mound, or extract the toxic oil from the grit immediately and carry it back to the colony internally. The slow action of the toxicants allows the ants to feed the toxic oil to other members of the colony before they die. When the toxicant is fed to the queen(s), she either dies or no longer produces new workers and the colony will eventually die.

There are several different toxicants, or active ingredients, that are used in commercially available broadcast bait products specifically registered for use against fire ants. Most products will control fire ant populations within 1 to 5 weeks. However, these areas are subject to reinfestation.

Some active ingredients interfere with reproduction, and are often referred to as insect growth regulators, or IGRs. The active ingredient abamectin B_1 , at broadcast application rates, prevents queens from laying eggs. Fenoxycarb prevents queens from laying worker eggs. Because workers are no longer being produced, colonies treated with IGRs will eventually be eliminated because the queen(s) will not be cared for and will die as workers

die off naturally. IGR products may take 5 to 10 weeks to eliminate 90% of the colonies, and large treated areas (>1 acre) may have control for as long as a year. Control in smaller areas is not as long lasting because these areas are more easily reinfested from adjacent areas.

A broadcast bait application eliminates the need to locate mounds, because it relies on foraging fire ants to find and feed the baits to the rest of the colony. Thus, large areas can be treated more efficiently. To ensure baits will be fed upon, follow these guidelines for effective bait applications.

- **Use fresh bait.** Most available fire ant baits use soybean oil as a feeding attractant. Baits that are old (over 2 years old in an air-tight container), left in unsealed bags, or stored at high temperatures may become rancid and will not be fed upon by foraging workers. Rancid bait often has a pungent odor somewhat similar to latex paint.
- **Keep baits dry.** Wet baits are not attractive to fire ants. Apply baits when the grass and ground are dry or drying, and rain is not expected, preferably for the next 6-12 hours.
- **Apply baits when fire ants are actively foraging.** Foraging activity can be determined by spreading bait in a small pile in the area to be treated. If fire ants are actively foraging, you should see ants removing the bait within 10 to 30 minutes. This also will indicate that the bait is attractive, and not too old. Fire ants generally will forage when air temperatures are between 70° and 90°F. During hot, summer weather, apply baits in the late afternoon or evening because fire ants will forage at night under these conditions.
- **Follow the directions on the label.** It is against the law to apply baits in areas not listed on the label.

Bait broadcasting equipment (Figure 3) suitable for small areas such as lawns and playgrounds include hand-held seed spreaders and chest spreaders. The spreader may need to be set at the smallest opening, and the applicator may need to walk rapidly to apply

the small doses in some bait labels. For some bait formulations, the application rate may be higher and these precautions may not be necessary. Electric spreaders are suitable for broadcasting baits over larger areas (1 to 25 acres). These spreaders must be mounted onto vehicles that can be calibrated to apply the required amount of bait per acre. Walk-behind rotary spreaders may apply excessive amounts of some baits and may not be the best choice of equipment. However, some manufacturers may provide separate attachments that result in lower application rates.

Broadcast Contact Insecticide Applications

This strategy attempts to blanket the surface of an area with insecticide that will kill ants on contact, unlike baits that require ants to ingest an active ingredient. Some active ingredients may kill ants for several months. The product must thoroughly cover an area, or fire ants may infest untreated spots. Depending on the product, individual ants may die quickly, but it may take 4 weeks or more to clear an area of fire ant nests. Application rates vary among products so it is very important to follow label instructions. For some products heavy rain or irrigation is needed after the product is applied. Most granular products are applied with fertilizer spreaders, but again follow label instructions for specific product application methods.

Individual Mound Treatments

This strategy attempts to eliminate colonies of fire ants by treating mounds individually. To eliminate a colony, the queen must be killed. If she is not destroyed, she will continue to lay eggs and the colony will recover. In the case of multiple-queen colonies, all the queens must be killed, thus making effective treatments very difficult. Individual mound treatments are time consuming and labor intensive because the mounds must be located and treated one at a time. However, colonies treated individually may be eliminated faster than colonies treated with broadcast bait applications.

There are chemical and nonchemical methods of treating mounds individually. Chemical methods include insecticides that are formulated as baits,

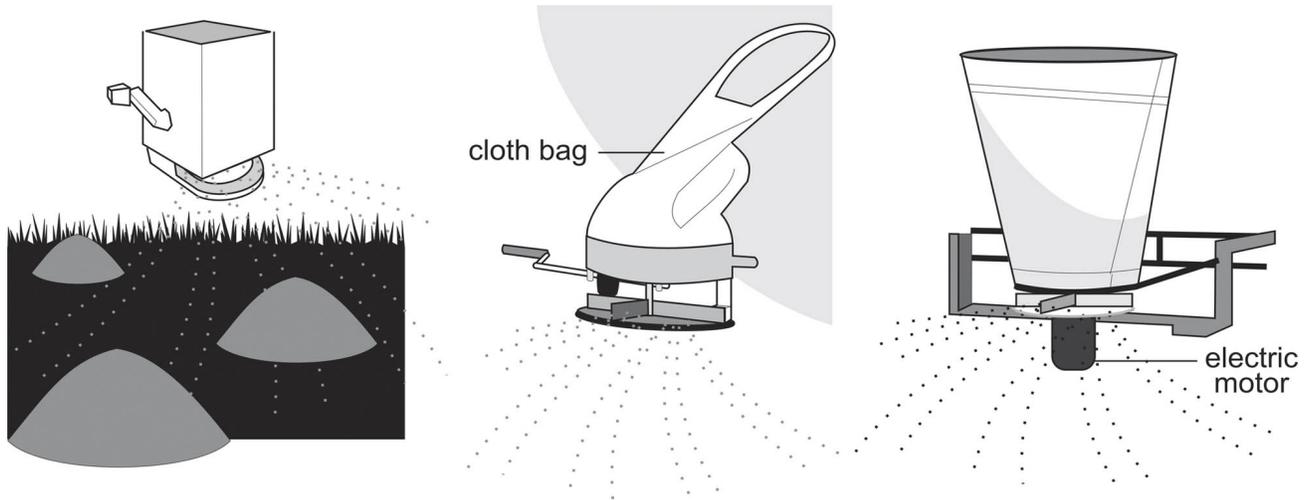


Figure 3. Application equipment for broadcast bait application.

drenches, granules, dusts, and aerosols. Non-chemical methods include applying hot water, and physically excavating the nest. All individual mound treatments may cause the ants to relocate and create a new mound. Even if the queen is killed, surviving ants may still inhabit the treated mound or make a new mound until they die off naturally, which may take over a month. Thus it may be necessary to retreat remaining mounds that still contain ants.

Baits

Bait products used for broadcast bait applications can be applied to individual mounds. Sprinkle the recommended amount of bait around the base of the mound up to three feet away (Figure 4). In addition, follow the Guidelines for Effective Bait Applications given previously. As with broadcast bait applications, the use of baits for individual mound treatments may take one to several weeks to eliminate colonies.

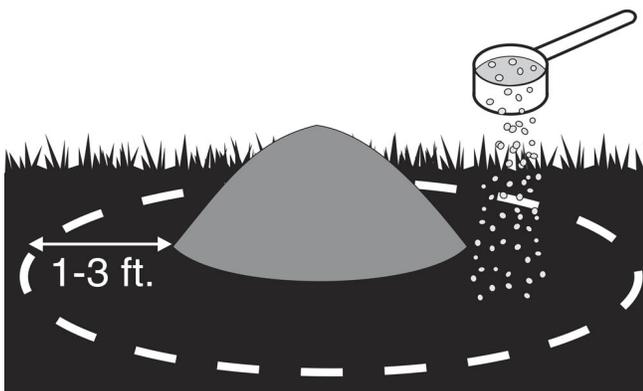


Figure 4. Individual mound bait application.

Drenches

These products are solutions consisting of insecticides and water that are applied to mounds. To be effective, the drench needs to contact a majority of the ants. This is best accomplished by applying the drench to an undisturbed mound on cool, sunny mornings. Under these conditions the ants, including the queen(s) and brood, are concentrated just under the top surface of the mound, where it is warm. If drenches are applied in hot, dry weather, most of the ants are deep within the mound, and the drench will not contact the ants. It is recommended that entire mounds be saturated by first wetting the top of a mound, then soaking a 12-inch swath around the base of the mound, and finally, pouring the remaining drench on top of the mound from a height of at least 3 feet to obtain penetration into the mound. Use about 1 gallon of drench per mound for mounds with bases up to 8 inches in diameter and 2 gallons for larger mounds (Figure 5). Colonies may be eliminated within a few hours to several days after treatment.

Granules

In general, these products contain an insecticide that is released and carried into the mound with water that is poured over the granules. As with the drenches, granules are effective only if the insecticide penetrates the mound and contacts a majority of the ants and the queen(s). To apply, evenly scatter a measured amount (follow label directions) of granules over the surface and around a mound,

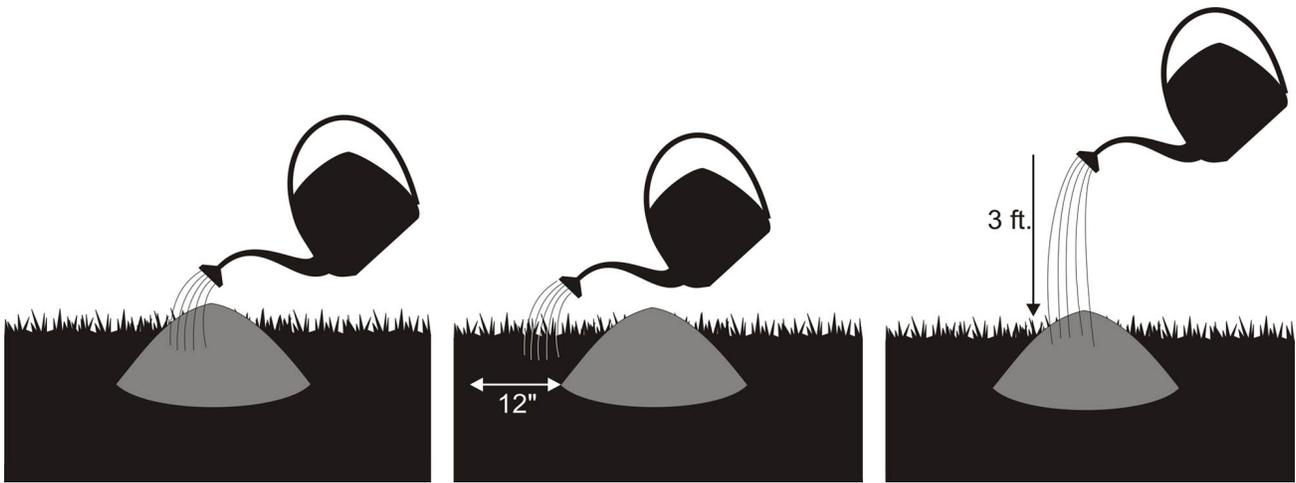


Figure 5. Individual mound drench application.

without disturbing the mound. With a sprinkler can, sprinkle 1 to 2 gallons of water over the granules, gently, to avoid disturbing the colony and washing granules off the mound (Figure 6). Watering may not be necessary with some products (follow label directions). Treating mounds on cool, sunny mornings will help the treatment contact the colony. It may be several days before the entire colony is killed.

Dusts

Dusts are insecticidal products that are dry powders. The dusts stick to the bodies of ants as they walk through treated soil. Ants that contact the dust will eventually die. Dusts are applied by evenly sprinkling a measured amount of dust (follow label directions) over the mound. Avoid inhaling or touching the dust (Figure 7). Some dusts, such as those containing 75% acephate, should kill an entire colony within a week.

Aerosols

Some products are available in aerosol cans equipped with a probe, and contain insecticides that quickly immobilize and kill ants on contact. As the probe is inserted into a mound, the insecticide should be injected into the mound for a specified amount of time (follow label directions). Depending on the size of the mound, several insertions may be needed to distribute the insecticide. Aerosols generally disperse throughout the mound more quickly than drenches. However, as with other individual mound treatments,

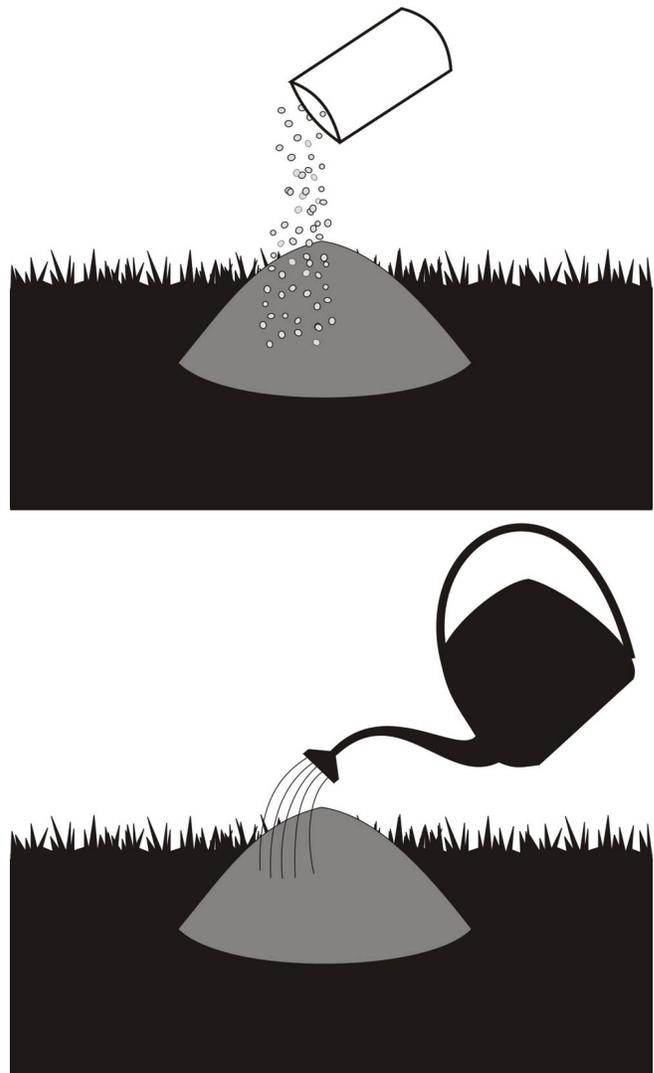


Figure 6. Individual mound application of soluble granule products.



Figure 7. Individual mound application of dry powder products.

application on cool, sunny mornings will help maximize contact with the colony (Figure 8). While aerosols are more convenient to use than drenches, they generally are more costly and do not provide significantly better control than some drenches.



Figure 8. Individual mound aerosol application.

Organic Insecticides

Commercially available organic products that contain ingredients such as boric acid and diatomaceous earth are known to kill ants. However, their effectiveness in killing entire colonies when applied to mounds has not been consistently demonstrated. There are also several products which contain plant derived, or botanical, insecticides such as rotenone, nicotine sulfate, and pyrethrins. As with the other mound treatments, the product must contact and kill the queen(s) to control colonies.

Hot Water

Scalding or boiling water (190° to 212°F) has been used to eliminate colonies. Slowly pour about three gallons of hot water onto the mound. The water should drain into the vertical tunnels of the mound and eventually collapse the entire mound structure. Treatments may be more effective if applied on cool, sunny mornings. It has been reported that 20 to 60% of the mounds treated by this method have been eliminated. Several applications may be needed, and hot water may injure plants adjacent to treated mounds. One must be very careful when using hot water to avoid burning oneself.

Excavation

Fire ant mounds may be dug up and removed from an area. Apply talcum or baby powder to the handle of a shovel and the inside of a bucket to deter the ants from crawling up the handle or escaping from the bucket. The best time to excavate a mound is on cool, sunny mornings, when a majority of the ants and brood are near the mound surface.

Other Home Remedies and Control Devices

Many home remedies and mechanical control devices have not been scientifically proven to consistently eliminate fire ant colonies. Oftentimes these cures will kill many ants and the colony will abandon the mound, thus giving the false impression that the colony was killed. In actuality, the colony most likely just established another mound elsewhere, and elimination of the entire colony, or the queen(s) did not occur. Some home remedies also are dangerous to apply and can seriously contaminate the environment. These remedies include the use of gasoline or other petroleum products; battery acids; bleaches, ammonia, and other cleaning products. Such remedies should never be used.

Other **ineffective** home remedies include:

- soap solutions and wood ashes soaked into a mound, which supposedly remove the wax layer that protects an ant's body;
- applying grits to fire ant mounds in an attempt to get ants to eat the grits, which will then supposedly swell inside them and explode the

ants (recall that ants can only ingest liquids, so they do not even eat grits); and,

- shoveling mounds together in an attempt to have different colonies fight and kill each other (this is not effective with either single or multiple-queen colonies).

Combining Broadcast Baiting and Individual Mound Treatments

This strategy utilizes the efficiency of broadcast baiting and the fast action of individual mound treatments. Baits must be broadcast first to efficiently reduce fire ant populations (see Guidelines for Effective Bait Applications). Wait a minimum of 3 days after broadcasting to allow fire ants to forage and distribute the bait before individually treating mounds. Treat mounds preferably with a dust, drench, granular, or aerosol insecticide specifically labeled for fire ant control. Treat only mounds that are causing immediate problems or are a potential hazard (e.g., mounds located in areas frequented by people or pets) (Figure 9). Most mounds that receive the slower acting baits will eventually be eliminated, and the presence of small populations of fire ants may help slow the reinfestation of an area.

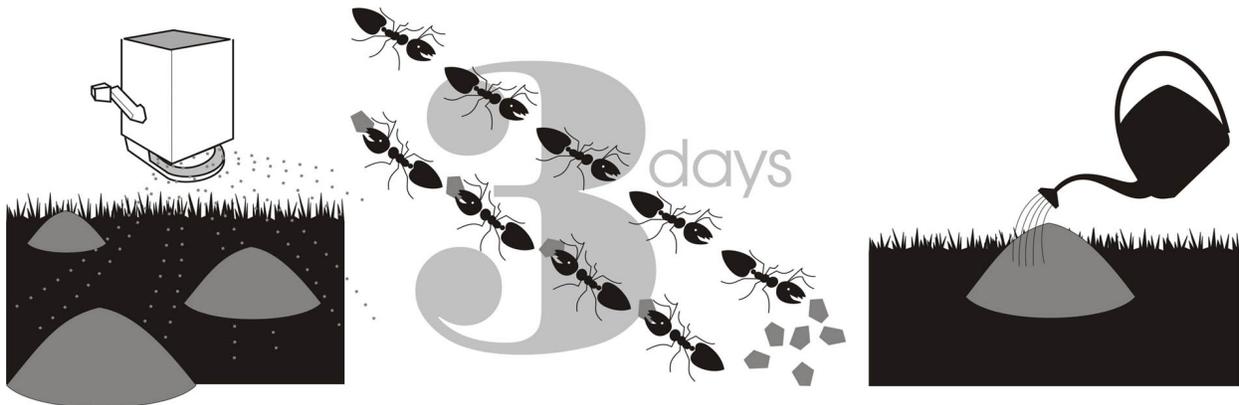


Figure 9. Two-step method combining broadcast bait application followed by individual mound insecticide treatment after 3 days.

Barrier and Spot Treatments

Products that contain active ingredients, such as acephate, carbaryl, permethrin, resmethrin and others, immediately kill ants on contact. These products are usually sold as sprays or dusts, and some are latex paint mixtures. They may be applied in wide bands on and around building foundations, equipment and

other areas to create barriers that exclude ants. They also may be applied to ant trails to eliminate foraging ants. Barrier and spot treatments do not eliminate colonies. Follow label directions for specific uses and application procedures.

Options for Managing Fire Ant Populations in Lawns and Turf

Fire ants infest lawns, school yards, athletic fields and parks. In these places they may pose a medical threat and affect human activity. Their mounds also detract from the aesthetic value of the landscape.

Treatment Options

Option 1: For Small Areas

This option covers small areas (usually 1 acre or less) of ornamental turf or places where preservation of native ants is desired. This option selectively controls fire ants, but reinvansion should be expected. It requires more labor and monitoring than other options.

Step 1. Treat all unwanted fire ant mounds using the individual mound treatment of choice.

Step 2. Selectively treat new or undesirable mounds as needed.

Option 2: For Long-term Suppression

For long-term ant suppression in ornamental turf and non-agricultural lands, including roadsides. This option is best suited to larger areas and will not eliminate all ant activity. Suppression of ants occurs slowly (weeks to months) and the cost is moderate. This option is not suggested for areas with large numbers of native ants and few fire ant mounds (15 to 20 per acre or fewer).

Step 1. Make an annual or semi-annual broadcast application of a bait-formulated or granular insecticide in the spring and/or fall.

Step 2. At least 3 days after broadcasting the bait, begin treating individual mounds in sensitive or high traffic areas as needed.

In areas with excessively high numbers of mounds per acre (200 or more), two applications of bait may be needed within several months to result in a satisfactory level of ant suppression, since all mounds may not be affected by a single bait application. Reapply when the presence of ants justifies the cost of treatment.

If and when bait applications are terminated, fire ants can reinfest the area, sometimes with more mounds than were present initially. Mated queens may "seed" the treated area with new colonies and be unaffected by the earlier bait applications. Also, in low-lying flood prone areas, baits may be less effective because ants move in and out of these areas often.

Option 3: To Eliminate Mound Building and Foraging Activity

To eliminate all mound building and foraging activity in ornamental turf. Effects of this option are more rapid and dramatic than with Option 2, but this option may be more expensive and requires more contact insecticide.

Step 1. (Optional). Make an annual or semi-annual broadcast application of a bait-formulated or granular insecticide in areas where there are many mounds (more than 20); or, individually treat fire ant mounds.

Step 2. Routinely broadcast or spray a contact insecticide every 8 weeks or so when ants are detected. Heed the re-entry or treatment-to-harvest intervals specified on product labels.

Option 4: Small Areas Needing Minimal Pesticide Use

For small areas (less than an acre) where minimal pesticide use is desired, such as areas frequented by young children. This option is very labor intensive, and may be practical if only a few mounds are present.

Step 1. (Optional) Broadcast a bait-formulated insecticide. While all baits have low mammalian toxicities, relative toxicities for the commercial baits vary.

Step 2. At least three days after baiting (if baits were applied) individually drench mounds with hot (scalding) water.

Step 3. Excavate and/or reapply hot water to mounds that are still active. Repeat when necessary.

Step 4. (Optional) Make an annual or semi-annual broadcast application of a bait-formulated insecticide in the spring and/or fall to suppress reinfestations.

Commercial Turf Treatment Options

Option 1: Shipping Sod Within Quarantined Area

To treat sod to be shipped within the quarantined area use options 1, 2, or 3 listed for lawns and ornamental turf.

Option 2: Shipping Sod Out of Quarantined Area

To treat turf to be shipped out of the quarantined area ("Imported Fire Ant 2007: Quarantine Treatments for Nursery Stock and Other Regulated Articles" and "The Fire Ant Manual").

Step 1. A Compliance Agreement and required shipping permits must be obtained from the Florida Department of Agriculture and Consumer Services.

Step 2. Apply granular approved products in accordance with certification program ("Imported Fire Ant 2007: Quarantine Treatments for Nursery Stock and Other Regulated Articles" and "The Fire Ant Manual").

References

The Fire Ant Manual (http://www.aphis.usda.gov/import_export/plants/manuals/domestic/downloads/fire_ant.pdf).

Imported Fire Ant 2007: Quarantine Treatments for Nursery Stock and Other Regulated Articles (http://www.aphis.usda.gov/publications/plant_health/content/printable_version/IFA2007.pdf).

Acknowledgements

This article was adapted from the University of Florida, Florida Cooperative Extension Service bulletin "Imported Fire Ants and Their Management in Florida". Further information can be obtained at: [http://www.extension.org/pages/Integrated_Pest_Management_\(IPM\)_for_Managing_Fire_Ants](http://www.extension.org/pages/Integrated_Pest_Management_(IPM)_for_Managing_Fire_Ants)

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