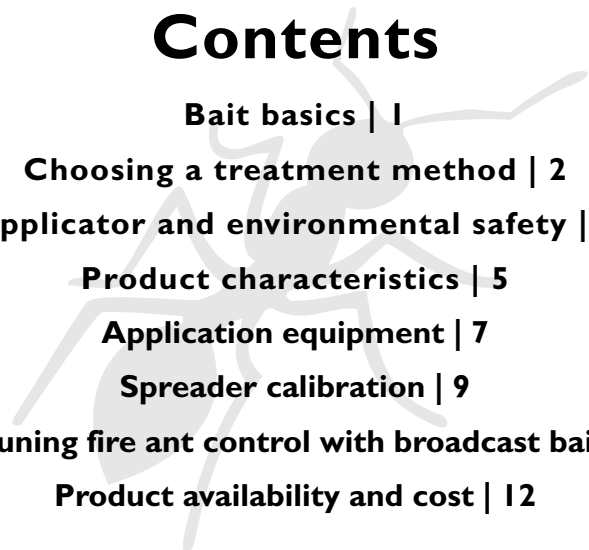


Broadcast Baits for Fire Ant Control



Texas Imported Fire Ant
Research & Management Plan

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This publication covers only one method of fire ant management. For more information, see publications B-6043, *Managing Red Imported Fire Ants in Urban Areas*, and B-6076, *Managing Red Imported Fire Ants in Agriculture*. They are available from the county Extension office and on the Web at <http://fireant.tamu.edu>.

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Broadcast Baits for Fire Ant Control

Charles L. Barr*

The number of conventionally formulated, broadcast-applied bait products available to control red imported fire ants (*Solenopsis invicta* Buren) increased dramatically in early 1999. As the number of products increased, so did buyers' confusion over brand names, active ingredients and the products' performance, application and general safety.

This guide addresses common questions about broadcast baits from both consumers and professional pesticide applicators. Although the information on this group of insecticides is as up to date as possible, technology, marketing and regulations create frequent changes.

Always read and follow label directions.

Bait basics

What is a bait insecticide?

A bait is an insecticide that insects sense to be food. In the case of ants, workers find the bait particles and carry them back to the colony, where larvae, workers and queens consume and circulate it.






By various modes of action, the active ingredient in the bait breaks the life cycle of the colony, which eventually dies out. Fast-acting types of insecticides kill queens and some workers. Insect growth regulator types (IGRs) do not kill workers, but disrupt the colony life cycle, so that workers die of natural causes and are not replaced.

Baits work very slowly compared to individual mound treatments (IMTs). If baits kill ants too fast, the foragers might not make it back to the mound, and sick workers would be removed before the active ingredient reached the queens—the ultimate target for colony elimination.

This slow speed is both the great advantage and disadvantage of baits. The advantage is that the active ingredient reaches most of the ants and many of the

colonies in a treated area before it noticeably affects them. Even the smallest colonies will probably pick up an effective dose whether the mound is even visible, let alone given individual attention. The result is easy, thorough control over large areas.

Baits have other advantages over contact insecticides:




-  In most cases, they are the least expensive way to control fire ants.
-  Ants are controlled in an area for a longer time than with contact insecticides.
-  Very little labor is required.
-  They pose very little toxic threat to people.
-  There are very few environmental hazards associated with baits.

The main disadvantage is that control is slow—it takes weeks or months to be effective, compared to hours or days for contact-type insecticides.

What is a “conventionally formulated” ant bait?

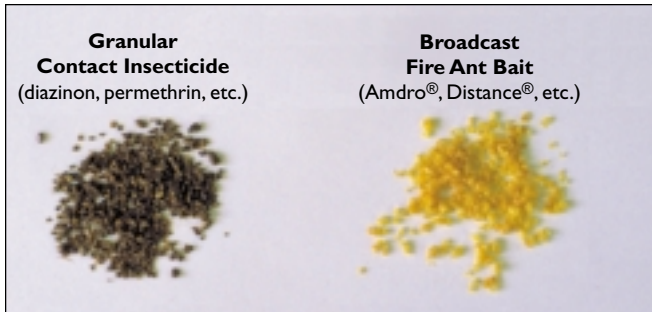
Conventionally formulated baits are what most people have in mind when they think of fire ant bait. Different formulations are used to control fire ants, but the term “conventionally formulated” refers to the majority of baits on the market. These products look and smell alike, are generally applied alike and give similar rates of control. All have small, oily, yellowish granules and smell like toasted corn.

Conventionally formulated baits have three main components:

-  Defatted corn cob grit **granules** serve only as a means of distributing the product. Although ants carry them to the mound, they do not eat them.
-  **Soybean oil** serves as both the attractant and active ingredient carrier. Preservatives and antioxidants are usually added to the oil to keep it from going rancid and to extend its shelf life.
-  The **active ingredient** actually affects the ants and determines how fast and for how long a product works.

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Though most baits are of the soybean oil formulation described above, several other granule types are available. Firestar® (fipronil) and some Maxforce® (hydramethylnon) baits use non-oily granules. Though they look different, they work the same way as conventionally formulated baits. The following application tips also apply to these baits.



Granular contact insecticides and baits appear somewhat similar, but their use and how they work are very different.

What does “broadcast-applied” mean?

Any insecticide can be applied either directly to a target (mounds in the case of fire ants), or to an entire area—a procedure known as broadcasting. Many fire ant control products, including baits, can be applied by either method with good results.

When using IMTs, you must first locate the mounds, then treat them. When broadcasting a bait insecticide, you do not have to find the mounds to treat them, regardless of how many fire ant colonies are present or whether they can even be seen. The main advantages of broadcast application are that there is no need for the time-consuming task of locating mounds or the risk of not treating mounds that are too small to detect.

How do you use baits successfully?

Most bait products are applied at a rate of 1 to 1½ pounds over an acre of land (roughly the size of a football field or a square 209 feet on a side). This is very little material and usually requires special application equipment. Overapplication offers little or no additional benefit in eliminating ants, but costs more money.

Keep these tips in mind for successful bait application:



The ants must be actively foraging (searching for food). Ants forage when the air temperature is 75 to 90 degrees F. Even if ants are foraging, they may be picking up only certain types of food. The only sure way to tell if ants are feeding on bait is to offer them a small amount and see if they pick up the granules.



Water ruins baits. Do not apply baits if rain is expected within 24 hours. Do not water the area for at least 24 hours. Avoid applying baits when there is a heavy dew.



Use fresh bait. The soybean oil in baits becomes rancid over time, making it unattractive to ants. Buy fresh product and keep it stored in a sealed container. Rancid bait has a pungent, acrid smell instead of the toasted corn smell of fresh bait. If a newly opened container of bait is found to be rancid, return it to the seller for fresh product.



Use bait promptly. Most companies claim that their products have an unopened shelf life of 2 to 3 years. Bait left open to the air may become rancid in a few weeks. Even when resealed and stored properly, bait from an opened container should be used within a year.



Test the conditions. The best way to tell if it is a good time to apply a bait is to place a little on the ground in the area to be treated and wait 15 to 30 minutes. If you see ants carrying particles, you will know that ants are foraging and the bait is attractive to them.

What to expect from a broadcast bait

Satisfaction with baits depends on knowing what they can do. *Baits work slowly!* If you want or need to control colonies within a few days, use an individual mound treatment. (Note: Certain baits, such as those containing hydramethylnon, abamectin and spinosad, may kill ants within a few days when applied as an IMT.)

Using broadcast baits, you can expect 80 to 95 percent maximum control within 1 to 6 months after application and lasting from 6 to 12 months, with very little effort and expense.

No product gives 100 percent control overnight or lasts forever.

Choosing a treatment method

Baits are the best treatment for *many* situations. But despite their many good points, baits are not the best treatment for every situation. IMTs are appropriate where fast control is needed, where there are very few colonies, and where desirable ants are present.

Hundreds of products are labeled for use on fire ants or just “ants” as individual mound treatments. Contact insecticide-based IMTs come in a wide array of granules, dusts and liquids under a host of brand names. Many have similar active ingredients and application

requirements. Used properly, most give similar, satisfactory results when eliminating a single fire ant colony is the goal.

There are about a dozen broadcast bait products and they, too, can be used to treat individual mounds. The speed at which a colony will be eliminated depends on the product's active ingredient. Some are no faster than if broadcast-applied. If your goal is to reduce the number of fire ant colonies in an *area*, broadcast baits have distinct advantages in most situations, most notably their lower cost and the longer period of effectiveness.

Besides cost and effectiveness, IMTs and broadcast baits have numerous other important differences.

The table below lists these characteristics for each product type. Remember: These are generalizations; there is a range within each product category.

Broadcast bait vs. IMT field test

An experiment was conducted to learn about three of the most important differences between IMTs and broadcast baits: cost, speed of control and duration of control. The plots were the size of an average yard, and the treatments were applied using products, equipment and methods a homeowner would use. One product, diazinon granules, was even applied incorrectly to simulate a common homeowner mistake.

Table 1. Comparison of characteristics of broadcast baits and nonbait individual mound treatments for fire ants.

Characteristic	Nonbait individual mound treatment (IMT)	Broadcast baits
Speed of action	Fast (hours to days)	Slow (weeks to months)
Time to reinfestation	Not applicable, except area treated	3 to 12+ months
Area retreatment times	Weekly to monthly	1 to 2 per year
Need to locate mounds	Essential	Unnecessary
Application labor	Moderate to high	Low
Application equipment	Household items to professional equipment	\$10 to \$300 spreader
Cost per acre (43,560 square feet)	Depends on how many mounds are in the area	\$10 to \$18
Cost per mound	10¢ to more than \$1	Depends on how many mounds are in the area
Potential applicator toxicity	Low to high	Very low
Potential environmental toxicity: leaching, runoff, etc.	Low to high	Very low
Risk to nontarget ants	Low	Depends on species and active ingredient

Table 2. Treatments used in an experiment to test cost, speed of control and duration of control of individual mound treatments and broadcast baits.

Treatment	Trade name	Product type	Application rate	Application method	
IMT combination	Diazinon, irrig.	Diazinon	5% granule	1/3 cup/mound	Scatter on mound, drench
	Diazinon, dry	Diazinon	5% granule	1/3 cup/mound	Scatter on mound only*
	Chlorpyrifos	Dursban, Lorsban	44.9% liquid	1 oz/mound	Mix w/water, drench mound
	Acephate	Orthene	75% powder	2 tsp/mound	Dust on mound
Hydramethylnon, IMT	Amdro	0.73% bait	5 TB/mound	Sprinkle around mound	
Hydramethylnon, broadcast	Amdro		1.5 lb/acre	Broadcast across area	
Fenoxycarb	Logic, Award	1.0% bait	1.5 lb/acre	Broadcast across area	
Untreated	N/A	N/A	N/A	N/A	

* Application without a water drench is NOT according to label directions, but is a common practice that may result in less control and/or relocation of colonies.

Records were kept of the time it took two people to find and treat the mounds (where applicable) so that the cost of labor could also be calculated. The test ran from October 1997 through December 1998 in Brazos County (south central), Texas.

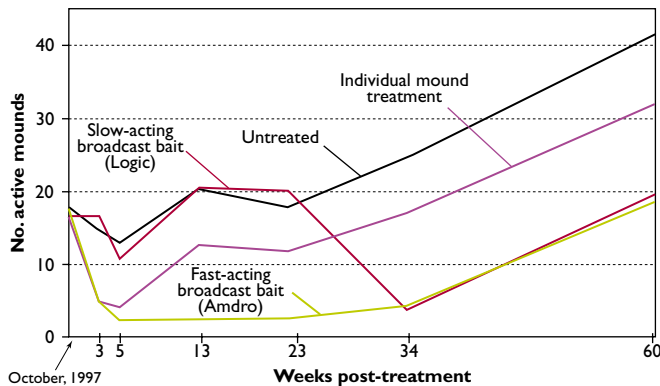


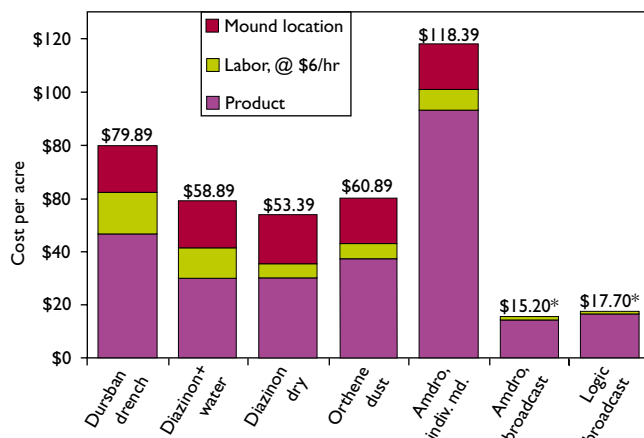
Figure 1. Comparison of effectiveness of broadcast treatment to that of individual mound treatment of fire ants.

Effectiveness results

In the experiment, the IMTs and the broadcast Amdro had similar speed of activity: Both eliminated active ant mounds within 5 weeks of application. The broadcast Amdro, however, controlled ants well for more than 7 months, whereas the ants in the IMT areas bounced back after only 3 months. Logic took 6 months to show *any* control, because of the mild winter. Regardless of the treatment, ant populations were back to pretreatment levels within a year.

Treatment cost results

The costs were standardized to treat an area with a density of 150 colonies per acre. *IMT costs rise and fall in proportion to colony density*, but do not fall



Calculations based on 150 mounds per acre. Individual mound treatment costs will vary with density, but will not fall to zero due to mound location costs.
*Cost does not change regardless of mound density.

Figure 2. Costs to treat 150 fire ant mounds per acre using various products and methods.

to zero because of the costs of finding the mounds (\$17.89 per acre in this study), whether or not active mounds are present. *Broadcast bait costs do not change*, regardless of colony density.

The results show that broadcast baits were clearly more cost-effective in this test, but baits are not always the best choice. If you need fast control, or if the area has very few colonies or has desirable ants, IMTs are more appropriate. Also, you must consider which season of the year that you want maximum control if you are considering an insect growth regulator bait. If you treat in the fall, you may not achieve maximum control until the spring. If you treat in late spring or early summer, the ants should be under control within 2 or 3 months.








Applicator and environmental safety

When selecting and using baits, an important concern is safety of both the applicator and the environment. Generally, broadcast baits are safer to use and introduce less total insecticide and fewer toxic active ingredients into the environment than almost any other type of insecticide application. The main environmental drawback of broadcast baits is that they may affect desirable ant species if they are applied imprecisely or if desirable ants are foraging into the areas treated for fire ants.

Applicator safety

Although broadcast baits are relatively safe and easy to apply by almost any standard, you should take a few safety precautions when applying them. Most precautions are designed to keep the granules from contacting your skin and eyes.

Handling precautions and safety equipment

-  Wear long-sleeved shirt and long pants.
-  Wear nonabsorbent gloves. Leather and cotton soak up oil and prolong the exposure hazard.
-  Wear boots with your pant cuffs outside to keep granules from accumulating inside.
-  Wear safety glasses or goggles. Thrown or wind-blown bait can easily get in your eyes.
-  If the bait contacts your skin, brush off the granules, then wash with soap and water.
-  Remember, the active ingredient is in an oil, so soap is necessary.
-  Do not wear your clothes again before washing them separately from other laundry.

Product characteristics

Table 3. Characteristics of various fire ant control products, as of April 2002.

Active ingredient	Mode of action	Speed of action	Control duration	Brand name(s)	Use site(s)
Abamectin ¹	IGR-like toxicant	2-6 months	6-18 months	Ascend (pro) Clinch, Varsity	T&O ² Limited agriculture only
Hydramethylnon	Metabolic inhibitor	2-4 weeks (fast)	6-12 months (short)	Amdro, SiegePro AmdroPro, Combat (retail) Maxforce, Probait (pro)	T&O, pasture, hay T&O only T&O only
Fenoxycarb	IGR	2-6 months (slow)	6-18 months (long)	Logic (retail) Award (PCO)	T&O, limited agriculture T&O
Fipronil ³	Nerve toxicant	2-4 weeks (fast)	6-18 months (long)	Firestar	T&O
Pyriproxyfen	IGR	2-4 months	6-18 months	Spectracide Distance, Esteem	T&O T&O, limited agriculture, fruit and nut orchards
S-methoprene	IGR	2-6 months	6-18 months	Extinguish	T&O, agriculture
Spinosad ¹	Nerve toxicant	2-4 weeks	6-12 months	Justice and products with Conserve	T&O, Justice labeled for IMT use in pastures

¹Abamectin and spinosad are both naturally occurring compounds produced through microbiological fermentation.

² T&O=turf and ornamental, refers to ornamental turf, trees, shrubs, flower beds, etc. in the landscape. It does NOT include vegetable gardens.

³The fipronil-containing products Over N' Out®, Chipco Choice® and Chipco Top Choice® are not baits. They are slow-acting granular contact insecticides. Speed of action is similar to that of Firestar, but they have true residual insecticidal activity for about a year.

Chart terminology

Active ingredient: The active ingredient and its concentration are listed on product label. The concentration may change over time and/or among manufacturers. Products with the same active ingredient, regardless of product name, should perform similarly.

Mode of action: IGR = Insect Growth Regulator, which disrupts the insect's developmental or reproductive cycle.

Speed of action: An estimate of when products will reach maximum effectiveness, based on scientific test data. Weather greatly affects the speed of action. Hot, dry weather generally increases speed of IGR products, as the ants die naturally.




Duration of control: The range of time it takes ants to fully reinfest an area back to pretreatment levels, based on scientific test data. Again, environmental factors greatly affect colony reinfestation. Extreme heat, cold or drought slows reinfestation; moderate weather tends to encourage it. Factors such as runoff, flooding, soil type and shade also affect the reinfestation rate.

Product name: Brand name given by manufacturer or packager. None of the broadcast baits is restricted use, which means that anyone can buy them. Products listed as "pro" or PCO are sold through wholesalers for professional pest control operators.

Use site: An abbreviated list of where the product can be used.








Brand names: Those listed are trademarks or registered trademarks.

Application safety


-  The spinning rotor of an electric spreader can seriously injure fingers. Before you approach the rotor, be sure that the spreader is turned off or, best, disconnected from the battery.
-  To prevent particles from hitting people, do not allow anyone within 40 feet of an electric spreader.
-  Unlike for fertilizers or heavier granules, the wind greatly alters the throw patterns and distances of bait, causing it to blow back onto the operator or into nontarget areas. Adjust the swath (the distance the spreader throws bait particles) spacing and safety buffers relative to the wind as you move back and forth over an area.

Environmental safety precautions


Take steps to minimize undesirable effects of broadcast baits on the environment. Although the risks are slight, the precautions are easy to follow:

-  **Never** apply bait, or any pesticide, directly to water or drainage areas.
-  Do not apply bait to hard surfaces (paving, rocks, plastic, etc.) where water runs off rapidly.
-  Avoid indiscriminate or sloppy application to nontarget sites. For instance, wooded and shady areas tend to harbor more desirable ants, but few fire ants.
-  Do not apply bait to food-producing areas, such as vegetable gardens, orchards and pastures, unless the product is specifically labeled for use there.
-  Avoid using baits where poultry or other animals might pick up bait particles. Remove the animals until the ants have gathered the bait (overnight is usually sufficient, or as directed on the label).
-  Consider using IMT or no treatments where there are less than 20 colonies per acre. Fire ants may reinvade at higher densities if you stop the periodic treatments.
-  Avoid overapplication by using proper calibration methods. One pound per acre is a light scattering, not a yellow cloud!

Bait storage

-  Store baits (and all pesticides) in their original, sealed container away from any human or animal foodstuff in an area where animals and children cannot get it. Baits may be very attractive to

animals because of their food-like smell and, although the active ingredients are relatively nontoxic, the soybean oil and carrier may cause digestive problems.

-  For best shelf life, store baits in a cool, dry place (not a refrigerator with food), with the container sealed as tightly as possible.

Toxicity

Many people are concerned about pesticide residues in the environment. Because toxic and long-lasting residues can get into sewer and run-off water, several cities have begun programs to encourage people to use broadcast baits instead of contact-type individual mound treatments. Table 4 outlines some characteristics of commonly available baits and, for comparison purposes, those of a few contact insecticides commonly used for individual mound treatments.

Application equipment

Broadcast baits are some of the easiest insecticides to apply. They require no mixing, little measuring or weighing, and one rapid pass over the area to be treated. They do require some specialized, relatively inexpensive application equipment.

The main reason to use this specialized equipment is to avoid overapplying the bait. Applying too much fire ant bait has little or no effect on product effectiveness, the environment, worker safety or any other factor. It does, however, increase the cost with little or no benefit.


If a little is good, a lot is not better. It's just more expensive.


Most conventionally formulated baits are applied at a rate of 1 to 1½ pounds per acre (43,560 square feet), or about an ounce per 3,000 square feet. This is a light sprinkling, not a yellow cloud. Some exceptions include Spectracide® bait (1 pound per 4,400 square feet), the spinosad baits (4 to 6 pounds per acre) and Firestar (1½ to 15 pounds per acre.) Be sure to check label directions for correct application rate.


Consequently, baits can all be applied with the same equipment, most of which can be used to apply other dry, low-volume, broadcast items, such as seeds and granular insecticides. If you use the equipment for other applications, be sure to wash it thoroughly to avoid cross-contamination.

Several bait products come in shaker cans or bottles. For areas such as small yards, these do a satisfactory job at no additional cost. For larger areas, a much more uniform, accurate application is needed.

Although you can broadcast bait effectively using common pieces of equipment, such as fertilizer spreaders for home, farm and professional use, most such equipment has three problems that cause costly overapplication and/or uneven application:

 The opening through which the bait is dispensed, the gate, cannot be closed far enough to allow the correct amount through while maintaining a steady flow, causing overapplication and/or large skips and misses. Bait spreaders have small gates with fine adjustments so they can be calibrated accurately.

 Most spreader agitators stir material in some way. Bait particles are oily and relatively soft, so they tend to cling, pack into clumps and flow poorly when stirred. The better bait spreaders have some form of vibrating agitation that keeps the bait fluffed and flowing evenly.

 Baits are much lighter than other broadcast materials such as seed and fertilizer. Consequently, they need high-speed rotors to throw

the particles a reasonable distance (swath width).

For small areas, swath width is not a major concern, and most hand-cranked spreaders work well. However, the large PTO-powered rotors of tractor-mounted and pull-behind fertilizer spreaders rotate too slowly to throw the bait very far and may cause streaking. Narrower swaths require more time and labor, which can be costly.

Another concern for some spreaders is their low height, which may allow tall vegetation to deflect the bait particles. Electric seeders with high-speed rotors throw bait much farther and more evenly. Also, they are relatively light and can be mounted on almost any vehicle at a reasonable height to clear vegetation.

The following are some of the more common types of effective bait application equipment. The list is not comprehensive and the illustrations should be used only as examples. Any brand of spreader with the characteristics outlined above should broadcast bait effectively and accurately.

Table 4. Characteristics of commonly available fire ant baits and individual mound treatment chemicals.

Active ingredient	Brand name(s)	Concentration (as supplied)	Class or activity ¹	Active ingredient/acre ²	Oral/dermal LD ₅₀ (mg/kg) ³	Half-life in soil ⁴
Broadcast baits				@ 1 lb./acre		
Abamectin	Clinch, etc.	0.011%	IGR-like	0.00011 lb	300/>1,800	21 days
Fenoxycarb	Logic, Award	1.0%	IGR	0.01 lb	16,800/>2,000	4 days
Fipronil	Firestar	0.00015%	toxicant	0.0000225 lb (max)	97/354	130 days
Hydramethylnon	Amdro, etc.	0.73%	toxicant	0.0073 lb	1,146/>5,000	4 days
Methoprene	Extinguish	0.5%	IGR	0.005 lb	>34,600/>3,000	10 days
Pyridine ^{2,5}	Spectracide	0.05%	IGR	0.0005 lb	>5,000/>2,000	10 days
Pyriproxyfen ⁵	Distance, Esteem	0.5%	IGR	0.005 lb	>5,000/>2,000	10 days
Spinosad	Justice, etc.	0.015%	toxicant	0.00015 lb	>5,000/>5,000	14 days
IMT				@150 md/ac		
Acephate	Orthene	75%	contact	1-2 lb	1,030/>10,250	3 days
Carbaryl	Sevin	5-42%, varies	contact	about 2 lb	250/>2,000	10 days
Diazinon ⁶	diazinon	5-10%, varies	contact	1-2 lb	1,250/>2,020	40 days
Permethrin	numerous	varies	contact	varies	430-4000/>2500	35 days

¹ IGR=insect growth regulator; toxicant=slow insecticidal activity; contact=contact insecticide

² All broadcast baits are applied at 1 to 1.5 lbs./acre except Spectracide (pyridine), which is applied at 1 lb./4,400 square feet (9.9 lb/ac) and spinosad products, which are applied at 1/2-3/4 lb per 1,000 square feet (4-6 lbs/ac). Mound treatment rates were standardized to 150 colonies/acre. The rate increases and decreases in proportion to colony density.

³ LD₅₀ is the amount of technical active ingredient in mg/kg body weight that will cause death in 50 percent of laboratory mammals (rats or rabbits) tested when administered either orally or dermally. Source: 1999 Farm Chemicals Handbook, Meister Publishing Co. Higher values indicate less-toxic pesticides.

⁴ From various sources. Some numbers are an average for different conditions.

⁵ Two names, as listed on product label, represent the same chemical compound.

⁶ Phaseout of diazinon for home uses will begin in 2002.

Note: The brand names are trademarks or registered trademarks.



For small areas, not much larger than a typical yard

Type: Hand-held rotary, 1-pound capacity

Cost: Less than \$10

Brand name: Numerous

Availability: Most feed, hardware, and garden stores

Bait distribution: Fair, in an 8- to 10-foot-wide swath

Rate accuracy: Fair to poor

Comments: These seeders are very inexpensive and good enough for around the home. They cannot be calibrated accurately and usually overapply. The stirring agitator works poorly.



For medium-sized areas (2 to 10 acres) or for high accuracy

Type: Hand-held rotary, about 10-pound capacity

Cost: \$22 to \$30

Brand name: Earth-Way, others

Availability: Farm and ranch supply, lawn and garden centers

Bait distribution: Excellent, in an 8- to 12-foot swath

Rate accuracy: Excellent if calibrated properly

Comments: These seeders can quickly pay for themselves by consistently applying the proper amount of bait. The shaking gate agitator gives very good flow with few clogs. More area can be covered by having the applicator sit on the back of a vehicle.



For large areas (more than 10 acres) and frequent or heavy use

Type: 12V electric-powered, vehicle mounted

Cost: \$250 to \$320

Brand name: Herd, model GT-77 (various mounts available)

Availability: Farm or lawn equipment dealers, usually 2- to 3-day delivery

Bait distribution: Excellent, in a 25- to 35-foot swath

Rate accuracy: Excellent, if calibrated properly

Comments: Can be mounted on anything with wheels and 12-volt power. Wide swath covers large areas rapidly. The model with the adjustable gate is highly recommended. Bait flow varies among brands and with temperature, humidity, ground roughness, etc.



For very large areas, rough or wooded/brushy terrain

Type: Aerial application

Cost: \$2.50 to \$3.00 per acre, plus product cost

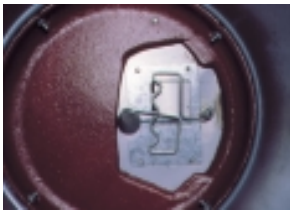
Brand name: Local certified aerial applicator

Bait distribution: Excellent and fast

Rate accuracy: Excellent, if calibrated and applied properly

Comments: Modification of aircraft to apply bait is simple and inexpensive. For details see the Fire Ant Project web site,

<http://fireant.tamu.edu/management/index.html>.



Close-up of Herd GT-77 seeder with adjustable gate and blocking plate. The opening is set at about 1/8-inch, which should apply 1 to 1 1/2 pounds of bait per acre at 5 to 6 mph ground speed. Always calibrate for best results at lowest cost.



For inexpensive seeders, use the smallest setting and walk briskly to apply the correct amount. Overapplication wastes money with little control benefit.

Spreader calibration

Calibration, why bother?

Calibration is the adjustment of any type of application equipment so that it applies the correct amount of pesticide. It is difficult to judge bait output by sight. A 50 percent increase in output is barely noticeable until you run out of material.

Underapplication or poor coverage, particularly with some of the faster acting bait products, often results in poor ant control. On the other hand, scientific tests have shown that some of the insect growth regulator baits are equally effective if used at lower rates than are recommended on the product labels and/or if the application patterns are altered.

Method 1: Trial and error, or “learn-as-you-go”

Hand-held spreaders costing less than \$10 are difficult to calibrate at all because the baits do not flow steadily through the gate opening. The best way to calibrate is to, first, measure the area to be treated, then weigh or measure out the appropriate amount of bait following label directions. Start with the spreader gate opening on the lowest setting or smaller—about 3/16-inch—and walk briskly across the yard. Be sure to keep swaths even with as few overlaps or gaps as possible.

If you have bait left when finished, apply it in swaths perpendicular to the first, and open the gate slightly wider the next time you apply. If you run out before finishing, add more bait and finish the job with a smaller gate opening.









Make note of the gate setting, swath width and walking speed. It may be convenient to write it on the spreader with permanent marker. You will need these notes next time. The trial-and-error method can be used for larger spreaders, but because it involves more bait, measuring large areas and increased expense, stationary calibration is best.

Method 2: Stationary calibration

Supplies needed

Unlike some application equipment, broadcast spreaders are relatively clean, easy and safe to calibrate. Calibrating does require some calculations and a few measuring items. Do not contaminate items that come in contact with food with bait products.

You will need:

-  Calculator
-  Kitchen type scale or, less accurately, measuring cups
-  Measuring tape, longer is better
-  Stopwatch or watch with second hand
-  Gloves and long-sleeved shirt
-  Safety goggles
-  Some assistance, if possible
-  Tarp or bag to catch and collect bait

Calculate your spreader’s swath width

To calculate the distance your spreader throws bait particles, either stand with a hand-held spreader or park a vehicle-mounted spreader so that it will throw entirely onto a hard surface or tarp. Make sure the spreader is at the height at which it will be used. Spread bait for 10 to 15 seconds. If you are hand cranking, make sure to turn the handle at the same speed that you will be turning it while walking, which is usually slower than when standing still.

Then, to each side of the spreader, find where the bait particles start to taper off, and mark it in some way. A few particles will always be thrown farther, but estimate where the main concentration stops. Measure the distance from one side to the other to determine your swath width.

As a rule of thumb, hand-held spreaders throw 8 to 12 feet, depending on your crank speed. Herd seeders throw 20 to 35 feet, depending on height. These distances may change greatly, depending on the speed of the wind and your orientation to it.

Table 5. Factors to use in figuring the number of pounds of insecticide per acre using various swath widths and travel speeds.

Swath width (ft)	Speed (mph)									
	3	4	5	6	7	8	9	10	11	12
10	.061	.081	.101	.121	.131	.141	.152	.162	.172	.182
15	.091	.121	.152	.182	.212	.242	.273	.303	.333	.367
20	.121	.162	.202	.242	.282	.323	.363	.404	.444	.485
25	.152	.202	.253	.303	.354	.404	.455	.505	.556	.606
30	.182	.242	.303	.364	.414	.485	.545	.606	.667	.727
35	.212	.283	.354	.424	.495	.566	.636	.707	.778	.848

Example: Four cups of bait are collected; the spreader throws a 30-foot swath, and tractor travels at 8 mph.

Calculation: 4 cups (3 oz/cup) = 12 ounces (0.75 lbs). 0.75 × .485 (from table) = 1.55 lbs/acre. Close enough!


Weight vs. volume


The weight of a bait depends on its oil concentration, which differs among brands and batches. Oily baits are much heavier. The best way to measure bait is with an accurate scale such as a postal, fishing or kitchen scale. If you don't have a scale, a very rough conversion is 1 poured or scooped (unpacked) measuring cup (8 liquid ounces) of bait weighs about 3 dry ounces, or $\frac{3}{16}$ pound.

Calibrating larger hand-held and vehicle-mounted spreaders

For the most accurate application, maintain a constant speed either walking or on a vehicle with a throttle that can be set, such as a tractor or lawn mower. The light weight and agility of all-terrain and utility vehicles make them good for areas with sensitive turf, many obstructions or rough terrain. The adjustable-gate model of the Herd GT-77 seeder is recommended, because calibration varies with temperature, humidity, terrain and oiliness of the bait.

To calibrate the spreader, stand or park on a hard surface and put a few pounds of bait in the hopper. Block the bait throw with a tarp or bag so that it can be collected. Run and time the spreader for exactly 1 minute. Collect and weigh (or measure) the bait dispensed. Divide the pounds of bait dispensed by the cross-referenced number in Table 5, placement based on your expected speed of travel and swath width. The result is the application rate in pounds per acre.

 To correct overapplication: Speed up, increase the swath width (raise spreader) or narrow the gate opening.

 To correct underapplication: Slow down, decrease the swath width or increase the gate opening.

Bait tends to flow in increments. A $\frac{1}{32}$ -inch gate adjustment may make no difference. The next $\frac{1}{32}$ -inch may vary the rate by 20 or 30 percent, as an entire extra granule is let through or stopped. For fine calibrations, adjust the speed or height (swath width) before adjusting the gate.

Fine-tuning fire ant control with broadcast baits

When applied as directed, all the products listed in this publication reduce the number of fire ant colonies in an area over a period of time. Very simply, they work. There are, however, a number of ways to make them work better, faster, longer and/or at a lower cost.

Application timing

Fast-acting baits kill not only the queens, but also the worker ants that consume enough of the bait. Insect growth regulator-type baits do not kill adult ants. Rather, they break the colony's life cycle. Workers die of natural causes and are not replaced, so the colony eventually disappears.

Environmental conditions determine how fast IGR-treated colonies are eliminated. Research suggests that hot, dry conditions cause the highest rates of worker death, while cool, moist conditions allow ant survival. Consequently, colonies treated in the fall with an IGR bait may not disappear until spring, 6 months later. That same bait, applied in May or June, will probably eliminate colonies in 2 to 3 months, because more ants die in the hot, dry summer.

Table 6. Quick-reference application amounts of fire ant baits for small areas.

Percent of acre	Square feet	Pounds product (1-lb - 1.5-lb rate)	Cups product (approx. dry at 1-lb - 1.5-lb rate)
0.023	per 1,000	0.023-0.035	1/8 cup
0.125 (1/8) acre	5,445	0.125-0.1875	3/4 - 1
0.25 (1/4) acre	10,890	0.25-0.375	1 1/2 - 2
0.5 (1/2) acre	21,780	0.50-0.75	2 3/4 - 4
1 acre	43,560	1.0-1.5	5 1/2 - 8

To take advantage of these bait characteristics, make your treatments not when you have ant problems, but when you expect to have ant problems, so you won't have them.

Bait combinations (hopper-blend treatment)

There is a trade-off between speed and duration of control with fire ant baits. Research has shown that combining a fast-acting toxicant product with a slow-acting, long-lasting product as a hopper-blend offers the best characteristics of both: fast action and long duration.

For instance, hydramethylnon (Amdro®) plus fenoxycarb (Logic®/Award®) baits gives the rapid suppression of Amdro® and the long duration of control of Logic®. Test results indicate that hydramethylnon plus each of the other slow-acting baits controls colonies as fast as the fast-acting bait

alone and may provide longer duration of control. Combinations are applied as a hopper blend of half the amount of each product (0.75 pounds), applied at 1.5 pounds per acre total.

Reduced rate and alternative method applications (skip-swath treatments)

Bait applications generally cost about \$12 to \$18 per acre per year. Although quite reasonable for small areas such as home yards and high-return-on-investment sites such as golf courses, this cost may be out of the question for large sites such as ranches and wildlife management areas.

Baits have been applied at reduced rates and/or coverages to reduce costs, but the results are mixed. Reducing hydramethylnon (Amdro®) to 1/2 pound per acre reduces its effectiveness, as does a skip swath application. On the other hand, applying fenoxycarb (Logic®/Award®) at half-rate, full-coverage (0.75

Table 7. Effectiveness of combining a fast-acting toxicant product with a slow-acting, long-lasting product.

Active ingredient (Brand name)	Treatment season for fastest results	1:1 Amdro blend at 1.5 lb/ac total	Reduced-rate effectiveness
Abamectin (Clinch, Varsity)	Late spring-early fall	Speeds action	Full effectiveness, as skip swath is unproven
Hydramethylnon (Amdro, Siege)	Any season, especially fall	Not applicable	Do not reduce to less than 1.0 lb/ac (1.5 lb preferred)
Fenoxycarb (Logic, Award)	Late spring-early fall	Speeds action	Effective with skip swath and 3/4 lb/ac full coverage
Fipronil (Firestar)	Any season	Not applicable, fast acting	Effectiveness as skip swath not tested. Equally effective at 1.5 to 15 lb. per acre rates.
Pyriproxyfen (Distance, Esteem)	Late spring-early fall	Speeds action	Effective as skip swath
Pyridine (Spectracide Bait)	Late spring-early fall	Probable, but not tested	Also effective at 3 lb/ac
S-methoprene (Extinguish)	Late spring-early fall	Speeds action	Full effectiveness as skip swath is not proven
Spinosad (Eliminator, etc.)	Any season, especially fall	N/A, fast acting	Some response to higher rates

Note: The brand names listed are trademarks or registered trademarks.

Note: The hopper blend of Amdro®Pro or Siege®Pro plus Extinguish™ has received a 24(c) label in Texas.

pound per acre) and as a skip swath (1.5 pounds per acre applied in alternating 30-foot swaths, total 0.75 lb./ac.) results in similar control to a full-rate, full-coverage application (1.5 pounds per acre). The result is an effective treatment at half the cost and, in the case of skip swath, half the labor. Ongoing test results indicate the same may hold true for some of the other slow-acting baits.

True skip swath applications are practical only on large, open areas. Products that perform well with skip swath applications can be used to good effect in situations where complete and/or accurate coverage is difficult, such as around woody or brushy patches and rough terrain. The products will likely affect fire ant mounds 10 to 20 feet from the edge of the actual treated area. This may be an additional advantage of the slow-acting bait component of hopper blends as well.

Disclaimer

It is legal for a consumer to combine baits or to apply less bait than the product label recommends in Texas. However, bait product manufacturers do not support these practices, and Texas Cooperative Extension cannot recommend them. The user, therefore, assumes any liability.

Texas Cooperative Extension and bait manufacturers are trying to secure label recommendations for both hopper blend and skip swath applications.

Research reports can be found at:

<http://fireant.tamu.edu/research/index.html> (see Broadcast Bait-based Field Trials)

Table 8. Costs and sources of fire ant control products.

Active ingredient	Brand name	Source	Approximate price per pound*
Abamectin	Ascend	PCO distributors	\$5.80 (25 lb)
	Varsity	Lesco only	\$6.60 (25 lb)
	Clinch	Ag wholesale/retail	\$7.50 (25 lb)
Fenoxycarb	Logic	Ag wholesale/retail	\$8.30 (3 lb jug), \$6.60 (25 lb)
	Award	PCO/T&O distributor	\$8.30 (3 lb jug), \$7.80 (25 lb)
Fipronil	Firestar	PCO/turf distributors	\$9.50 (2 lb bottle), \$133 (15 lb)
Hydramethylnon	Amdro	Retail	\$9.50 (in 6 oz and 1 lb bottles)
	Combat	Retail	\$6.00 (in 2 lb bottle)
	SiegePro, Pro Bait, Maxforce	PCO distributors	\$6-8 (from 2 lb to 25 lb)
	AmdroPro	PCO/Ag distributors	\$9.50 (1 lb), \$7.40 (25 lb.)
S-methoprene	Extinguish	PCO/Ag distributors	\$12 (1 lb), \$11 (2.5-lb), \$7.40 (25 lb)
Pyridine	Spectracide	Retail	\$7.50 (1 lb bottles)
Pyriproxyfen	Distance, Esteem	PCO distributors	\$9.50 (2 lb jug), \$7.40 (25 lb)
Spinosad	Justice, etc.	PCO/Ag distributors	\$9.85 (1 lb)

* Actual price may vary according to final seller and by total amount purchased. Prices for products indicating PCO (pest control operator) use are wholesale. Retail will be higher.

Note: The brand names listed are trademarks or registered trademarks.

Broadcast Baits—Quick Reference

Why treat with broadcast baits?

No need to find mounds
 Long-lasting control, 6 to 12 months
 Least expensive method in most cases
 Very little labor required
 Extremely low human toxicity
 Specific to ants
 Very few environmental hazards

Why not treat with broadcast baits?







Very slow to work, weeks to months
 Does not give 100 percent control (80 to 95 percent)
 More expensive for few colonies (less than 10 per acre)
 Ruined by moisture within 12 hours of application
 Works only when ants are active
 Requires specialized spreader (cost: from less than \$10 to \$300)
 Can harm some nontarget ant species

Product Guide

Active ingredient	Brand name(s)	Use site(s)	Speed of action	Duration of control
abamectin	Ascend Clinch, Varsity	T&O* limited ag only sports turf	2-6 months	6-18 months
hydramethylnon	AmdroPro, SiegePro Amdro, Maxforce, Combat, Probait	T&O, pasture, hay T&O only	2-4 weeks	6-12 months
fenoxycarb	Logic Award	T&O, limited T&O	2-6 months	6-18 months
Fipronil	Firestar	T&O	2-4 weeks	6-18 months
pyridine	Spectracide	T&O	2-4 months	6-18 months
pyriproxyfen	Distance, Esteem	T&O, limited ag	2-4 months	6-18 months
s-methoprene	Extinguish	almost any site	2-6 months	6-18 months
spinosad	Justice, other pro- ducts with Conserve	T&O	2-6 weeks	6-12 months

*T&O, turf and ornamental, refers to ornamental turf, trees, shrubs, flowerbeds, etc. in the landscape. Does NOT include vegetable gardens.

Application tips

-  **More is not better, just more expensive.** Apply at 1 to 1 1/2 pounds per acre, or as listed on the label.
-  Use proper spreaders and *calibrate!*
-  Apply only when ants are actively searching for food.
-  Apply when rain is not expected for 24 hours. Product may work if only 4 to 6 hours without rain.
-  Use fresh product. Shelf life is 2 to 3 years unopened, 1 year opened and sealed, 1 to 2 months open.
-  Do not apply to water or sites not listed on the label.

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