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Imported Fire Ant Control in Production Nurseries With Baits





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I. BAITS USED IN THE FEDERAL IMPORTED FIRE ANT QUARANTINE

Four active ingredients used in fire ant bait products are currently approved under the Federal Imported Fire Ant Quarantine for treating nursery stock, including fenoxycarb, hydramethylnon, pyriproxyfen, and (S)-methoprene. Bait products containing one or more of these active ingredients and labeled for use in nurseries include Amdro[®] Pro, Award[®] Fire Ant Bait, Distance[®] Fire Ant Bait, Extinguish[®] Professional Fire Ant Bait, or Extinguish[®] Plus (Table 1). Although some information in this publication applies to general bait use, the goal of the publication is to provide information on baits that can be used in the Federal Quarantine for commercial nurseries.

II. GENERAL BAIT INFORMATION

A. What is a Fire Ant Bait? A bait has three essential parts: 1) a toxicant or insect-controlling chemical (active ingredient), 2) a food substance or attractant (*e.g.*, soybean oil), and 3) a distributing particle that carries both the toxicant and food substance (*e.g.*, corncob grit). Generally, the insecticide active ingredient is dissolved in the oil portion of the bait and the ants consume the insecticide while feeding on the oil. Baits are particularly effective against social insects like ants that forage for food and bring it back to the colony.

B. Bait Features:

- 1) Slow-acting toxicant. A slow-acting toxicant allows the product to be distributed to other members of the colony before the original forager dies.
- 2) Non-repellent properties. No part of the bait can be repellent to the target fire ants.
- 3) Effective at a wide range of doses. As bait ingredients are passed between members of the colony (*i.e.*, trophallaxis), the insecticide can become progressively diluted. Therefore, the insecticide must work at a wide range of doses.
- 4) Minimal non-target effects. Ideally, baits would be more attractive to fire ants than other insects. However, native ants will forage fire ant baits and some impact can occur, especially when baits are broadcast. Native ants are beneficial because they reduce site re-infestation by fire ants.
- 5) Generally lower risk to handlers than traditional insecticide products. The insecticide in baits is formulated at very low concentrations (often 0.5 to 1%) and the toxic action of some baits (*e.g.*, insect growth regulators) are more specific to insects, resulting in fewer undesirable effects on non-targets. Nonetheless, applicators still need to use the same caution when handling baits as with any pesticide product and the personal protective equipment (PPE) listed on the label must be worn to comply with the law (Table 1).
- 6) Generally safe to the environment. Baits have minimal environmental impact if used according to the label. All bait insecticides approved for the Federal Quarantine are toxic to aquatic organisms and should never be applied to water or sites where rain or irrigation could wash the bait into surrounding water bodies.

C. Bait Benefits for Your Nursery. Baits are one of the most practical and economical methods for treating large amounts of nursery acreage for fire ant control because baits are:

- 1) Low cost. Bait products are relatively inexpensive, typically costing from \$10 to \$15 per acre. Purchasing bait in bulk quantities may further lower your cost, but when deciding how much to purchase remember that baits have limited shelf life (see Section IV). A typical bait spreader with a 20 ft. swath width will only require about 10 minutes to treat one acre, so labor costs are also relatively small with a bait application.
- 2) Efficient and effective. A broadcast bait treatment avoids the time consuming process of locating and individually treating all the fire ant colonies in the area, and small colonies that are easy to miss during visual inspections are effectively treated.

D. Bait Limitations. All baits used in the Federal Imported Fire Ant Quarantine for nursery stock treatment must be used in conjunction with a traditional toxicant contact insecticide.

Limitations described below are reasons why baits cannot be used “alone” in the Federal Quarantine:

- 1) Short field residual. Baits do not last long in the environment like traditional broad-spectrum contact insecticides. Moisture from dew, rain, or irrigation makes bait unattractive to foraging fire ants. Therefore, the bait may only be effective for one day and it is critical to apply when conditions are favorable for ant foraging (see section IV). No bait will provide continuous control of fire ants.
- 2) Slow control. The reduction in fire ant populations following a bait application may not be observed in the treatment area for several weeks following treatment. None of the baits permitted in the Federal Quarantine can provide same day control of fire ants, but metabolic inhibitor baits (Amdro Pro) work faster than insect growth regulator (IGR) baits (Award, Distance, and Extinguish). Baits with IGR properties require a longer period to eliminate colonies because they interrupt reproduction by sterilizing the fire ant queen and do not kill existing worker ants, which must die naturally.
- 3) Ineffective on newly mated queens. Fire ant colonies release winged reproductives periodically to increase and disperse the ant population. The newly mated female reproductives (queens) do not forage for food, and the new colony founded by the queen will not have foraging workers for at least 30 days after the mating flight. Therefore, baits are completely ineffective for preventing the re-infestation of a nursery by newly mated queens, and baits will not eliminate new colonies being started by newly mated queens until worker ants begin foraging.

III. WHEN TO USE FIRE ANT BAIT IN A NURSERY

Fire ant baits can be used under three circumstances in commercial nurseries:

- 1) General fire ant suppression. Baits are a cost effective way to suppress fire ant populations on your nursery property. In this case, the goal is not to meet Federal Quarantine requirements, but to just reduce fire ant infestations. Any bait labeled for commercial nursery sites can be used for general fire ant suppression. To achieve maximum fire ant suppression, a spring and fall application is optimal, but check the labeling to confirm that two applications per year are allowed for the bait you are using. Some baits allow more than two applications per year, but usually specify minimum periods between re-treatment. If your property has less than 20 mounds per acre, it may be more cost effective to treat individual mounds rather than broadcast the bait (see Section IV and Table 1 for directions on individual mound treatments). Individual mound treatments also help to conserve beneficial native ants. Fire ant colonies often concentrate in areas with fewer disturbances from farm machinery (*e.g.*, fence and nursery rows), so your general fire ant suppression activities may want to be focused in these sites.

- 2) Federal Imported Fire Ant Quarantine pre-harvest treatment for field-grown nursery stock. The pre-harvest treatment is one of three methods approved to certify field-grown nursery stock before shipping from a Federal Quarantine regulated area (the other two methods are post-harvest treatments). To comply with the Federal Quarantine certification requirements, the in-field treatment **must use one of the accepted baits** (Table 1), **followed by a granular chlorpyrifos treatment three to five days after bait treatment.** The purpose of the bait is to reduce fire ant populations at the site and to either kill the queen (or queens) or stop reproduction in the colonies. The bait has no residual activity. Therefore, the chlorpyrifos treatment is **mandatory** to provide rapid elimination of existing colonies and provide residual activity against fire ant queens attempting to re-infest the site. It is critical for the bait to be applied three to five days **before** the chlorpyrifos, to give the ants an opportunity to forage the bait and distribute the bait insecticide to the queen and other colony members, before foraging activity is impacted by the fast-acting chlorpyrifos treatment. Both the bait and granular chlorpyrifos treatments **must be** broadcast to an area that extends a minimum of 10 feet past the edge of the harvested nursery stock on all sides. The bait treatment is only effective when temperatures are suitable (see section IV), and therefore, baiting after October or before April is not recommended or likely to be approved by the Department of Agriculture.
 - 3) Fire Ant Free Nursery Program. Baits are also used as a component of the Fire Ant Free Nursery Program for containerized nursery stock. The goal is to reduce fire ant infestations on the nursery property with bait usage, in conjunction with other treatments being applied to containerized plants. For more details, see “Quarantine Treatments for Nursery Stock & Other Regulated Articles” available: http://www.aphis.usda.gov/publications/plant_health/content/printable_version/IFA2007.pdf.
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IV. EFFECTIVE AND SAFE BAIT USAGE

You must apply baits properly for the bait treatment to work:

- 1) Follow label directions. It is a violation of Federal law to use any pesticide in a manner inconsistent with its labeling. In addition, baits have specific requirements that must be met for the bait to work properly and these requirements are detailed on the label.
- 2) Wear proper personal protective equipment (PPE) for your safety. Baits approved for the Federal Quarantine all require long-sleeved shirt and long pants or coveralls and shoes plus socks (Table 1). Most bait labels recommend chemical-resistant or waterproof gloves. Gloves should be worn even if not recommended on the label because the oil in the bait could transfer the insecticide to your skin. None of the bait labels allowed in the Federal Quarantine list eye protection as required PPE, but protective eye wear is still a good idea, especially if standing near an operating bait spreader that is slinging bait particles.
- 3) Soil surface temperature between 70° to 90° F. It is important to apply bait when fire ants are foraging. When summer air temperatures exceed 90° F, baiting should only be done in mid-morning after the dew has dried or late afternoon when air temperatures are lower. Baiting should not be done at all when air and soil surface temperatures are below 60° F.
- 4) Pay careful attention to expiration dates. The bait must be attractive to fire ants or it will not be foraged. The oil portion of baits can become rancid over time. Fire ant baits will also absorb moisture; this may impede flow from a bait spreader. Opening the bait container and exposing the bait to air reduces shelf life. It is a good practice to use all of the bait after opening the container. Bait from an opened and closed container will be significantly less attractive to fire ants after 6 months compared to bait from a non-opened container. Some bait labels specify usage within 3 months of opening (*e.g.*, Amdro Pro). If buying bait in bulk quantities, avoid buying more bait than you will use from an unopened container in a year. Test your bait to see if it is still attractive to ants before using, especially if it has been stored for a long period or if the bait has a stale odor (see #9).

- 5) Bait storage. Store baits in cool (no warmer than room temperature), dry locations away from strong odors that might contaminate the bait (*e.g.*, gasoline, cigarette smoke, other pesticides). Keep containers closed and do not open until you are ready to use the entire product.
- 6) Do not disturb mounds more than necessary. The amount of time ants spend repairing the mound is time spent away from foraging the insecticidal bait.
- 7) Recommendations for bait treatment of individual mounds. Although most application scenarios in the nursery involve broadcasting the bait, spot treating individual mounds when they are detected can be a low cost method to reduce fire ant populations. Most extension recommendations indicate individual mound treatments should be applied only around the mound perimeter and not on the mound surface because fire ant workers exit from lateral foraging tunnels. However, recent research indicates fire ants also effectively forage baits on the mound surface. Therefore, apply the individual mound treatment at rates recommended for the particular bait you are using (Table 1) to both the mound surface and around the perimeter of the mound out to a distance of 4 feet in all directions.
- 8) Apply when ants are actively foraging (See #3 above). Use pieces of meat (*e.g.*, hotdog) or potato/corn chips placed at varying distances from several mounds to determine whether ants are actively foraging. If using potato/corn chips, chips with more oil and fat will be more attractive (*i.e.*, use fried chips with high fat contents and not low fat products). Check for ant activity on food baits after 10 to 30 minutes. If no ants are present on the food baits, it is probably a bad time to apply the bait.
- 9) Test your insecticide bait at the same time you test food baits. The oil portion of insecticidal bait can become rancid with time, making the bait less attractive. Therefore, while evaluating ant-foraging activity with food (See #8 above), use chemical resistant gloves to place a small amount of insecticidal bait in the same area. If ants remove the food, but not the insecticidal bait, it indicates the bait may be old or the ants are not interested in the bait at that time. Fire ant food preferences can vary seasonally, so time applications to agree with the ant foraging response to the insecticidal bait, to avoid wasting time and the expense of the treatment.
- 10) Apply when foliage is dry and no rainfall is expected for 6 to 12 hours. Do not apply baits when dew is present, after irrigation, if rain has occurred or is expected, or during periods of excessive humidity. Irrigation should also be avoided for at least 24 hours after application according to some bait labels (*e.g.*, Distance), and this recommendation is appropriate for other baits used in the Federal Quarantine. Wet bait is unattractive to fire ants. Also, high humidity can cause clumping of your bait and affect the dispersal of the bait from your spreader.
- 11) Other pesticide treatments. Other pesticide treatments applied before or too soon after bait applications can reduce bait effectiveness. Always apply baits in advance of other pesticide treatments (preferably 3 – 5 days before other fungicide, herbicide, or insecticide treatments). Consider other activities that could also reduce bait palatability to fire ants, such as fertilizer and lime applications, and avoid these treatments around the time of the bait application.
- 12) Apply broadcast bait treatments uniformly. Uniform bait distribution increases the likelihood that all mounds in the area will have access to the bait. At the same time, avoid overlapping swaths that will over-treat the area and violate the labeled rate for the pesticide.
- 13) Calibrate your equipment regularly to ensure baits are applied at the correct rate. Be aware that changes in humidity can alter the spreading properties of bait particles and may reduce or increase the rate applied. Applying more bait than listed on the label will not provide better control, but will cost more money and also violates the law.
- 14) Assign bait application equipment for “bait use only”. Pesticides or fertilizers can contaminate bait equipment and reduce bait attractiveness to fire ants. It is a good idea to mark your spreader with the words “Fire Ant Bait Only” (Spanish: “Solo Usar Con Cebo Para Hormiga De Fuego”). If other pesticide products have been used in the spreader hopper, it should be thoroughly cleaned (see #15) before baiting.

- 15) Clean your bait equipment after each use. Bait left in the spreader hopper can become rancid, contaminating future bait applications and making them less effective. In addition, bait left in the hopper may dry and become crusty, making the next application difficult or less accurate. Follow manufacturer recommendations for cleaning the equipment. Manufacturer directions for Herd[®] spreaders include washing with soap and water at least every three days of use. Use a non-scented soap to reduce the likelihood of contaminating the spreader with odors that may be unattractive to fire ants. Between washings, the majority of left over bait can be removed from the hopper using a small scoop and brush. After the hopper has been mostly emptied, any small amount of residue that remains can be removed with a shop vacuum.
- 16) Do not use illegal substances. Baits are more effective, cheaper, and less damaging to the environment than illegal or ineffective treatments that are sometimes used for fire ant control (e.g., gasoline, diesel fuel, motor oil, bleach, other household chemicals). Do not use these substances in your fire ant control programs.
- 17) Use recommended equipment. The most effective method to treat large acreage is with a broadcast spreader such as a Herd[®] GT-77 (Fig. 1A and 1B) or a PTO-driven spreader like a Vicon (Fig. 1C and 1D). Herd[®] spreaders can be mounted on all terrain vehicles (ATV's, including Gators, Mules, etc.), pickup trucks, or tractors and must be connected to the vehicle's battery to operate the electrical motor. Mounting a switch (Fig. 1D and 1E) between the battery and the spreader allows the driver to turn the unit off and on during applications. Nursery row width and field conditions will be a factor in which vehicle type can be used. A Herd[®] spreader mounted in the receiver hitch of a truck works well in open areas where it is possible to drive at higher ground speeds. In nursery settings, it is easier to maintain a constant ground speed using tractors small enough to drive the middles of nursery rows. Backpack blowers modified to apply baits are also available and may be useful for nursery rows that are too narrow for mechanized equipment. Small areas can be treated with hand-held or push rotary spreaders (Fig. 1F), but these devices are less accurate and their bait output can vary with the consistency of the applicator's walking speed.

Table 1. Summary of pesticide label information or comments from the manufacturer for fire ant baits (Note: The Federal Imported Fire Ant Quarantine requires a contact insecticide be used in conjunction with these baits).

Item ^a	Baits Approved For Use in the Federal Imported Fire Ant Quarantine			
	Amdro [®] Pro	Award [®] Fire Ant Bait	Distance [®] Fire Ant Bait	Extinguish [®] Professional Fire Ant Bait ^c
Manufacturer(s)	BASF Corp. or American Cyanamid Co.	Syngenta Crop Protection, Inc.	Valent USA Corp.	Zoecon Professional Products
Active ingredient	Hydramethylnon	Fenoxycarb	Pyriproxyfen	(S)-Methoprene
Mode of action	Metabolic Inhibitor	IGR	IGR	IGR
Use rate	1 to 1.5 lb / acre	1 to 1.5 lb / acre	1 to 1.5 lb / acre	1 to 1.5 lb / acre
REI	12 hours	12 hours	12 hours	4 hours
PPE application	LS, LP, CG, SS	LS, LP, SS	LS, LP, WG, SS	LS, LP, CG, SS
PPE early reentry	C, CG, SS	C, WG, SS	C, WG, SS	C, CG, SS
Maximum lb / acre / year	8 lb	Not specified	Not specified	No maximum
Maximum applications / year	4 times	2 preferred (3 if needed)	2 – 3 / year suggested	2 – 3 / year suggested
Minimum application intervals	3 months	3 – 4 months	3 – 4 months	When ants observed
First impact on fire ants	0 – 4 weeks	4 – 8 weeks	3 – 4 weeks	3 weeks
Substantial colony mortality	Not specified	4 – 8 weeks	8 weeks	8 – 10 weeks
Length of control ^b	Up to 10 weeks	Up to 6 months	Up to 6 months	Up to 6 months
Individual mound treatment	2 – 5 level tablespoons	1 – 3 level tablespoons	1 – 4 tablespoons	3 – 5 tablespoons
Storage directions	Cool, dry place, container closed, use 3 months after opening	Dry area away from heat	Cool dry place, container closed	Cool dry place, container closed

^a Information was derived from the pesticide labels and manufacturer communications. Always read the label because labels can change. Metabolic inhibitor baits kill the queen, workers, and larvae. IGR (insect growth regulator) baits affect the reproduction of the queen, but do not kill worker ants, which must die of natural mortality factors. REI = Restricted entry interval, the amount of time before workers can re-enter the area without personal protective equipment required for early reentry on the label. PPE = Personal protective equipment required on the label for application or early re-entry (C = coveralls, LS = long sleeved shirt, LP = long pants, CG = chemical resistant gloves, WG = waterproof gloves, SS = shoes plus socks). Although not specified on the label, protective eyewear is also a good idea. All baits may require more time than specified to control fire ants in cooler weather. All these baits, with exception of Extinguish, should be applied only to non-bearing nursery stock.

^b Length of control can vary due to several factors, including how effectively the bait was applied, environmental conditions at the time of application and the influence of those conditions on ant foraging activity and the amount of bait gathered before the bait loses its attractiveness, and the fire ant population density in the vicinity of the treatment site, which affects the re-colonization rate.

^c Extinguish Plus is also approved for the Federal Imported Fire Ant Quarantine because it contains hydramethylnon and S-methoprene, and therefore, functions as both a metabolic inhibitor and an IGR bait. Extinguish Plus is not listed in the Federal Quarantine guide, but is approved.



Fig. 1. Images of a tractor-mounted (A and B) Herd spreader or (C and D) Vicon spreader; an on / off switch for the Herd spreader mounted on the (E) fender of a tractor or (F) beneath the tractor seat; and (G) an Earth-Way push spreader being used to apply fire ant bait in a commercial nursery.

For more information, contact your local Tennessee State University or University of Tennessee county Agricultural Extension agent. Additional information may be obtained at:

Tennessee State University, School of Agriculture and Consumer Sciences, Cooperative Extension Program, 3500 John A. Merritt Blvd., Box 9635, Nashville, TN 37209-1561
<http://agfacs.tnstate.edu/uno/Extension.html>

The University of Tennessee Institute of Agriculture, 2621 Morgan Circle, 101 Morgan Hall, Knoxville, TN 37996
<http://agriculture.tennessee.edu/>

Precautionary Statement

To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label.

Disclaimer

This publication contains pesticide recommendations that are subject to change at any time. The recommendations in this publication are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The label always takes precedence over the recommendations found in this publication. Likewise, the Federal Imported Fire Ant Quarantine also takes precedence over the recommendations in this publication. Use of trade or brand names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others that may be of similar, suitable composition, nor does it guarantee or warrant the standard of the product. The author(s), Tennessee State University, the University of Tennessee Institute of Agriculture and University of Tennessee Extension assume no liability resulting from the use of these recommendations.

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