UF IFAS Extension UNIVERSITY of FLORIDA

ENY-169

Ant Control in the Apiary[1]

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Ants are one of a beekeeper's most common pests, both in the apiary and in the honey house. Florida and the southeastern United States have a large and diverse ant fauna, with both native and exotic species. The vast majority of ant species have no impact on our bees or us. The few pest species can cause serious problems. We can divide the ants into two pest groups, bee and brood eaters and honey and nectar stealers. Some species can cause both problems at times.

The Bee and Brood Eaters

black carpenter ant—*Camponotus pennsylvanicus*

compact carpenter ant—*Camponotus planatus*

Florida carpenter ants—*Camponotus floridanus* and *C. tortuganus*

crazy ant—*Paratrechina longicornis*

crazy ant—*Nylanderia bourbonica*

tawny crazy ant—*Nylanderia fulva*

bigheaded ant—*Pheidole megacephala*

red imported fire ant—*Solenopsis invicta*

little fire ant—*Wasmannia auropunctata*

The Honey and Nectar Stealers

Argentine ant—*Linepithema humile* (formerly *Iridomyrmex humilis*)

ghost ant—*Tapinoma melanocephalum* (called black-headed ants in California)

white-footed ant—*Technomyrmex difficilis*

Pharaoh's ant—*Monomorium pharaonis*

The most prominent ants that people notice are the **carpenter ants**. These are some of our largest ants and are abundant in both suburban and rural locations. Many Floridians call these bull ants because of their large size. The eastern or Florida harvester ant, *Pogonomyrmex badius*, is also called the "bull ant," but they can deliver a wicked sting. Carpenter ants cannot sting, but they do deliver a slicing bite into which they spray formic acid. There are numerous species in Florida. These ants are omnivorous, eating honeydew, nectar, honey, other insects, and carrion. The most widespread and common is the Florida carpenter ant. The head and thorax are reddish and the abdomen is black. These ants do not excavate wood but nest in voids. Vacant bee equipment is a favorite nesting location. They will commonly nest between the inner and outer covers. These ants generally won't raid healthy colonies, but will raid weakened colonies for honey, brood, wax moth larvae, and uncapped nectar.

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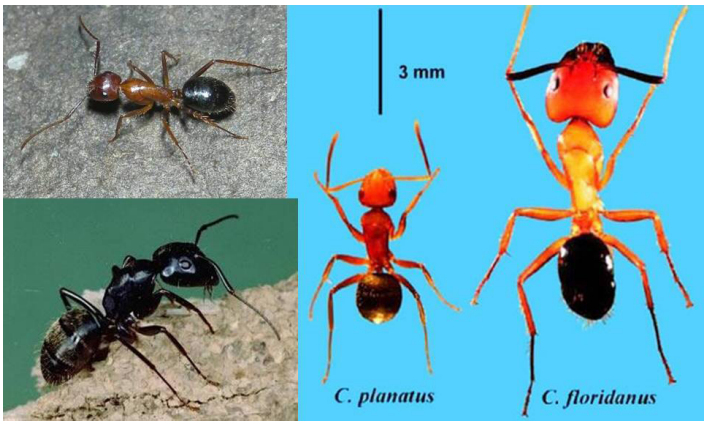

Figure 1. The Florida carpenter ant (*Camponotus floridanus*) (upper left), a comparison of the compact carpenter ant (*Camponotus planatus*) and the Florida carpenter ant (right), and the black carpenter ant (*Camponotus pennsylvanicus*) (lower left).
Credits: William Kern, UF/IFAS (Florida carpenter ant); Rudolf H. Scheffrahn, UF/IFAS (comparison of workers of the compact carpenter ant and the Florida carpenter ant); Clemson University, USDA Cooperative Extension Slide Series, Bugwood.org (black carpenter ant)

In the Florida Panhandle and most of eastern North America, we have the black carpenter ant, *Camponotus pennsylvanicus*. These ants will excavate wood softened by fungal wood rots. Another species that was introduced into south Florida is the compact carpenter ant, *Camponotus planatus*. The compact carpenter ant is diurnal (active during the day) while the other carpenter ants are more nocturnal (active at night). It is solid brown in color. Although they are smaller than our native carpenter ants, I have had more problems with compact carpenter ants in south Florida than any other ant species. They have excavated into the wood of both lids and supers and have even taken over nuc boxes. Carpenter ants tend to be polymorphic (many sizes of workers). While carpenter ants will take sugar baits on occasion, protein-based baits are generally better accepted.

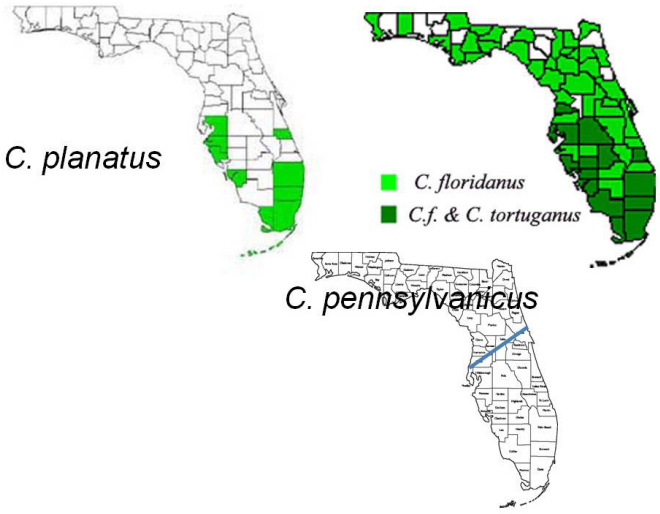

Figure 2. Distribution of the common *Camponotus* species in Florida. *Camponotus pennsylvanicus* occurs roughly from the Interstate 4 corridor northward.

The **crazy ants**, *Paratrechina longicornis, Nylanderia bourbonica*, and the tawny crazy ant, *Nylanderia fulva*, get their name from their very fast movement made possible by their very long legs. *Paratrechina longicornis* and *Nylanderia bourbonica* have moderate sized colonies from a few hundred to a few thousand workers. The tawny crazy ant, *Nylanderia fulva*, is a much more serious problem due to their much larger colonies. These ants are in the formic acid ant subfamily (Formicinae), so they spray formic acid as a defensive chemical rather than having a stinger. They will take either sugar or protein-based baits.

Figure 3. The crazy ants, *Paratrechina longicornis, Nylanderia bourbonica*, and *Nylanderia fulva*. Crazy ants can be identified because the scape (first antennal segment) is longer than the head (yellow bracket in the top picture). In *Paratrechina*, the scape is almost twice the length of the head.
Credits: http://antkey.org/

Another exotic invader is the **pan-tropical bigheaded ant**, *Pheidole megacephala*. Their colonies are hunting machines. These ants nest in the soil and send out foraging columns to find insects and other small animals to dismember and carry back to the colony. Normally they will be happy with carrying off dead bees from the entrance and small hive beetle larvae that leave the hive to pupate in the soil. If a hive becomes very weak, they will go inside the hive and carry off bee brood, small hive beetle larvae, and wax moth larvae. They are most susceptible to protein-based ant baits.

Of course, the most famous ant in Florida is an invader from South America, the **red imported fire ant**, *Solenopsis invicta*. Fire ants are known for their sting and the blister it causes. They will forage on insects, seeds, carrion, and even fruits like strawberries, peppers, etc. They have polymorphic workers (many sizes of workers in the same colony) and usually one queen per colony. My experience with them living under hives protected by ant guards has generally been positive. They much prefer foraging for small hive beetle larvae in the soil and dead bees on the ground than

invade a healthy hive. I have lost several swarms placed in nucs due to red imported fire ants, and weakened hives are susceptible to their predation. Natural predators from South America, the decapitating Phorid fly, and fire-ant-specific pathogenic fungi and viruses have been introduced and may help keep fire ant populations to a reasonable size in the future.

Bigheaded ant, *Pheidole megacephala*.

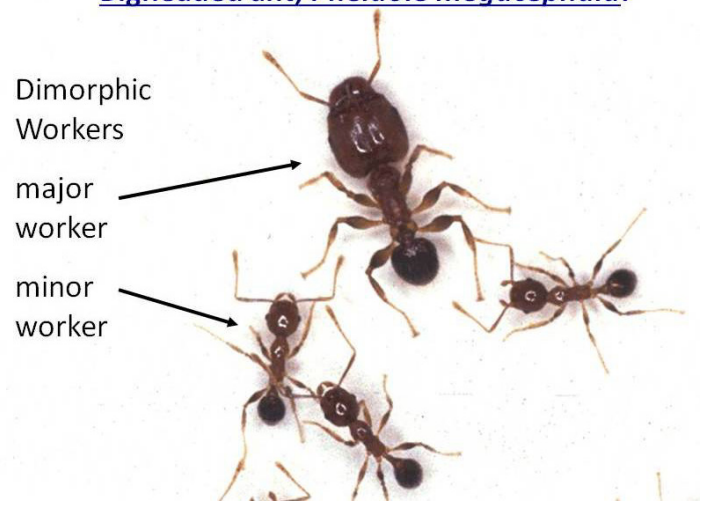

Figure 4. Bigheaded ants (*Pheidole megacephala)* are named for the major workers that make up less than 5% of the colony.
Credits: William H. Kern, UF/IFAS

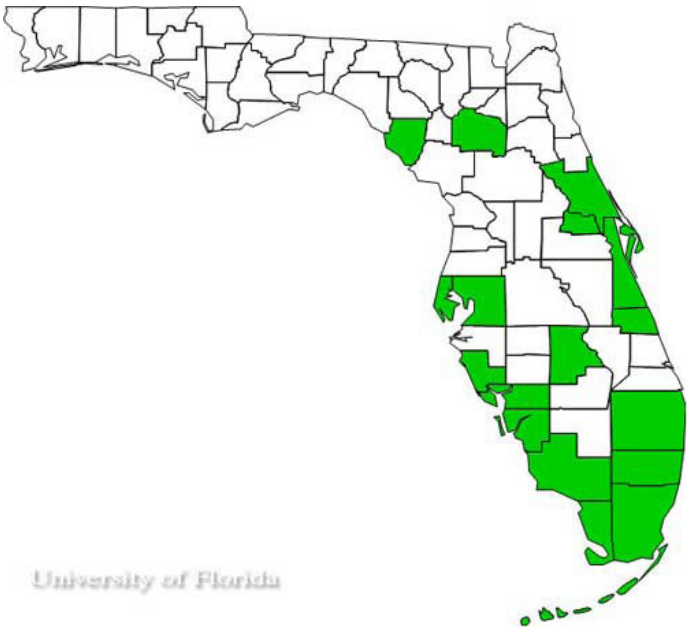

Figure 5. Florida counties with confirmed infestations of bigheaded ants as of 2007.
Credits: Warner and Scheffrahn (2007)

The **little fire ant**, *Wasmannia auropunctata*, was introduced from South America and now occupies most of the Florida peninsula. It has become a major problem for Hawaiian beekeepers since its 1999 introduction into Hawaii. These small ants (1.5 mm, the thickness of a US penny) are two-node ants and have a wicked sting.

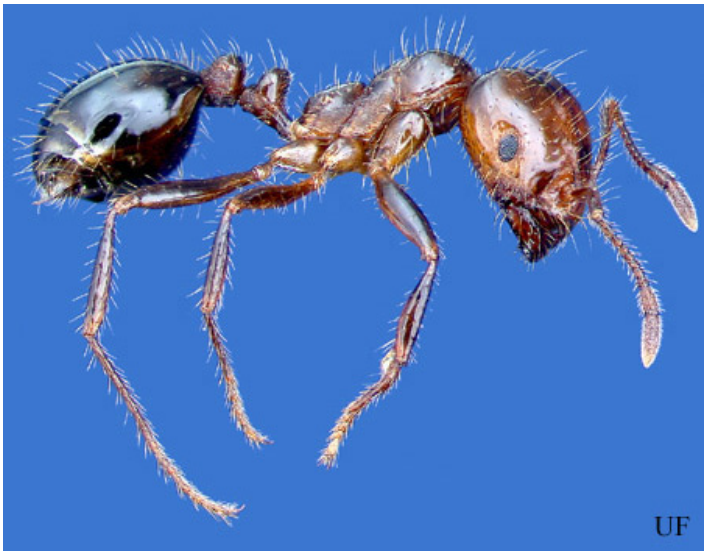

Figure 6. Lateral view of a worker of the red imported fire ant (*Solenopsis invicta* Buren). These ants have a two-node waist segmentation and no propodial spine on their back above the last pair of legs. Notice the shiny appearance that can often distinguish fire ants from similarly sized two-node ants.
Credits: David Almquist, UF/IFAS

Figure 7. Little fire ant (*Wasmannia auropunctata* [Roger]), workers. Reddish to almost orange with strongly sculptured head and thorax.
Credits: UF/IFAS

The **Argentine ant**, *Linepithema humile* (formerly *Iridomyrmex humilis*) is a medium-sized, dull brown ant with a single-node waist. They are generally seen in large foraging columns. These are formic acid ants like carpenter ants and crazy ants. This is one of the ant species reported to form super colonies that can be hundreds of kilometers across. Their large colony size and love for sugars can be devastating to bee hives if hives are not protected by effective ant guards. They are best controlled with sugar-based liquid baits.

Figure 8. Argentine ant (*Linepithema humile).*
Credits: http://itp.lucidcentral.org/id/ant/pia/Fact_Sheets/Linepithema_humile.html

The **ghost ant**, *Tapinoma melanocephalum*, is another invasive ant species from either Africa or Asia. They are tiny, 1.3 to 1.5 mm long, or the thickness of a US dime or penny. Their coloration also makes them look smaller than they truly are. On a light-colored surface you mostly see the head and thorax, while on a dark surface you mostly notice the abdomen and legs. In either situation, the ant appears half the size it really is. They are also monomorphic, which means that all the workers in a colony are the same size. Several times I have seen an entire colony of these ants nesting on the top bar of a frame under the cover. These are sugar-loving ants, feeding on honeydew, nectar, honey, and any sugar-containing liquid inside houses. They can be a serious nuisance in the honey house. The defensive pheromone of the ghost ant is composed of 6-methyl-5-hepten-2-one and actinidine. When these ants are crushed, they give off a banana oil smell, or some people describe it as smelling like a piña colada. The 6-methyl-5-hepten-2-one is structurally very similar to the honey bee alarm pheromone component isopentyl acetate (see Figure 7). This may explain why these ants upset a bee colony when the ants are disturbed or crushed.

The **white-footed ant**, *Technomyrmex difficilis*, is originally from southeast Asia. These ants are about 3 mm long, the thickness of 2 US pennies. These are tree-dwelling ants that can develop into colonies of over one million workers. They have an unusual reproductive system compared to most ants. There are three reproductive types of females in a WFA colony, typical winged queens and two non-winged forms that are called intercastes. The numerous queens and intercastes all lay viable eggs and make up as much as 40% of the colony. A small colony of 100,000 WFA would have about 40,000 females laying eggs. These ants are best controlled with numerous bait stations containing sugar-based liquid bait. A large colony can remove up to a gallon (4 liters) of liquid bait every 2–3 days, requiring regular replacement.

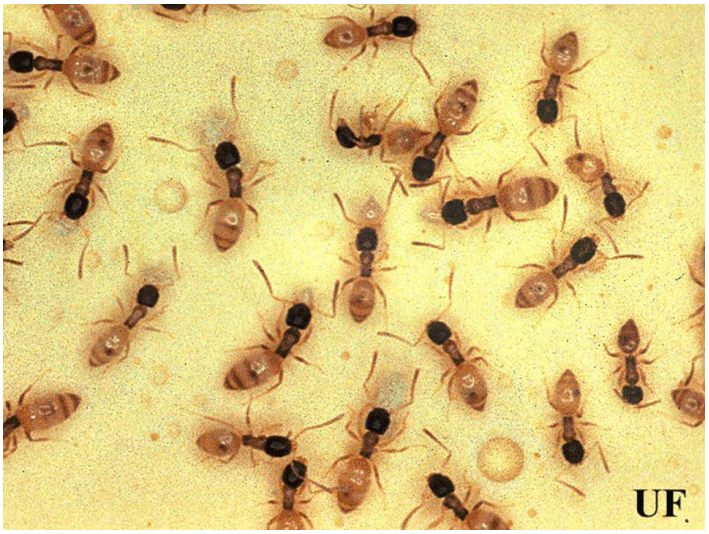

Figure 9. Ghost ant (*Tapinoma melanocephalum)* (called black-headed ants in California or sugar ants in the Southeast).
Credits: J. L. Castner, UF/IFAS

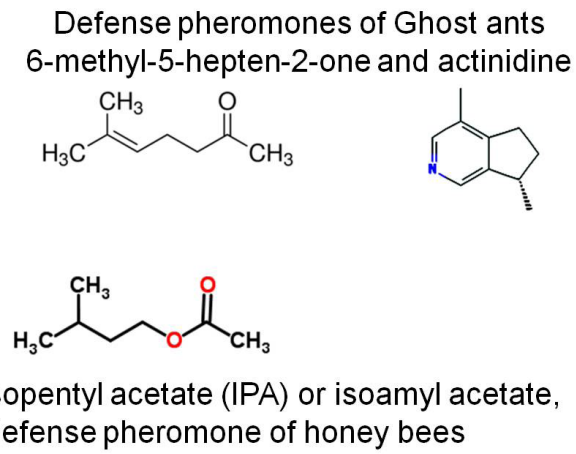

Figure 10. A structural comparison of the defense pheromones of ghost ants and honey bees.

The **Pharaoh ant**, *Monomorium pharaonis* (Linnaeus) is one of our most troublesome structural pest ant species. The workers are brown and 1.5–2.0 mm long (between the thickness of a US penny or nickel). These ants have a two-node waist and a spatula-shaped stinger that can't penetrate human skin, so they can't sting you. These ants are more likely to be a pest in the honey house than in the apiary. These ants are reported to be native to northern Africa, but because they have been carried all over the world by human commerce, it is impossible to identify their origin. Pharaoh ants are omnivorous and are reported to change their diet

preferences (sugar, proteins, oils/fats) based on the needs of the colony. Often sugar (honey or corn syrup), oil (peanut butter oil or butter/ margarine), and protein-based baits (liver baby food, piece of hot dog, or Vienna sausage) are offered on a choice card to see which bait will work best.

Figure 11. Worker of the white-footed ant (*Technomyrmex difficilis* Forel). Black body with cream-colored feet and end of antennae. They have a one-node waist that attaches low on the gaster making it difficult to see the petiole of the waist.
Credits: R. H. Scheffrahn, UF/IFAS

Figure 12. Pharaoh ant worker (*Monomorium pharaonis* [Linnaeus]). The roughness of the head and thorax differs from the shiny cuticle seen in fire ants. They have a two-segmented waist (pedicel) and a stinger, but the stinger is ineffective against human skin.
Credits: Jim Kalisch, University of Nebraska-Lincoln

Important Facts about Ants

Adult ants can only ingest liquids. They cannot eat solid food. The sieve plate in the back of their mouth/throat will only allow liquids to pass through. This has an impact on the effectiveness of various types of bait. Liquid baits are easier to ingest than gel baits, which are easier than solid baits. Granular baits are chewed by the ants, to remove the toxicant-containing oils, or saliva dissolves the soluble bait components and toxicant, and this liquid is then swallowed.

Baits

Carnivorous and scavenger ants like bigheaded, fire, and carpenter ants prefer proteins and fats/oils, while sugar-loving ants like ghost, white-footed, and Argentine ants readily go to sugar-based baits. Baits are universally considered the best option for ant control. The ideal bait has an attractive food-based matrix and the active ingredient (the poison) is non-repellent and slow acting, so it can be distributed throughout the colony before the foragers start to die. Pest control professionals who aren't sure which ant they are dealing with can use a choice card with liver baby food (protein), peanut butter (oils), and honey or sugar syrup. Whichever option the ants most prefer is the bait type you should use or use multiple baits.

Baits used outdoors should be inaccessible to people, pets, wildlife, and non-target pollinators. Commercial or home constructed bait stations are the easiest way to accomplish this.

Figure 13. There are numerous commercial ant bait stations on the market, and bait stations are also easy to make in the home workshop. The important consideration is that they be inaccessible to bees while allowing the ants to enter freely.
Credits: William H. Kern, UF/IFAS

Exclusion

Exclusion has long been the preferred method of ant control. Beekeepers have used ingenious methods of keeping ants out of beehives. Ant stands can be purchased or made. Usually they involve either a moat or a sticky barrier. The moat usually contains water and dish soap or detergent. In dry locations, fine dust like talc or amorphous silica gel dust are used in the moats. The dust coats the ant's feet and they are unable to climb out of the moat and die.

Non-drying, sticky materials like synthetic isoparaffinic hydrocarbon or organic mixtures (castor oil, waxes, and resins) are available commercially as barrier materials. Axial grease or wheel-bearing grease has been used in the past, but is not recommended because of potential

environmental contamination. Some of the commercial organic mixtures are even approved for organic production.

Figure 14. Scatter or granular baits should be covered with a simple protective cover. This protects the bait from rain, irrigation, sunlight, and wildlife. Scraps of plywood, lumber, HardieBoard, asphalt shingles, or other weather-proof exterior materials can be used to make these bait covers.
Credits: William H. Kern, UF/IFAS

Figure 15. A small sampling of the variety of ant stands available on the market or suitable for do-it-yourself projects.
Credits: William H. Kern, UF/IFAS

Weed Control

The best-built and most expensive ant guard will cease to be effective if weeds touch the hive above the ant barrier. The ants use weeds as a ladder that allows them to get around the barrier. Control weeds with weed cloth under the hives, herbicides, mowing, string trimmers, solarization, hand cutting, and flame treatments.

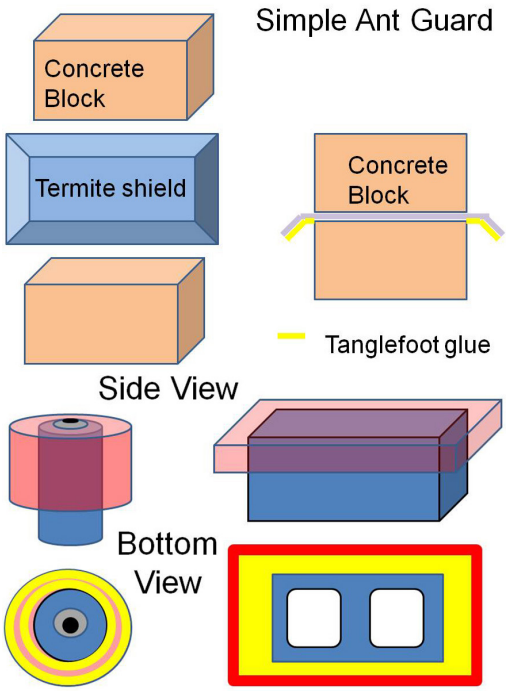

Figure 16. Simple ant guards are essentially upside-down sticky moats. Termite foundation shields, old cake pans, sheets of galvanized steel, or even disposable aluminum roasting pans can be treated with sticky barrier adhesive and then placed upside down over concrete blocks or other supports. A virtually free ant guard can be made by using 2 recycled steel cans. The outside can should be larger in diameter but shorter than the inside can. The 2 cans are held in place with a pop rivet or a nut and bolt. Barrier adhesive is applied between the two cans creating an impassible barrier.

Figure 17. There are several synthetic isoparaffinic hydrocarbon or organic mixtures (castor oil, waxes, and resins) available as barrier materials. They can be messy to work with; a removable protective covering (like Tangle Guard) and disposable gloves can help.
Credits: William H. Kern, UF/IFAS

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Appendix 1. Commercially available ant baits. This list is likely not complete, and any products missing from this list were not omitted deliberately. Those products listed are only for illustrative purposes and do not imply any endorsement, warranty, or recommendation by UF/IFAS. Manufacturers add and discontinue products, so this list will not be permanently accurate and should only be used as one possible guide to available products.

Active Ingredient	Mode of action	Representative Products
Borax (Sodium Tetraborate Decahydrate)	Boron toxicity (multisite inhibitors)	TERRO® Ant Killer TERRO® Liquid Ant Baits Terro PCO Liquid Ant Bait InTice Gelanimo Ant Bait InTice™ Rover Ant Bait InTice™ Thiquid™ Ant Bait InTice Smart Ant Gel DominAnt Liquid Ant Bait
Boric Acid	Boron toxicity (multisite inhibitors)	InTice 10 Perimeter Bait
Disodium Octaborate Tetrahydrate (DOT)	Boron toxicity (multisite inhibitors)	Gourmet Ant Bait Gel Gourmet Liquid Ant Bait
Abamectin	Chloride channel activator (nerve and muscle action)	Advance 375A Select Granular Ant Bait Advance Carpenter Ant Bait Ascend Fire Ant Bait Award II Fire Ant Bait InVict AB Insect Paste Maggies Farm Ant and Roach Gel Prescription Treatment Ascend Fire Ant Bait
Thiamethoxam	Nicotinic acetylcholine receptor agonist (Neonicotinoid)	Optigard Ant Bait Gel
Fipronil	GABA-gated chloride channel antagonist (nerve poison)	Maxforce Carpenter Ant Bait Gel Maxforce FC Ant Bait Gel Maxforce FC Fire Ant Bait Granular
Indoxacarb	Voltage dependant sodium channel blockers (nerve poison)	Advion Ant Bait Gel Advion Fire Ant Bait
Hydramethylnon	Mitochondrial complex III electron transport inhibitor (stops energy production)	Amdro Fire Ant Bait Amdro Pro Fire Ant Bait Maxforce Complete Granular Insect Bait
Hydramethylnon with S-Methoprene	See above and below	Extinguish Plus Fire Ant Bait Amdro Yard Treatment Fire Ant Bait Granules
S-Methoprene	Insect growth regulator- juvenile hormone analogue	Extinguish Professional Fire Ant Bait
Dinotefuran	Nicotinic acetylcholine receptor agonist (Neonicotinoid nerve poison)	Alpine Ant Bait Gel Hot Shot Ultra Liquid Ant Bait
Imidacloprid	Nicotinic acetylcholine receptor agonist (Neonicotinoid nerve poison)	Maxforce Quantum Ant Bait InVict Blitz Ant Granules InVict Xpress Granular Bait
Metaflumizone	Sodium-blocker	Siesta Insecticide Fire Ant Bait
Spinosad (a mixture of spinosyn A and spinosyn D)	Nicotinic acetylcholine receptor allosteric activators (nerve poison)	Ferti-Lome Come and Get It! Fire Ant Killer