



Cockroaches and Their Management¹

P. G. Koehler, F. M. Oi and D. Branscome²

Cockroaches are pests throughout the United States. They are annoying and, when abundant, they are also destructive. Cockroaches, also known as waterbugs, croton bugs, or palmetto bugs, destroy food and damage fabrics, book bindings, and other materials. When cockroaches run over food they leave filth and may spread disease. They secrete an oily liquid that has an offensive and sickening odor that may ruin food. This odor may also be imparted to dishes that are apparently clean. Excrement in the form of pellets or an ink-like liquid also contributes to this nauseating odor. Some people are allergic to cockroaches and become ill.

Kinds of Cockroaches

The kinds of cockroaches most commonly found in and around Florida homes are the Florida Woods Roach, American (Figure 1), smokybrown (Figure 2), brown (Figure 3), Australian (Figure 4), German (Figure 5) and Asian. The smallest cockroaches, the German, Asian, and brownbanded (Figure 6), are close to the same size and the adults are seldom more than 5/8" long. The larger cockroaches, the American, Australian, brown, and the smokybrown,

are 1 1/4" - 2" long and are often called palmetto bugs. Though they are generally found outdoors, they can become an indoor problem when they migrate or are carried indoors. The largest cockroach, the Florida woods roach, will also enter dwellings from the outside or from beneath the house. Outdoor cockroaches do not survive well indoors and many times people overreact to the presence of these cockroaches. Often, removal of these outdoor cockroaches from the house is all that is needed for control.

The Asian cockroach (Figure 7) looks very much like a German Cockroach, except it flies. Asian cockroaches are attracted to the lights in your home. They will fly to porch lights and find their way inside. Once inside, however, their survival is poor like other outdoor cockroaches.

Development of the Cockroach

The cockroach has three life stages: the egg, nymph, and adult. Cockroach eggs are deposited in groups in a leathery case or capsule called an ootheca. This capsule is usually dropped or glued to some

1. This document is ENY-214, one of a series of the Department of Entomology and Nematology, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Publication Date: January 1994. Revised: January 2003. Please visit the EDIS Web site at <http://edis.ifas.ufl.edu>. Additional information on these organisms, including many color photographs, is available at the Entomology and Nematology Department Web site located at <http://entnemdept.ifas.ufl.edu>.

2. P. G. Koehler, professor/extension entomologist, F. M. Oi, assistant extension entomologist and D. Branscome, graduate assistant, Entomology and Nematology Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611. The use of trade names in this publication is solely for the purpose of providing specific information. UF/IFAS does not guarantee or warranty the products named, and references to them in this publication does not signify our approval to the exclusion of other products of suitable composition. All chemicals should be used in accordance with directions on the manufacturer's label. Use pesticides safely. Read and follow directions on the manufacturer's label.



Figure 1. American cockroach (actual size, 1 1/2"). Credits: James Castner, University of Florida



Figure 4. Australian cockroach (actual size 1 1/2"). Credits: James Castner, University of Florida

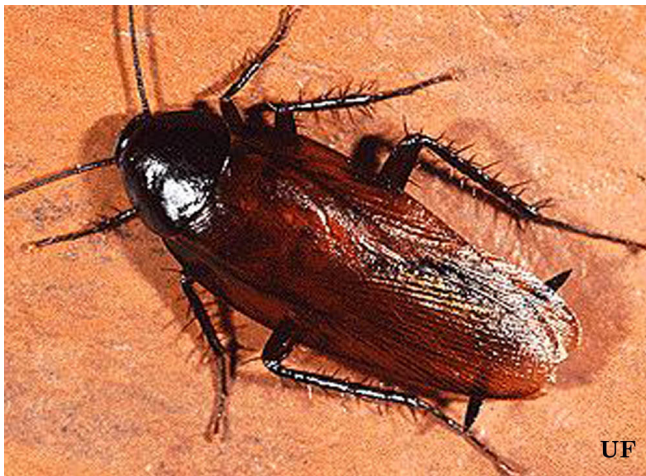


Figure 2. Smokybrown cockroach (actual size, 1 3/4"). Credits: James Castner, University of Florida



Figure 5. German cockroach (actual size 5/8"). Credits: James Castner, University of Florida



Figure 3. Brown cockroach (actual size, 1 1/2"). Credits: James Castner, University of Florida



Figure 6. Brownbanded cockroach (actual size, 3/4"). Credits: James Castner, University of Florida

surface by the female as soon as it is formed; however, the female German cockroach carries the

capsule protruding from her body until the eggs are ready to hatch. There may be from 30 to 48 eggs in



Figure 7. Asian cockroach (actual size 5/8"). Credits: James Castner, University of Florida

the capsule of the German cockroach, but capsules of other cockroaches may have only 10-28 eggs.

The newly hatched nymphs have no wings and shed their skins (molt) several times before becoming winged adults. German and brownbanded cockroaches may have several generations per year, but the outdoor species may require a year to develop from egg to adult.

Where to Look for Cockroaches

Cockroaches hide in dark, sheltered places during the day and come out to feed at night. They may be found around the kitchen sink or drain board, in cracks around or underneath cupboards and cabinets or inside them (especially in the upper corners), behind drawers, around pipes or conduits (where they pass along the wall or go through it), behind windows or door frames, behind loose baseboards or molding strips, on the underside of tables and chairs, in the bathroom, and in radio and TV cabinets.

The German cockroach is usually found in the kitchen and bathroom, although it may be found all over the house. The other kinds of cockroaches prefer damp, warm places and usually develop in garages, sewers, attics, storerooms and similar locations. They then enter the home from outside breeding sites.

Methods of Cockroach Control

An IPM approach is the most effective method of cockroach control. The least effective control method is the use of chemicals alone. Using

chemicals alone results in insecticide resistance and, ultimately, very poor control.

Homeowners may undertake their own IPM plan for cockroach control with good success, or they may elect to contract the services of a professional pest control operator. Professionals have the equipment and training to do a thorough job and have access to products not available to homeowners. If you decide to contract the services of a professional pest control operator, get estimates from several reputable firms before you decide on one.

Prevention and Sanitation

Successful cockroach control requires prevention and sanitation. Vacuuming will eliminate cockroach skins and feces that cause cockroach allergies. Cockroach feces also contains a chemical (aggregation pheromone) that attracts cockroaches to an area. Eliminating the cockroach feces by scrubbing with hot, soapy water will decrease the amount of aggregation pheromone available to attract cockroaches to the area.

Prevention and sanitation can be divided into four categories: exclusion and elimination of food, water, and harborage. Following the recommendations in the four categories will likely eliminate the most important factors that affect cockroach establishment.

Exclusion

- German cockroaches can initially infest a structure when infested grocery bags are brought inside. Inspect groceries for cockroaches before storing. Keep grocery bags in outside storage areas.
- Cockroaches breed prolifically in corrugated cardboard boxes. Discard unnecessary boxes immediately.
- Keep doors and windows shut.
- Keep screens in good repair to prevent cockroaches from entering your home.

- Check attic vents and make sure that large openings around outside drainage lines and sewer vents are screened or sealed. Use tightly packed steel wool as a temporary filler until openings can be sealed properly.
- Caulk cracks and gaps around doors and windows to help prevent cockroaches from entering your home.
- Children can transport cockroaches from school to home in book bags and lunch containers. Inspect these items regularly.
- Dwellings, such as apartments that are separated by a common wall are particularly difficult situations. An infestation can migrate between apartments via the plumbing encased in a common wall. Therefore, cockroaches from one apartment can easily migrate to another apartment, infesting a "clean" dwelling. To help prevent this, caulk holes in common walls and around plumbing.

Elimination of Water Sources

Water is the most important factor in cockroach survival. German cockroaches can survive only 12 days with food but no water. However, if only water is present with no food, cockroaches can survive for about 42 days. Cockroaches often come indoors during periods of drought because they are looking for moisture. Eliminate water sources by doing the following:

- Tighten or patch leaky pipes in kitchen and bathroom areas.
- Do not let water stand in sinks for long periods of time.
- Do not over water indoor plants because accumulated water will be available to cockroaches.
- Empty pans under refrigerators used to catch water from condensation.
- Be aware that pet drinking dishes, aquaria, and pipe condensation (under sinks, in wall voids) can also be sources of moisture.

- Eliminate sources outside where water can collect, such as cans, tires, and tree holes.

Elimination of Food Sources

Cockroaches do not need large amounts of food to survive, especially in the presence of water. Furthermore, food sources can compete with cockroach baits, decreasing their effectiveness. Elimination of food sources includes:

- Store and dispose of garbage properly. The highest concentration of cockroaches in a home is usually around the garbage can and around the refrigerator.
- Seal garbage can lids to prevent cockroaches from accessing food sources. Also, keep garbage areas clean by wiping frequently.
- Dump sink strainers frequently to prevent food build up.
- Wash dishes immediately after use. Dishes left unwashed are a major source of food for a kitchen infestation.
- Keep kitchen appliances such as toasters, toaster ovens, microwaves, stoves, ovens, and refrigerators free of crumbs and other food debris. In addition, clean the areas around these appliances.
- Reseal all food after opening or store in the refrigerator.
- Seal pet food tightly. Do not leave food and water out all the time.
- Regularly vacuum or sweep under and around furniture where people eat, such as the dining room table. Vacuuming can also remove cockroach egg cases that will not be killed by insecticides. Remember to promptly dispose of the vacuum cleaner bag in an outdoor container.

Elimination of Harborage

In addition to food and moisture, cockroaches require a place to live. The cockroach harborage is critical to its survival. Cockroaches prefer dark places that are warm and moist. Places that provide tight

spaces such as stacks of newspaper or cardboard, piles of clothing, or cracks and crevices in structures are ideal.

Harborages not only provide a place for cockroaches to live, but they also can create "pesticide free" zones where cockroaches can hide if insecticides are selected as one tactic in the IPM program.

Eliminate harborages by doing the following:

- Seal cracks and crevices. Adult cockroaches can fit into cracks only about 1/16 inch and prefer spaces of about 3/8 inch.
- Pull mulch away from the house. The large, outdoor cockroaches breed prolifically in pine straw mulch and poorly in gravel or on bare soil.
- Stack firewood off the ground and well away from the house.
- Fill tree holes with cement to remove this prime harborage area.
- Keep shrubbery and ornamentals well trimmed and away from the house. Ivy is a favorite breeding place for outdoor cockroaches.
- Keep clutter such as newspapers, bags, and clothing from accumulating.

Chemical Control

Use prevention and sanitation methods before and concurrently with chemical control tactics. The most commonly used chemical formulations for cockroach control are baits, sprays and dusts. While cockroach foggers are commonly seen in the marketplace, their effect is limited to the cockroaches that directly contact the fog. Thus, control is variable and will not be discussed here.

Baits

Baits are most highly recommended because of their effectiveness and targeted application, decreasing unnecessary pesticide exposure. Baits usually come in granular formulations, plastic stations, or large syringes for gel applications. Bait

for homeowner use can be found in Table 1. Baits for professional use can be found in Table 2.

- Apply granular formulations outside in plants and mulched areas.
- Bait stations are most effective when placed in corners where you suspect cockroaches are hiding or coming into your home.
- Get small stations for German cockroaches and large stations for the larger outdoor cockroaches.
- Place the gel in syringes in cracks and crevices around windows, doors, and any other suspected cockroach harborage, except in food handling areas.
- Never spray a liquid insecticide where baits have been applied. Liquid insecticides used in the vicinity of baits will repel cockroaches from the bait.
- Pest control operators have other baits in different forms that also provide long lasting control.

Sprays

- Greasy surfaces decrease the effectiveness of insecticide applications. Therefore, before treating surfaces eliminate grease and oil by scrubbing with hot, soapy water.
- Generally, liquid sprays will not be effective when applied to wood surfaces such as cabinets and shelves.
- Insect growth regulators will take 4 to 6 weeks for a noticeable decrease in the population. But control is longer lasting than other contact insecticides because the cockroaches are no longer able to reproduce once exposed. Evidence on insect growth regulator exposure is twisted wings on the adult cockroaches and altered behavior. Expect to see more cockroaches during the day as a result of IGR use. Seeing more cockroaches after IGR use means the treatment is working.

- Apply materials to cracks and crevices where cockroaches live. These areas include cracks around pipes under sinks, around toilet bowls, around baseboards, and around appliances.
- Never spray around or into electrical outlets.
- Avoid spraying food preparation surfaces.
- Do not touch surfaces until dry (at least 4 hours).
- Some materials may damage carpets, tile, or plastics. Check the label before using any material on these surfaces.
- Outdoor products should be applied at the label rate to cracks and crevices where cockroaches are suspected of living or entering the home, such as door thresholds and window frames.
- A perimeter treatment along the base of the foundation wall, in cracks and crevices, and at points of entry into the home can also help control the larger outdoor cockroaches.

Dusts

Dusts are slow-acting but can give long lasting control. Boric acid is probably the most commonly used dust labeled for cockroach control. It is most effective indoors in clean, dry areas.

- Apply boric acid with a duster that puts out a thin film of dust.
- Apply dusts in hidden areas such as under refrigerators, stoves, sinks, wall voids, and other cracks and crevices.
- Do not apply dusts in open areas such as on shelves or counters where food and utensils are kept.
- Boric acid is highly toxic to plants and will discolor some fabrics.
- Other effective dust and borate products are available to pest control operators.

IPM Approach for Indoor Cockroaches

- Thoroughly vacuum and wipe the premises with hot soapy water.
- Place baits (gel and station type) according to label directions.
- Check baits monthly until populations decrease, then quarterly.
- Replace empty bait stations because they provide additional harborage for cockroaches when empty.
- If populations are very high, a "clean-out" using a liquid insecticide mixed with an insect growth regulator, such as hydroprene or pyriproxyfen, in cracks and crevices may be needed to knock down the initial population.
- Place baits in areas not treated with liquid insecticide or place baits 4 to 6 weeks after spraying.

An IPM Approach for Outdoor Cockroaches

- An 80 percent reduction in cockroach abundance was achieved using the following IPM approach.
- Only use a thin layer of mulch around the home that extends 1 foot out from the foundation. This will allow drying time and make conditions less conducive to cockroach survival.
- Apply control products within 3 feet of the home in pine straw, fallen leaves, or ivy, and next to other cockroach habitats such as garden borders, large rocks, or railroad ties. Always follow the label.
- Treat sheltered cracks and crevices such as porch corners, under ledges, in crawl space gratings, and under garage doors. Baits or liquid products can be used, but not both at the same time in the same place.

References

Koehler, P. G. 1993. Cockroaches. IN Pests in and around the Florida home. SP-134. University of Florida, IFAS Publications. 82-85 pp.

Smith, L. M., A. G. Appel, T. P. Mack, G. J. Keever, and E. P. Benson. 1993. Integrated pest management effectively controls smokybrown cockroaches. *Highlights of Agricultural Research* 40(2): 7.

Suiter, D. R. 1993. Cockroach control without insecticides. IN Pests in and around the Florida home. SP-134. University of Florida, IFAS Publications, 86-89 pp.

Table 1. Insecticides labeled for Homeowner Use.

Formulation	Common Name	Trade Name (Manufacturer)	Signal Word	Cockroach
Bait, Crack and Crevice (see label)				
Combination Product	Fipronil, Hydramethylon	Combat Plus (quick kill formula roach baits and roach killing gel)	Caution	All cockroaches
Bait Station				
Bait	Fipronil	Combat Quick Kill Formula, Large Roach	Caution	American, Australian, Palmetto Bugs, Smokybrown
Bait	Fipronil	Combat Quick Kill Formula, Roach	Caution	Asian, German
Bait	Hydramethylon	Combat Source Kill 1, Roaches	Caution	Asian, German
Crack and Crevice				
Aerosol	Prallethrin (0.03%), Esfenvalerate (0.05%), MGK-264 synergist (0.3%)	Ortho Roach, Ant & Spider Killer	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Pyrethrins, MGK-264, Permethrin	Ortho Ant-B-Gon	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Tetramethrin (0.2%), Phenothrin (0.2%)	Ortho Flying Insect Killer 1	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Beta-Cyfluthrin	Bayer Power Force Carpenter Ant & Termite Killer Plus	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Ready-To-Use	Bifenthrin	Ortho Home Defense Perimeter & Indoor Insect Killer	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown

Table 1. Insecticides labeled for Homeowner Use.

Formulation	Common Name	Trade Name (Manufacturer)	Signal Word	Cockroach
Ready-To-Use	Cyfluthrin	Bayer Advanced Home, Home Pest Control Indoor & Outdoor Insect Killer	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Indoor Space Treatment				
Ready-To-Use	Pyrethrins (0.05%), Permethrin (0.4%)	Ortho Indoor Insect Fogger	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Indoor Surface Treatment				
Aerosol	Prallethrin (0.03%), Esfenvalerate (0.05%), MGK-264 synergist (0.3%)	Ortho Roach, Ant & Spider Killer	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Pyrethrins, MGK-264, Permethrin	Ortho Ant-B-Gon	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Ready-To-Use	Cyfluthrin	Bayer Advanced Home, Home Pest Control Indoor & Outdoor Insect Killer	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Insect Growth Regulator (IGR)				
Combination Product	Abamectin B1, Hydroprene	Raid Max (Roach Bait plus Egg Stoppers)	Caution	All cockroaches
Outdoor Barrier				
Aerosol	Prallethrin (0.03%), Esfenvalerate (0.05%), MGK-264 synergist (0.3%)	Prallethrin (0.03%), Esfenvalerate (0.05%), MGK-264 synergist (0.3%)	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Beta-Cyfluthrin	Bayer Power Force Carpenter Ant & Termite Killer Plus	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Bifenthrin	Ortho Termite & Carpenter Ant Killer	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Esfenvalerate	Ortho Bug-B-Gon Multipurpose Insect Killer	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Malathion	Ortho Malathion 50 Plus Insect Spray	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Granule	Cyfluthrin	Bayer Advanced Lawn & Garden Multi-Insect Killer	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Granule	Cyfluthrin	Bayer Power Force Ant Killer Ready-to-Use Granules	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Granule	Cyfluthrin	Bayer Power Force Multi-Insect Killer Ready-to-Spread Granules	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown

Table 1. Insecticides labeled for Homeowner Use.

Formulation	Common Name	Trade Name (Manufacturer)	Signal Word	Cockroach
Ready-To-Use	Bifenthrin	Ortho Home Defense Perimeter & Indoor Insect Killer	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Ready-To-Use	Cyfluthrin	Bayer Advanced Home, Home Pest Control Indoor & Outdoor Insect Killer	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Ready-To-Use	Cyfluthrin	Bayer Power Force Multi-Insect Killer Ready-to-Spray	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Ready-To-Use	Cyfluthrin	Bayer Power Force Multi-Insect Killer Ready-to-Use	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Ready-To-Use	Esfenvalerate	Ortho Bug-B-Gon Multipurpose Insect Killer Ready-to-Use	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Outdoor Broadcast				
Emulsifiable Concentrate	Beta-Cyfluthrin	Bayer Power Force Carpenter Ant & Termite Killer Plus	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Esfenvalerate	Ortho Bug-B-Gon Multipurpose Insect Killer	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Malathion	Ortho Malathion 50 Plus Insect Spray	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Ready-To-Use	Cyfluthrin	Bayer Advanced Home, Home Pest Control Indoor & Outdoor Insect Killer	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown

Table 2. Insecticides labeled for Commercial Use.

Formulation	Common Name	Trade Name (Manufacturer)	Signal Word	Cockroach
Bait Station				
Bait	Abamectin	PT Avert Cockroach Gel Bait Formula 2 (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Disodium Octaborate Tetrahydrate	Gourmet Ant Bait	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Disodium Octaborate Tetrahydrate	Gourmet Ant Bait Gel	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Fipronil	MaxForce FC Large Roach Bait Stations	Caution	American, Australian, Palmetto Bugs, Smokybrown
Bait	Fipronil	MaxForce FC Small Roach Bait Stations	Caution	German
Bait	Hydramethylnon	MaxForce Roach Killer Small Bait Stations	Caution	German

Table 2. Insecticides labeled for Commercial Use.

Formulation	Common Name	Trade Name (Manufacturer)	Signal Word	Cockroach
Bait	Orthoboric Acid	Dr. Moss's Liquid Bait System (JT Eaton)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Crack and Crevice				
Aerosol	Acephate	PT Orthene Crack & Crevice Pressurized Residual (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Cyfluthrin	PT Cy-Kick CS Pressurized Crack & Crevice Residual (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Cyfluthrin	PT Cy-Kick Crack & Crevice Pressurized Residual (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Hydroprene	Gentrol Aerosol (Zoecon)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Lambda Cyhalothrin	PT 221L (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Pyrethrins (0.5%), PBO (4.0%)	PT P. I. Contact Insecticide (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Pyrethrins and Others	PT 565 Plus XLO (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Pyrethrins and Others	PT Microcare Pressurized Pyrethrum Capsule Suspension (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Abamectin B1	PT Avert Cockroach Gel Bait Formula 2 (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Abamectin B1	PT Avert Cockroach Gel Bait Formula 3 (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Abamectin B1	PT Avert Dry Flowable Coackroach Bait Formula 1 (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Fipronil	MaxForce FC Roach Killer Bait Gel (3-Pack)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Hydramethylnon	MaxForce Fine Granule Insect Bait	Caution	American, German, Palmetto Bugs, Smokybrown
Bait	Hydramethylnon	MaxForce Granular Insect Bait (25 lb)	Caution	American, German, Palmetto Bugs, Smokybrown
Bait	Hydramethylnon	MaxForce Granular Insect Bait (6 lb)	Caution	American, German, Palmetto Bugs, Smokybrown
Bait	Hydramethylnon	MaxForce Roach Killer Bait Gel (Triple)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown

Table 2. Insecticides labeled for Commercial Use.

Formulation	Common Name	Trade Name (Manufacturer)	Signal Word	Cockroach
Bait	Hydramethylnon	Siege Gel Insecticide	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Hydramethylnon	Siege PBS Gel Insecticide	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Imidacloprid	Pre-Empt (Bayer)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Orthoboric Acid	Attrax Carbohydrates Roach Bait	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Orthoboric Acid	Niban FG	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Orthoboric Acid	Niban Granular Bait (Nisus)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Orthoboric Acid	Snuffer (Nisus)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Dust	Boric Acid	PT Perma Dust Pressurized Boric Acid Dust (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Dust	Deltamethrin	DeltaDust (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Dust	Pyrethrins	PT Tri-Die Silica & Pyrethrin Dust (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Dust	Pyrethrins and Others	PT Tri-Die Pressurized Silica & Pyrethrin Dust (Whitmire Micro-gen)	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Dust	Pyrethrins, PBO, Silica Gel	Drione (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Bifenthrin	Talstar F Insecticide/Miticide (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Bifenthrin	Talstar Termiticide/ Insecticide (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Chlorfenapyr	Phantom (BASF)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cyfluthrin	PT Cy-Kick CS Controlled Release Cyfluthrin	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown

Table 2. Insecticides labeled for Commercial Use.

Formulation	Common Name	Trade Name (Manufacturer)	Signal Word	Cockroach
Emulsifiable Concentrate	Cyfluthrin	Tempo SC Ultra (Bayer)	Danger	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cypermethrin	Cynoff EC (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cypermethrin	Cynoff Power Spray Insecticide (FMC)	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cypermethrin	Cynoff WP (FMC)	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cypermethrin	Cynoff WSB (FMC)	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cypermethrin	Prevail FT Termiticide (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Deltamethrin	Suspend SC Insecticide (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Hydroprene	Genrol IGR Concentrate (Zoecon)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Permethrin	Dragnet SFR Termiticide/Insecticide (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Prallethrin	PT ULD SPy-300 (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Propetamphos	Catalyst (Zoecon)	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Pyrethrins	Kicker (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Pyrethrins (0.5%), PBO (5.0%)	PT ULD BP-50 (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Pyrethrins (0.5%), PBO (5.0%)	Pyrenone 50 (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Pyrethrins (2.5%), PBO (12.5%)	Synerol Insecticide (Aventis)	Caution	German
Emulsifiable Concentrate	Pyrethrins and Others	PT Microcare CS Controlled Release Pyrethrum (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Pyrethrins and Others	PT ULD BP-100 (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown

Table 2. Insecticides labeled for Commercial Use.

Formulation	Common Name	Trade Name (Manufacturer)	Signal Word	Cockroach
Wettable/ Soluble Powder	Cyfluthrin	Tempo 20 WP (Bayer)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Wettable/ Soluble Powder	Tralomethrin	Saga WP Insecticide (Aventis)	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Fumigation				
Fumigant	Sulfuryl fluoride	Vikane (Dow AgroSciences)	Danger	American, Asian, German, Palmetto Bugs, Smokybrown
Indoor Space Treatment				
Aerosol	Pyrethrins (0.5%), PBO (4.0%)	PT P. I. Contact Insecticide (Whitmire Micro-gen)	Caution	
Aerosol	Pyrethrins (4.03%), PBO (32.26%)	Turbocide Gold with Pyrenone (Aventis)	Caution	American, German
Aerosol	Pyrethrins and Others	PT 565 Plus XLO (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Pyrethrins and Others	PT Pro-Control (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Pyrethrins and Others	PT Pro-Control Plus (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Hydroprene	Gentrol IGR Concentrate (Zoecon)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Hydroprene	TurboCide Gold with Gentrol (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Prallethrin	PT ULD SPy-300 (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Pyrethrins	Kicker (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Pyrethrins (0.5%), PBO (5.0%)	PT ULD BP-50 (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Pyrethrins (0.5%), PBO (5.0%)	Pyrenone 50 (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Pyrethrins (0.5%), PBO (5.0%)	Pyrenone 100 (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Pyrethrins (2.5%), PBO (12.5%)	Synerol Insecticide (Aventis)	Caution	German
Emulsifiable Concentrate	Pyrethrins and Others	PT ULD BP-100 (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown

Table 2. Insecticides labeled for Commercial Use.

Formulation	Common Name	Trade Name (Manufacturer)	Signal Word	Cockroach
Indoor Surface Treatment				
Aerosol	Acephate	PT Orthene Crack & Crevice Pressurized Residual (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Cyfluthrin	PT Cy-Kick CS Pressurized Crack & Crevice Residual (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Hydroprene	Gentrol Aerosol (Zoecon)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Pyrethrins and Others	PT Microcare Pressurized Pyrethrum Capsule Suspension (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Dust	Pyrethrins	PT Tri-Die Silica & Pyrethrin Dust (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Bifenthrin	Talstar F Insecticide/Miticide (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Bifenthrin	Talstar Termiticide/ Insecticide (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cyfluthrin	PT Cy-Kick CS Controlled Release Cyfluthrin	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cyfluthrin	Tempo SC Ultra (Bayer)	Danger	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cypermethrin	Cynoff EC (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cypermethrin	Cynoff Power Spray Insecticide (FMC)	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cypermethrin	Cynoff WP (FMC)	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cypermethrin	Cynoff WSB (FMC)	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cypermethrin	Prevail FT Termiticide (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Deltamethrin	Suspend SC Insecticide (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Hydroprene	Gentrol IGR Concentrate (Zoecon)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown

Table 2. Insecticides labeled for Commercial Use.

Formulation	Common Name	Trade Name (Manufacturer)	Signal Word	Cockroach
Emulsifiable Concentrate	Permethrin	Dragnet SFR Termiticide/Insecticide (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Prallethrin	PT ULD SPy-300 (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Pyrethrins	Kicker (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Pyrethrins (0.5%), PBO (5.0%)	Pyrenone 50 (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Pyrethrins (0.5%), PBO (5.0%)	Pyrenone 100 (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Pyrethrins (2.5%), PBO (12.5%)	Synerol Insecticide (Aventis)	Caution	German
Emulsifiable Concentrate	Pyrethrins and Others	PT Microcare CS Controlled Release Pyrethrum (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Wettable/ Soluble Powder	Cyfluthrin	Tempo 20 WP (Bayer)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Wettable/ Soluble Powder	Tralomethrin	Saga WP Insecticide (Aventis)	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Outdoor Barrier				
Aerosol	Acephate	PT Orthene Crack & Crevice Pressurized Residual (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Cyfluthrin	PT Cy-Kick CS Pressurized Crack & Crevice Residual (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Cyfluthrin	PT Cy-Kick Crack & Crevice Pressurized Residual (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Lambda Cyhalothrin	PT 221L (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Pyrethrins and Others	PT Microcare Pressurized Pyrethrum Capsule Suspension (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Orthoboric Acid	Niban FG	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Orthoboric Acid	Niban Granular Bait (Nisus)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown

Table 2. Insecticides labeled for Commercial Use.

Formulation	Common Name	Trade Name (Manufacturer)	Signal Word	Cockroach
Dust	Deltamethrin	DeltaDust (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Dust	Pyrethrins	PT Tri-Die Silica & Pyrethrin Dust (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Dust	Pyrethrins and Others	PT Tri-Die Pressurized Silica & Pyrethrin Dust (Whitmire Micro-gen)	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Bifenthrin	Talstar F Insecticide/Miticide (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Bifenthrin	Talstar Termiticide/ Insecticide (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cyfluthrin	PT Cy-Kick CS Controlled Release Cyfluthrin	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cypermethrin	Cynoff EC (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cypermethrin	Cynoff Power Spray Insecticide (FMC)	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cypermethrin	Cynoff WP (FMC)	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cypermethrin	Cynoff WSB (FMC)	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Cypermethrin	Prevail FT Termiticide (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Deltamethrin	Suspend SC Insecticide (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Permethrin	Astro Insecticide (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Permethrin	Dragnet SFR Termiticide/Insecticide (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Pyrethrins	Kicker (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Pyrethrins and Others	PT Microcare CS Controlled Release Pyrethrum (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown

Table 2. Insecticides labeled for Commercial Use.

Formulation	Common Name	Trade Name (Manufacturer)	Signal Word	Cockroach
Granule	Deltamethrin	DeltaGard G (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Wettable/Soluble Powder	Cyfluthrin	Tempo 20 WP (Bayer)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Outdoor Broadcast				
Bait	Hydramethylnon	MaxForce Fine Granule Insect Bait	Caution	American, German, Palmetto Bugs, Smokybrown
Bait	Hydramethylnon	MaxForce Granular Insect Bait (25 lb)	Caution	American, German, Palmetto Bugs, Smokybrown
Bait	Hydramethylnon	MaxForce Granular Insect Bait (6 lb)	Caution	American, German, Palmetto Bugs, Smokybrown
Bait	Orthoboric Acid	Niban Granular Bait (Nisus)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Bifenthrin	Talstar F Insecticide/Miticide (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Permethrin	Dragnet SFR Termiticide/Insecticide (FMC)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Granule	Deltamethrin	DeltaGard G (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Wettable/Soluble Powder	Cyfluthrin	Tempo 20 WP (Bayer)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Voids/Attics				
Aerosol	Acephate	PT Orthene Crack & Crevice Pressurized Residual (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Pyrethrins (0.5%), PBO (4.0%)	PT P. I. Contact Insecticide (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Aerosol	Pyrethrins and Others	PT 565 Plus XLO (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Hydramethylnon	MaxForce Fine Granule Insect Bait	Caution	American, German, Palmetto Bugs, Smokybrown
Bait	Hydramethylnon	MaxForce Granular Insect Bait (25 lb)	Caution	American, German, Palmetto Bugs, Smokybrown
Bait	Hydramethylnon	MaxForce Granular Insect Bait (6 lb)	Caution	American, German, Palmetto Bugs, Smokybrown
Bait	Imidacloprid	Pre-Empt (Bayer)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown

Table 2. Insecticides labeled for Commercial Use.

Formulation	Common Name	Trade Name (Manufacturer)	Signal Word	Cockroach
Bait	Orthoboric Acid	Niban FG	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Orthoboric Acid	Niban Granular Bait (Nisus)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Bait	Orthoboric Acid	Snuffer (Nisus)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Dust	Boric Acid	PT Perma Dust Pressurized Boric Acid Dust (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Dust	Deltamethrin	DeltaDust (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Dust	Pyrethrins	PT Tri-Die Silica & Pyrethrin Dust (Whitmire Micro-gen)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Dust	Pyrethrins and Others	PT Tri-Die Pressurized Silica & Pyrethrin Dust (Whitmire Micro-gen)	Warning	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Dust	Pyrethrins, PBO, Silica Gel	Drione (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown
Emulsifiable Concentrate	Deltamethrin	Suspend SC Insecticide (Aventis)	Caution	American, Asian, Australian, German, Palmetto Bugs, Smokybrown