

MAINTENANCE GUIDEBOOK VII TERMITE, INSECT, AND RODENT CONTROL

CHAPTER FIVE - COCKROACHES

SECTION A GENERAL

Cockroach infestations are among the most widespread and persistent of all pest problems. An infestation does not always indicate untidiness or dirt—cockroaches can inhabit even the cleanest kitchens. The five most common types of cockroaches in urban areas of the United States are: German, brown-banded, American, Oriental, and smoky-brown cockroaches. Five additional cockroach species sometimes found in other than buildings include: brown, Australian, Surinam, woods, and Asian roaches.

Except for size, most cockroaches are relatively similar in overall shape and appearance. They like tight places where their bodies touch surfaces both above and below them. Once inside a building, cockroaches find harborage (living areas) in cracks, crevices, and voids, and easily move among floors, rooms, and apartments through hollow walls, electrical and plumbing access holes, conduits, and garbage chutes. In dining halls, cockroaches are commonly found under work benches, tables, and counters where spilled food accumulates; behind and under refrigerators, stoves, and other bulky equipment; in serving-line areas; near raw garbage storage; in wall voids; and in hollow legs of equipment and tables.

These most common cockroaches inhabiting buildings are nocturnal and remain in the dark whenever possible, only emerging to search for water and food. Large infestations should be suspected when cockroaches are seen in the open or in the light.

Cockroaches are strongly attracted to food and water. Although they can survive many days without food, they must have frequent access to water. Newly hatched cockroaches die in three days without water, and although adult cockroaches may live 20 to 30 days without it, during that time they are unable to reproduce. Because of the wide range of food available to cockroaches (see Hazards of Infestation), they cannot be starved out of a building; but, good sanitation and cleanliness may prevent cockroach populations from increasing.

1. GERMAN COCKROACH

The German cockroach (Fig. 5-1) is the most common, and most rapidly reproducing of this country's cockroach species. It is also responsible for most calls requesting help with pest control. A German cockroach population, given favorable conditions, can increase in number at least 20 times within three months.

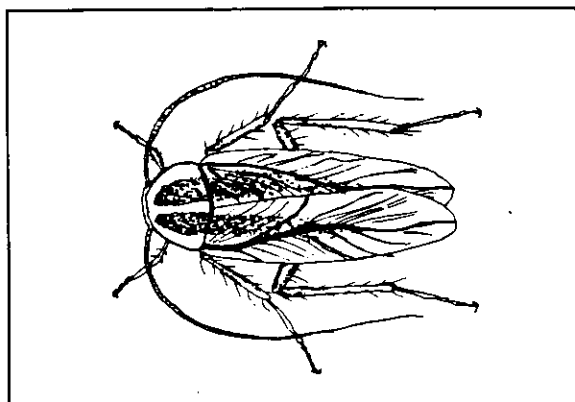


Figure 5-1

The German cockroach is 1/2-inch long, honey brown in color, with two dark streaks on the pronotum (first body section behind the head). Both adult males and females have fully developed wings and can fly short distances. Incubation of young lasts about two weeks at 80°F. The female protects the eggs by carrying a 1/4-inch-long egg case, containing from 30 to 40 eggs, until a day or so before hatching, when she deposits it in a protected area. A female produces from four to

eight egg cases in her lifetime, during which time she mostly remains hidden in cracks and therefore less exposed to pesticides. Young (nymphs) German cockroaches resemble adults but are smaller and lack wings. Nymphs shed their skins (molt) six to seven times before they mature in about twelve weeks. German cockroaches complete a generation in four to six weeks, and the entire life cycle lasts from 14 to 28 weeks. Household infestations can be detected by finding shed skins and empty egg cases on shelves and in cupboards, even when cockroaches themselves are not noticed.

The optimum indoor harborage for German cockroaches is inside the motor area of refrigerators and around stoves, under kitchen and bathroom sinks, undisturbed cabinets, and around toilet bowls where protection, food, and moisture are available from poor sanitation, leaking sink traps and faucets, condensation, standing water, and wet sponges. Although bathrooms have less food available, cockroaches may live in bathrooms and move through electrical and plumbing pipe chases and floor and wall cracks into adjacent rooms containing food. Small nymphs use 1/64-inch cracks for harborage, but larger adults require crevices about 3/16-inch wide.

German cockroaches are usually imported into tightly constructed homes with bottled-drink containers, in potato, onion, dried pet food, and grocery sacks, and in furniture and corrugated cardboard. When German cockroaches are moved into buildings from outdoors, they may be accompanied by American or Oriental roaches.

2. BROWN-BANDED COCKROACH

The brown-banded cockroach (Fig. 5-2) is the second most typical U.S. species, but it does not generally constitute a problem as widespread as the German cockroach. The brown-banded cockroach is about the same size as the German cockroach (1/2-inch), but does not have two dark stripes on the pronotum. Wings of both sexes of brown-banded cockroaches show a light, brownish-yellow, horizontal band across the pronotum, and at the base of wings, another partial band about one-third down from the pronotum. Recently hatched young (nymph) brown-banded cockroaches resemble adults, but are smaller and lack wings. Nymphs are dark; the two light bands separated by a dark band behind their pronotum is more obvious than banded markings on adults. Adult males fly readily, but females do not fly.

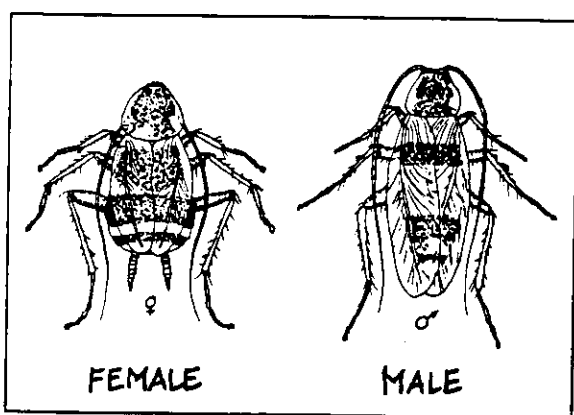


Figure 5-2

Brown-banded female cockroaches produce up to fourteen 1/8-inch-long egg cases (each containing 13 to 18 eggs) during their lifetime. The female carries the new egg case less than two days and then attaches it to the underside of furniture, behind kitchen-cabinet drawers, and in corners inside cabinets and cabinet frames. Incubation time is about 50 days, similar to that of the American cockroach. Nymphs molt six to eight times before reaching maturity in five to six

months. Time required for their complete development varies from three to nine months.

Brown-banded cockroaches occur throughout the United States and become established in warm apartments and office buildings, where infestations may quickly build to rival those of German cockroaches. Lesser water requirements allow them to occupy more locations in a building than German cockroaches. Brown-banded cockroaches flourish in rooms with high temperatures and, like German cockroaches, build up the largest populations in kitchens. Brown-banded cockroaches more often frequent cabinets near ceiling level, but also find harborage behind picture frames, in areas near stoves, and other warm equipment (refrigerators, electric clocks, light timers, televisions, radios, and computers), as well as in ceiling voids, clothing, drapery, and clutter.

Brown-banded cockroaches gain access to buildings by being imported, along with supplies and containers (particularly corrugated cardboard boxes). Eggs and adults may often be introduced into structures on furniture. After gaining entry, infestations can quickly spread throughout a building.

3. AMERICAN COCKROACH

The American cockroach (Fig. 5-3) is very common in the southern U.S., where it is sometimes called "waterbug" or "palmetto bug." It also occurs worldwide. This cockroach is about 1-1/2 inches long, reddish-brown with light markings on the thorax, and has fully developed wings. True flight is not common; flying American cockroaches are usually found in the southern states. Adult males, however, can glide extended distances. The pronotum on this cockroach may be ringed by

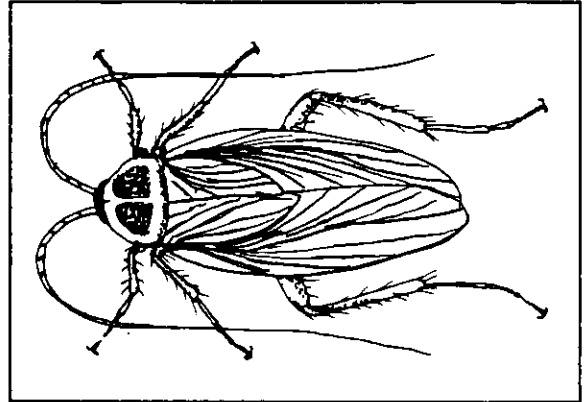


Figure 5-3

various irregular patterns of light color that darken toward the center, the rear margin is always light colored. Females can produce a 5/16-inch long by 3/16-inch wide egg capsule each week during the 12 to 24 weeks of spring and summer, each containing 14 to 16 eggs. She carries an egg case for about a day and then deposits it in a protected spot. A very high population should be suspected when egg cases are found in the open. Incubation lasts from one to two months. Mature American and Oriental cockroach nymphs can be difficult to tell apart. American nymphs normally go through 13 molts before reaching maturity in from 7 to 20 months.

Where climate allows, American cockroaches normally live outdoors and enter buildings through holes from crawlspaces or underground ducts, steam tunnels, manholes, and sewer line drains. American cockroaches are found in warm and moist basements, around water heaters, in boiler rooms, floor drains, and water sumps. Large numbers of American cockroaches may move into buildings when triggered by blocked drainage systems, heavy rains, or changes in barometric pressure.

4. ORIENTAL COCKROACH

The Oriental cockroach, sometimes called "waterbug" or "black beetle" (Fig. 5-4), can be a serious household pest. It is dark-brown to shiny black in color. Females are 1-1/4 inch long, about 20 percent longer than males. Males have fully developed but short, broad wings extending over about 70 percent of their bodies; females only have short triangular wing pads resembling lobes. Neither males nor females fly. Unlike other cockroaches, Orientals lack specialized pads on

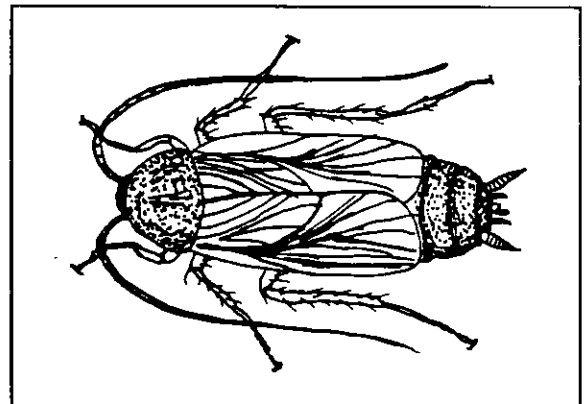


Figure 5-4

their feet and cannot climb smooth surfaces. Each year a female produces about five to ten egg capsules (3/8-inch long by 1/4-inch wide) containing 14 to 18 eggs. She carries the egg case for about 24 hours before leaving it in a warm, sheltered spot near available food. Incubation lasts about two months, and nymphs undergo seven to ten molts before reaching maturity in about 1-1/2 years. Mature American and Oriental cockroach nymphs may be difficult to tell apart.

Oriental cockroaches are more sensitive to a scarcity of water than other cockroaches, but are able to survive 13 weeks of continuous freezing temperatures outdoors when protected under stones and leaf debris. The Oriental cockroach is normally an outside species and its activity is usually restricted to ground or below-ground level. It favors crawl spaces, gaps between the soil and building foundations, underside of stoops and sidewalks, landscaping mulches, sewers, storm sewers, trash receptacles, and water meters. Large numbers of Oriental cockroaches enter dwellings to find moisture and optimum temperature, and are often triggered by drought, approach of winter, flooded drains, heavy rain, or changes in barometric pressure. Oriental cockroaches mainly invade dwellings under doors and through holes, cracks, and pipes joining crawlspaces, underground ducts, manholes, and sewer line drains. The Oriental cockroach prefers harborage on damp, porous surfaces, such as concrete or brick, and is mostly found in dark and damp basements, floor drains, and other moist places having a temperature between 68 and 82 degrees F.

Reducing food is not an effective control for Oriental cockroaches because they feed on a wide assortment of naturally occurring organic matter such as animal wastes (including rodent feces), rotting grass and weeds, bird and rodent droppings, human garbage, and dead insects, slugs, and animals.

5. SMOKY-BROWN COCKROACH

The smoky-brown cockroach (Fig. 5-5) resembles its relative, the American cockroach, in size and shape. This cockroach is dependent upon high moisture; in humid coastal areas, smoky-brown populations can infest every level of a structure. Adult smoky-brown cockroaches average just over 1-inch long and have wings longer than the abdomen. Both sexes fly. Their dark-brown mahogany color is striking, and they do not have light markings on the pronotum nor on the wings.

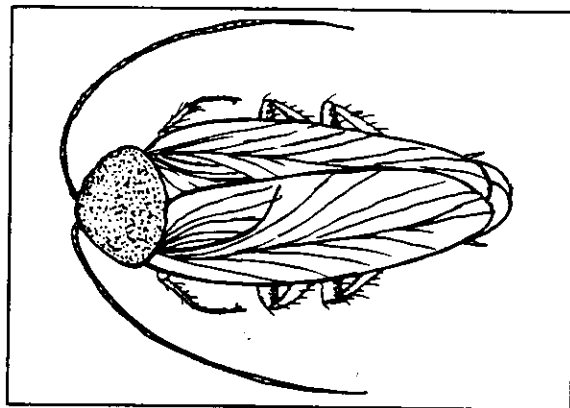


Figure 5-5

Antennal tips of young nymphs are white, as are the base antennal segments of older nymphs. The egg capsule of the smoky-brown cockroach is generally longer than that of the American cockroach and is black-to-brown in color; it contains from 17 to 24 eggs. The female usually carries an egg case

for one to two days and, if outside, glues it under bark or to a building surface. Inside, egg cases are glued to walls, ceilings, drapery, or sometimes just dropped on the floor. Nymphs hatch within 50 days and mature in about a year. The life cycle of the smoky-brown cockroach is about one year, and usually ends with a large adult die-off each fall.

The smoky-brown cockroach is basically a plant feeder found in warm and moist areas. It forages in mulch, trees, and vegetated areas near dwellings. It may invade structures and, inside, feeds on human food, soiled clothing, and garbage. This cockroach is found in the South and southeastern sections of the United States, especially Gulf Coast regions of Texas and Louisiana. It may invade or is accidentally imported into dwellings. Cockroaches gain entry into dwellings with infested firewood, through doors and cracks in the structure, adjoining garages, and under roof eaves. This cockroach also lives in gutters and under roof shingles, from where it can invade attics. Smoky-brown cockroach infestations commonly begin on upper floors and attics of buildings, after gaining access from trees overhanging roofs, and are found at water-damaged areas because of their great need for moisture. This cockroach is one of those which is difficult to control because it lives in such a wide variety of outdoor and indoor sites. Effective control requires a complete and thorough inspection of the structure in order to find and correct deficiencies.

SECTION B HAZARDS OF INFESTATION

Cockroaches affect more people than any other insect. They vomit partly-digested food materials and continually defecate while eating and pose significant health hazards by transmitting diseases (bacillary dysentery, typhoid fever, cholera, polio, amoebic dysentery, urinary-tract infections, diarrhea, and infectious hepatitis). In some parts of the country, even human allergy is attributed to cockroaches.

Some apartment residents spend one to two percent of their annual income every year on cockroach-control. This unnecessary exposure to substantial amounts of insecticide for many years may have subtle and debilitating health effects, especially on children and the elderly. Ineffective insecticides may result in more pesticide use, or residents may give up all control efforts. This only allows continual cockroach increases. Dependence upon chemicals only increases the hazards of infestation.

Cockroaches are scavengers that live on food waste and are attracted to human foods, particularly bakery products, cereals, meat, and cheese, which they contaminate since they also feed on dead animals and animal feces. Meanwhile, they also feed on or damage items like leather, wallpaper paste, book bindings, soiled clothing, art work, books, legal documents, postage stamps, draperies, and banknotes. Cockroaches are attracted to electrical switches, outlets, and smoke detectors, where their bodies and body fluids corrode points, activate or deactivate alarm systems, create pump failures, and cause short circuits in or damage to computers and drive heads.

Cockroach droppings, body parts, and dead cockroaches may accidentally be incorporated into human meals. Cockroach excrement, scent-gland secretions, and regurgitations spoil the palatability of human food. They strongly attract more cockroaches to established feeding sites, causing additional staining and contamination of food, food packages, and kitchen cabinet cracks and crevices where cockroaches gather.

SECTION C INSPECTION AND MONITORING

1. INSPECTION

A careful flashlight inspection of a dwelling is necessary to discover the presence and centers of cockroach activities in order to identify them and the available harborage, food, and water sources before control treatments can be initiated. Further, estimates of the pre-treatment size of cockroach populations compared with post-treatment population estimates provide important data for evaluation of the effectiveness of controls.

Refrigerators pose weak links in cockroach-control programs because they provide heat, harborage around coils, constant water supply, and hiding places that are almost impossible to treat. The presence of surface molds and water damage under or around refrigerators will help pin-point concealed cockroach habitat.

Make inspections, if possible, during evening hours, when cockroaches leave harborage. During the day, cockroaches remain deep within cracks. Use a flashlight during inspections (even if the area is not dark) to help concentrate your focus. Inspect for cockroaches every two weeks unless a decrease in roach problems justifies extending the time between inspections.

2. MONITORING

Once infestations are identified through inspections, use sticky traps to determine approximate insect numbers and to provide pre-treatment data for evaluation of the effectiveness of control measures. There are several effective sticky traps, some with attractive food baits, on the commercial pest-management market. Numbering traps and analyzing their locations and captures, which should be indicated on room-diagram maps, helps to identify cockroach harborage and needs for additional attention to sanitation measures, exclusion, or pesticide treatments.

Monitoring is done by placing sticky traps strategically in rooms and kitchens where harborage, warmth, water, and food are plentiful. The best trap locations are in corners where cockroaches congregate. Place traps against walls, fixtures, and under appliances; do not place them in the open or where they may become wet. Cockroaches tend to stay close to cracks and crevices when foraging

for food. Study cockroaches found on traps to determine the direction from which they entered the trap, which will help point out likely harborage sites. Additional follow-up monitoring with sticky traps is necessary five to seven weeks after the first monitoring session to see if young cockroaches are still hatching.

SECTION D COCKROACH CONTROLS

1. ACTION THRESHOLDS

When an average of two or more cockroaches per night per trap is caught in a room, do spot crack-and-crevice pesticide treatment of cockroach harborage with boric acid, place bait stations, and follow the recommended guidelines.

2. PREVENTION OF COCKROACH INFESTATIONS

Infestations can be prevented by reducing conditions which support cockroaches, including access to dwellings and harborage, moisture, and food. Otherwise, cockroach populations are very difficult to control because small, residual populations can survive in even the most sanitary of environments. Residual populations can explode into major problems. The use of pesticides, however, can never be regarded as a substitute for either prevention or good sanitation practices. Pesticidal suppression of cockroach populations without a change in environmental conditions that support them only gives a false and temporary sense of security, and may result in chemical resistance in pest populations.

Good building maintenance is mandatory if cockroaches are to be denied access to dwellings. This requires elimination of holes and cracks used by cockroaches to gain entry into buildings through the following measures: installation of tight-fitting windows, doors, screens, and door sweeps; caulking of all exterior and interior cracks and holes in foundations, walls, sills, floors, splashboards, and water, heating, and electrical-service chases; screening open sewer lines and drains; and repair of leaking plumbing facilities and removal of other sources of moisture.

An effective prevention program should contain the following major elements:

- Careful inspections of areas surrounding the building, noting and correcting conditions which attract or provide cockroach harborage, such as stacks of firewood, dead tree stumps and branches, vines and other vegetation on or next to the building, piles of bricks, stones, or wood, and leaf litter.
- Careful inspections of building exteriors from foundation to attic, noting and correcting all possible points where cockroaches or other pests could enter the building.
- Careful inspections of building interiors, attics, and crawlspaces from floor to ceiling, noting and

sealing all cracks, crevices, holes, and voids which could harbor cockroaches or other pests. Stainless-steel baskets can be used in sink and floor drains to prevent entry of cockroaches from sewers.

- Inspection of dwellings for accumulations of cardboard or wooden boxes, paper and plastic grocery bags, empty aluminum cans, beverage cartons, furniture, dried pet foods, seasoned firewood, and potted plants, through which cockroaches are often imported into a dwelling and in which materials cockroach populations flourish. Tactfully advise residents about needs for improved sanitation.
- Inspection for accumulations of food scraps often found under refrigerators and other kitchen equipment and in cupboards. Tactfully advise residents not to leave dirty dishes or puddles of water on cupboards, to clean up all food scraps immediately after eating, to store food in pest-proof containers, to use tight-fitting lids on garbage containers, and take out garbage every day.

3. CONTROL OF EXISTING COCKROACH INFESTATIONS

Cockroach problems almost always indicate the presence of excessive moisture and poor sanitation. Effective control measures should include physical, mechanical, and cultural changes. When those methods are not sufficient, chemical measures should also be utilized.

4. PHYSICAL, MECHANICAL, CULTURAL CONTROLS

Because of adjoining apartments, attics, crawlspaces, pipes, and other connections, serious cockroach problems in multi-unit dwellings usually require an intensive control program for the entire building. One unit left untreated will supply cockroaches to other units.

a. Exclusion

The entire building should be adequately sealed and secured against cockroach entry. Carefully check for and seal cracks and crevices in walls, around sinks, and gas, water and electrical lines, cupboards, and baseboards to eliminate all cockroach hiding and breeding habitats. Cockroaches may travel between apartments in and along electrical conduits and enter rooms through open prong holes in electrical outlets; keep outlets covered at all times. Fit self-closing devices to screen doors and check that screens are not broken.

Repair leaking faucets and water and drain pipes, and ventilate or dry out moist areas such as crawl spaces. Remove any other sources of moisture available to insects. Be sure indoor plants are not overwatered; place screens on fish tanks. Cover all air and ventilation vents with fine-mesh wire screens.

Direct runoff away from buildings. Remove rotting leaves from window wells and dense vegetation from around building foundations, and trim trees that touch the building. Place outside lighting away from the structure to avoid attracting cockroaches and other flying insects to the building.

b. Sanitation

Residents should be instructed in the following procedures to eliminate all food, moisture, and harborage available to cockroaches:

- Unnecessary equipment and stored materials in which cockroaches can hide should be removed from the dwelling.
- Foods should be stored in insect-proof metal cans or plastic or glass jars with tight-fitting lids, or kept in the refrigerator.
- Food and grease should be removed each day from stove doors, hinges, burner tops, joints, and crevices. Thorough clean-up of food particles on and under tables and counters should be done as soon as possible after meals, and dishes not promptly washed should be immersed in soapy water. Discourage eating in non-dining areas. All leftover pet foods should be cleaned up as soon as pets finish eating; don't leave food dishes out between feedings. Do not use liners on shelves or in drawers, which provide harborage for cockroaches under loose edges.
- Place all food, garbage, empty drink and food cans, and other materials providing potential insect food in sealed plastic bags or tightly sealed canisters as soon as possible. Do not store inside the building empty aluminum cans or bottles for recycling. Keep garbage cans tightly covered and take garbage out daily; under no conditions permit garbage to remain exposed overnight in apartments.
- Clean cockroach infested "focus" apartments by emptying all kitchen cabinets, drawers, and pantries and washing them out with soapy water before replacing items. Empty stored clothing from boxes and bags and wash and dry them before repacking in sealed plastic bags or in new, clean boxes.
- Egg cases and adult insects are frequently imported into dwellings on foodstuffs and containers coming from other cockroach-infested areas. Cockroaches hide and breed among folds of paper sacks and in voids of corrugated cardboard boxes. Carefully inspect (or sterilize) all incoming containers and shipments for cockroaches and egg cases before putting items on shelves. Seal all paper sacks and cardboard boxes in plastic garbage bags as soon as they are emptied and properly dispose of them.

Provide written information and graphic handouts to familiarize residents with cockroach-control programs and the need for sanitation. Residents should understand and be willing to follow steps to reduce the availability of food and harborage to cockroaches and to take measures to prevent

reinfestation. No amount or frequency of pesticide application is sufficient to control or eliminate cockroach infestations where sanitary conditions are not met.

c. Direct Controls

Sterilize equipment and furniture infested with cockroaches or egg cases by steam cleaning or in dry heat (in excess of 140 degrees F.) for 30 minutes. This method is useful when residents move from an infested unit to a new one.

5. PESTICIDE TREATMENTS

Chemical controls provide only temporary relief from insects in dwelling units unless the moisture, food particles, and grease found in kitchens are eliminated. When chemicals dissipate, cockroaches may re-invade dwellings. Thus, good exterior area sanitation is just as important as inside sanitation and control. To be effective, any short-residual chemical treatment should attain 95 percent or greater cockroach kill within the first few days, and later follow-up treatments should concentrate on the remaining cockroach reservoirs. Before any chemical is applied, it is vital to know the kind of cockroaches present and where they are hiding so harborage areas can be effectively treated.

Boric-acid dusts and sprays are generally used for effective chemical treatments. This chemical is applied through a narrow-diameter tube into harborage cracks and crevices where cockroaches live and breed. Boric-acid dust may also be applied under cabinets, drawers, and around pipes. When applied in cabinets, be sure to remove utensils and supplies and apply the dust to cracks; do not treat shelf surfaces. Only refined, pesticide-grade, 99% boric-acid dust should be used. Since the dust is harmful (as are most pesticides), a dust mask, goggles, and gloves should be worn during the treatment process. Various brands and formulations of boric acid are commercially available; some use aerosol carriers that makes application to small cracks easier. Boric acid may take 7 to 14 days to kill cockroaches, whereas other pesticides may kill cockroaches in a shorter time (if the cockroaches have not developed resistance). However, boric acid remains active for a long time. Cockroaches may develop resistance to most pesticides but, after over fifty years of use, they are still not resistant to boric acid. After applying boric acid to cracks and crevices, caulk them to eliminate future harborage and to keep out moisture.

Various types of solid, semi-solid, and liquid cockroach bait stations are commercially available. Many contain low-risk chemicals that are attractive to cockroaches and help control populations. Generally, ten or more bait stations are placed in cockroach harborage areas in a normal sized kitchen. Some bait stations have sticky tape on the back for applying baits to vertical surfaces. However, if sanitation is poor in a dwelling, bait performance will also be poor because of the availability of alternative foods.

Several new toxic paste or gel baits have been developed that are attractive to cockroaches. These toxicants can be stomach poisons, nerve poisons, chitin inhibitors, or insect-growth regulators (IGRs). Bait guns have also been developed to inject paste or gel baits directly into the cracks and crevices or other places where cockroaches hide.

END OF CHAPTER FIVE