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Main cockroach species in urban areas in our country and the world, prevention and alternative control methods of these pests

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Abstract- Cockroaches are located in major pests in urban areas in the world. Four best-known cockroach species are American cockroach, *Periplaneta americana*, Australian cockroach, *Periplaneta australasiae*, German cockroach, *Blattella germanica* and oriental cockroach, *Blatta orientalis*. It is known there are 3 species in Turkey. They are *B. germanica, B. orientalis and P. americana*. Oriental cockroach is Turkey's local insect and often confused with Blaps spp. Cockroaches may become pests in any structure like homes, schools, restaurants, hospitals, warehouses, offices, etc. They cause repulsive and disgusting feeling in people because of the bad smell they reek of, in the areas seen by the people and they also cause allergic reaction in many people. In conjunction with it is not easy to control cockroaches, sanitation and preventive measures are important to suppress population. The most practical way in control is to use chemicals (gel, granule, dust, baits and sprays). But only chemicals are not effective and today, with environmental consciousness, negative effects of pesticides on human health are more taken into account. Also, because of resistance to pesticides tendency to alternative methods in cockroach control is emerged. Usage of preparates, control cockroach populations, like entomopathogens, plant extracts etc. should be focused.

Index terms: cockroaches, alternative methods, prevention, urban areas.

I. INTRODUCTION

Cockroaches are main pests in urban areas in our country and the world. Cockroaches are known to have lived on earth for approximately 300 million years, they have about 4500 species in 6 different family. [1]

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Four best-known cockroach species are American cockroach, *Periplaneta americana,* Australian cockroach, *Periplaneta australasiae*, German cockroach, *Blattella germanica* and oriental cockroach, *Blatta orientalis*. It is known there are 3 species in Turkey. They are *B. germanica, B. orientalis* and *P. americana*. Oriental cockroach is Turkey's local insect and often confused with *Blaps* spp. [3]

II. COCKROACH SPECIES

The American Cockroach *(Periplaneta americana)*: American cockroach adults

grow to an average length of around 4 cm. They are reddish brown and have broad body. The insect can travel quickly This cockroach shows a characteristic morphology with its body and has two wings. American cockroaches generally live in moist areas, but can survive in dry areas if they have access to water. They prefer warm temperatures around 29 °C (84 °F) and do not tolerate cold temperatures. [3] They are common in sewers and animal-rearing facilities. Females produce average 800 eggs/year. Each capsule contains approximately 12 individual eggs.

Figure 1. *Periplaneta americana*

The Australian Cockroach *(Periplaneta australasiae)*: They are similar to American cockroach in shape. They prefer to live tropical and subtropical areas. In egg packet, there are approximately 22-24 eggs. [12]

Figure 2. *Periplaneta australasiae*

The German Cockroach *(Blattella germanica)*: It is a small species of cockroach, typically about 1.1 to 1.6 cm long. In colour, it varies from tan to almost black. It has two dark and parallel wings. Although *B. germanica* has wings, it can barely fly. It is very closely related to the Asian cockroach. They occur widely in human buildings and indoors. They particularly associated with kitchens, bathrooms and food processing facilities. They cannot survive severe cold Though

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nocturnal, this cockroach occasionally appears by day, especially if the population is crowded or has been disturbed. [5] The German cockroach reproduces faster than any other residential cockroach. Females produce more than 30.000 eggs/year. This cockroach is the most common species seen in Turkey. [3]

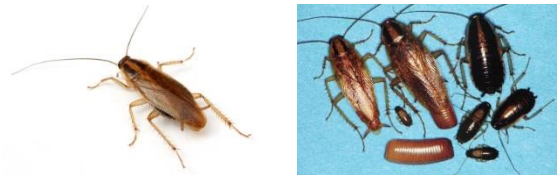

Figure 3. *Blattella germanica*

The Oriental Cockroach *(Blatta orientalis):* This cockroach, also known as the waterbug, is a large species of cockroach, adult males being 18–29 mm and adult females being 20–27 mm. It is dark brown to black in color and has a glossy body. The female Oriental cockroach has different appearance from the male. She has a wider body than the male. The male has long wings, which cover two thirds of the abdomen and are brown in color, and has a narrower body [4]. They are black in color and prefer moist places. In one egg compartments there are approximately 16–18 eggs. It is Turkey's local insect.

Figure 4. *Blatta orientalis*

They are coming out of their hiding places at night in search of food and water and they prefer wall crevices, cracks, narrow areas such as the lower surfaces of appliances and cabinets, newspapers and magazines residues for shelter. [5]

III. COCKROACH CONTROL

In conjunction with it is not easy to control cockroaches, sanitation and preventive measures are important to suppress population.

At first, their locations must be determined. For the successful control, the most findable places should be found.. Reduction of food and water sources and hiding places is essential. If cockroaches can find food to eat, all control methods will have limited effect. Cockroaches are likely to reinvade as long as a habitat is suitable to them (i.e., food, water, and shelter are available) [4]. Only sprays will not eliminate cockroaches. An IPM approach will be more effective.

In addition to sanitation and exclusion, baits can be effective against most species of cockroaches. Pesticide spray products are registered for use on cockroaches and may temporarily suppress populations, but they usually do not provide long-term solutions and are not generally recommended [4].

Issues to be considered in control:

- Humidity can be reduced with a dehumidifier or ventilation.
- Cracks in walls and other places they hide and shelter should be closed.
- Waste and food shouldn't be left exposed, food waste and empty bottles should be cleaned.

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- All food should be stored in tight containers. [6]

Today, with environmental consciousness, negative effects of pesticides on human health are more taken into account. Also, because of resistance to pesticides tendency to alternative methods in cockroach control is emerged. Among these control methods;

Heat and Cold Applications: They do not develop or reproduce when temperatures are below 7°C and up to 46°C. This temperature is extremely important in reducing the pest populations. CO_2 giving the wall space where the insects cockroaches can be created for extreme cold weather. Fumigation treatments are carried out with CO_2 in areas with low infection.

Vacuuming: In areas where the insect is the vacuum equipment is used to remove the cockroaches from the wall crevices and cracks small area, you may be able to eliminate adults, nymphs and egg cases with this method.

Cockroach pheromones: This pheromone synthesized and extracted by cockroach. When these pheremones added to the sticky traps lots of cockroaches is captured. When these boric acid and diatomaceous earth is effective in the applications are added until at least insecticides cockroach control. Besides these applications when the application of boric acid and diatomaceous earth are added, it is effective in at least insecticides as cockroach control.

Insect Growth Regulators (IGR's): They alter growth and development of cockroaches. Compounds like Hydroprene, Pyriproxyfen and Noviflumuron can be used for changing cocroaches' development. It is the preferred method because they are less toxic to humans and non-target organisms. [7]

Trapping: Traps offer the best way to monitor cockroach populations. By placing traps in several locations and inspecting them regularly, you can identify the areas of most severe infestation and know where to concentrate control efforts. Traps also can be very helpful in evaluating the effectiveness of control strategies. Available retail cockroach sticky traps work well. These traps are open-ended and are lined inside with a sticky material [4]. When cockroach pheromones added to sticky traps, the traps catch more cockroaches. When added to products such as boric acid and diatomaceous earth, the insecticide effect occurs.

Figure 5. Sticky trap

Plant extracts: Plants may be alternative to insect control because they have the bioactive chemical. [8]

Semiochemicals used against pests that are within plant extracts and essential oils. These oils are effective insect as a fumigant, contact insecticide, repellent (repellent) attractant (attractive). [9]

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Several plant essential oils which are called "green pesticide" like clove, mint, neem tree seed, thyme and rosemary show some contact toxicity on cockroaches. [7]

Chemical Control: Synthetically produced drugs, gel, granule, powder feed and spray pesticides used to cocroach control. Chemical pesticide application are most common in cockroach control. Baits and feeding powder is used. To control cockroaches, Bait products are the primary chemicals to be used. Baits have different formulations like gels, granules or dusts. Most insecticides used in baits are slow acting. For home control, Bait Stations are the most popular method. Gel Baits are useful for crack and crevice treatments.

Biological Control: In recent studies, it is indicated that to control these pests entomopathogens (fungi: *Metarhizium anisopliae*, *Beauveria bassiaana*; nematodes: Steinernema sp., Heterorhabditis sp.) can be effective. [10] [11]

Natural Enemies: Some animals as hedgehogs, frogs, turtles, geckos and mice feed on cockroaches. Some tiny parasitic wasps (like Evania, Hyptia and Tetrastichus) lay their eggs in egg packets of some cockroaches.

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