Apiculture Factsheet

Ministry of Agriculture
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Factsheet #104

THE HONEYBEE COLONY

Honeybees can not survive on their own for long, but require the social setting of the colony. It is the colony that matters; where tasks are accomplished through division of labour. Every member works, not for itself, but for the benefit of the colony. For example, during the summer season, large quantities of food are gathered and stored by the workers, even though the individuals do not live long enough to feed on these reserves during winter. Defensive behaviour of individual bees is not for themselves but for the benefit of the colony. Since stinging mostly results in death, the use of the stinger is of no value to the individual bee.

The Worker Bee

Worker bees have given up the functions of reproduction and egg laying, and passed on these tasks to the single queen of the colony. The worker bee has sex organs that are not fully developed. Her six-week life span in summer is devoted to carrying out the many tasks necessary for colony development and survival. Many duties carried out by the worker bee are the result of physiological changes that take place during the worker's life. The most important of these are the production and glandular secretion of royal jelly (brood food) and beeswax.

In addition to numerous in-house duties, worker bees forage for nectar, pollen, water and propolis. They also serve as scout bees in finding these materials and in locating a future home site for a swarm.

Three distinct phases may be observed in the life of the worker bee:

1. The "nurse bee" phase lasts about a week. At first she helps in incubating the brood and preparing brood cells. Next comes the feeding of older larvae that are provided a mixture of honey and pollen. About three days later the special brood food glands in the head of the worker bee become active. The concentrated milky secretion from the glands called "royal jelly" is fed to the queen larva in its pure form while a mixture of pollen, honey and jelly is fed to the worker and drone larvae.
2. The "domestic" phase. For about one week, the young worker bee takes on various hive duties such as storing of honey, building and repairing comb, and cleaning the hive. During this period, the young worker bee makes its first orientation flights and may carry out guard duties at the hive entrance.
3. The "field" bee or forager. The bee is now about fourteen days old. Foraging may last two, three, or four weeks according to the amount of energy expended. At this final stage in life, at the age of 6-8 weeks, most worker bees will die in the field. In winter, bees live from fall to the next spring.

Honeybees forage for four products: (1) nectar, which is converted into honey; (2) pollen, which is the protein and fat portion of the bees' diet; (3) water; and (4) propolis, or bee glue. Propolis is a resinous material from the buds of trees. Bees use propolis to close small openings in the hive.

When nectar is collected from flowers, it will be kept in the "crop" or honey sack where initial enzymatic conversions take place, while pollen and propolis are carried in the "pollen baskets" located on the hind legs.

The Queen

The honeybee queen is unique in being the only individual responsible for the reproduction of the colony population. Surrounded by a retinue of attendants, she goes about her single task of egg laying. During peak periods in spring and fall she may lay as many as 1,500 to 2,000 a day. She is capable of egg production only and does not nurse her brood. Laying usually begins in February and the rate increases until about mid-summer. By August, egg laying declines until mid-October when it stops altogether.

It is essential for the queen to maintain a high rate of egg laying if the colony is to replace all the workers that die during the normal development of the colony. The egg-laying ability of the queen is key to success of the colony and ultimately to the beekeeper since a large population of worker bees is needed to optimize honey yields and pollinate crops.

Unlike worker bees, a queen may live for 5 or 6 years. At any time, and especially later in life, the queen may falter in her egg-laying, which reduces brood development. The worker bees will construct queen cells in preparation to replace her. To reduce the risk of a slowdown in brood rearing or queen failure in the middle of production season, it is recommended to replace the queen every year or two.

The Drone

The drone is the male bee of the colony. It developed from an unfertilized egg and hence, the drone is a haploid with only half the number of chromosomes. All his genetic characteristics originate from his mother, the colony queen. Drones cannot sting and do not perform any duties within the hive or gather nectar from flowers. The rearing and feeding of drones requires considerable resources from the colony. In the summer, a colony may raise 200-300 drones but in the fall when the colony prepares for winter it will drive out the few remaining drones. The sole purpose of the colony to rear drones is to have one or more mate with a virgin queen from another colony and have the genes of the colony passed on.

The Brood Cycle

During its development, the honeybee undergoes four distinct stages of egg, larva, pupa, and adult, a process called complete metamorphosis. The queen is capable of laying fertilized eggs that produce worker bees or queens, and non-fertilized eggs that result in drones. During the first three days, the embryo inside the egg will develop rapidly. Then, just prior to hatching, the egg is provided a minute drop of bee milk. This applies to all brood regardless of caste.

In worker brood, the larva is liberally fed glandular food or "royal jelly" for two or three days, followed by a honey and pollen diet. This change of food determines the worker caste. When the diet is not changed and remains royal jelly throughout the larval period, the larva will become a queen.

During the larval stage, five molts take place. After eight days, the larva is fully grown and fed, and at this point workers seal the cell with a porous capping. This is called the "capped brood" stage. The larva will spin a cocoon and undergo the process of pupation. The duration of the pupal stage depends on the caste.

Workers and drones are reared in hexagonal-shaped cells which comprise the comb, but the queen is reared in an acorn-shaped cell, normally protruding vertically from the comb surface, with the opening at the bottom.

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