HONEY BEE DISEASES AND PESTS

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MEMBERS of a COLONY

- They are social insects.
- There are work divisions among bees.
- There are one queen, thousands workers, and several hundred drones in a colony.

QUEEN Bee

- It comes from a fertilized egg.
- has Diploid (2n) chromosome (32)
- 18-20 mm
- the wings do not completely cover the body.
- Nutrition, cleaning and other nursing works are done by the worker bees.
- It is fed with royal jelly, which has high protein value.
- Oviparous.
- It lays eggs on a continuous basis especially in spring and summer seasons.
- lays average 1500 eggs in a day (may be up to 3000).
- The life span is between 3 and 6 years.
- The queen may lay until the end of her life, but it should be replaced with young one at least every 2 years.

- There presence of the queen is identified by a substance called as "Queen Substance" secreted by the mandibular glands of the queen.
- The impacts of 9-oxo-2-decenoic acid (9-ODA) founded in the queen substance are that;

1. hampers the development of workers' ovaries.
2. hampers the construction of new queen coups (cell) in the colony.
3. hampers mating in the hive.
4. creates sexual attractiveness for drones at certain altitudes in the open air.
5. allows the recognization of the queen by the drones.
6. enables the coexistence of members of honey bee swarms together with the other pheromones.
7. encourages the activities of the workers.

- If the queen is lost, removed or dies, the organization is degraded in the colony.
- In this case, the workers transmit a new 2n larva to a new cell and feed it with continuously royal jelly to transform a new queen bee.
- Otherwise, the workers can make false queens.
- Sexual maturity occurs 6 days after the queen bee left the cell and between 14th and 16th in the drones.
- Mating of the queen bee occurs under the proper weather conditions (20 C, sunny and windless).
- The queen must mate until it is 20 days old.
- It mates with an average 6-8 drones.
- If the queen can not mate with enough numbers of drones, it will return to its mating flight within 1-2 days.
- The spermatheca of the queen takes about 7 million sperma.
- Artificial insemination is also possible.

DRONE BEE

- It comes from the unfertilized ovules with parthenogenesis.
- Haploid (n), 16 chromosome.
- The developing period is about 24 days.
- they have not wax gland and sting.
- Their mission is to fertilize the unmated virgin queens.
- Their lifespan is variable. The means are 13-14 days, 21-24 days, and 54 days.
- It mates only once and dies.
- Workers can adjust the number of drones.
- Large colonies have average 1500 drones.
- "The phenomenon of astonishment" is often seen in drones and this leads to the spread of diseases.
- The drones are attracted by the pheromones secreted by the queen.
- The drones in the hive are not attracted by the queen.

WORKER BEE

- It comes from the fertilized eggs.
- Diploid (2n).
- Their wings are long enough to cover the abdomen.
- They do not have mating skills.
- There is a division of labor between them.
- Their populations range from 10,000 to 90,000 depending on the season.
- If the colony is weak, the population can go down to 2000-3000 in winter mouths.
- Their average life spans are 4-6 weeks. However, this time varies to the developing season of workers.
- For example; the life span of it is about 35 days in March, 28 days in June, and it was observed that they could live up to spring in September-October birthed worker.

The adult life (day)	Duty
	Activities inside the hive
1-2	Housekeeper - cleans the cells and keeps the brood warm
3-5	Nurse or nanny - feeds older larvae with honey and pollen
6-11	Nurse or nanny - feeds younger larvae with royal jelly
12-17	Hive builder - produces wax and constructs comb, ripens honey
18-21	Guard and Ventilator - guides the hive entrance and ventilates the hive
	Activities out of the hive
22-55	Forager - flies out to gather pollen, nectar, propolis and water for hive

- The worker bees ventilate the hive in the hot season.

EGG

- 1 to 1.5 mm, white and slim.
- The queen lays a single egg in a cell, but before this, the cell must be spotless otherwise the queen will move to a different one. The worker bees are designed to clean them.
- Cells are different. There are a wider drone-size cells, in which she will release a non fertilized egg which will develop into a drone, smaller, standard worker-size cells where she releases a fertilized eggs for future worker bees.
- After 3 to 4 days from mating, the queen starts laying eggs and leaves an average 1500 eggs in a day.
- Honeycomb is a wax structure consisting of rows of six-sided (hexagonal) cells.

- Drone cells are larger in diameter (6-6.5 mm) and are domed much higher than worker cells. Drone cells are usually in groups at the lower edge of the frame and have a round "bullet shape" appearance.
- Worker cells are found in the center of the frame and it is measured as 5-5.5 mm. They are slightly domed, almost flat. Not translucent like capped honey.
- Queen cells are very different. When completed, they look like a peanut shell- rough-textured, elongated, average 2.5 cm, and they hang vertically off the frames.
- A fertile queen bee can lay about 250.000 to 300.000 eggs per year.
- Embryo development in the egg is completed in three days.
- On the third day, with a few hours before hatching, the nurse bees deposit royal jelly around the egg, which will soften chorion and facilitate hatching. The eggs will brake easily and the larvae will come out.

LARVA

- A healthy larva is curled in a C shape and has a glistening pearly white color.
- the larvae molt 4 times with an interval of one day.
- No matter if the bees will be drones, queens or workers, in the first three days of life, the larvae are fed with royal jelly.
- After the first 3 days, the drones and workers will be fed with a mixture of honey, pollen, and water.
- With the exception of the larva who is going to be a queen. The queen is feed only with royal jelly in their all life.
- On the sixth day, when the larva stage is complete, the cell is covered by workers with a thin layered wax that is a air-borne structure.
- This structure is called as "operculum".
- The larva enters the pre-pupa period and molt one more times during 2-4 days, subsequently larvae transforms to pupa.
- The larvae molts 5 times in total.

PUPA

- The pupae do not receive any kind of food from the nurse bees.
- At first they are white and shaped like adult bees, but without wings.
- Two days after the cells have been capped, the transformation of larvae into pupae begins. It's a slow, imperceptible transformation.
- The pupae period is completed within 4-4.5 days in queen, 8 days in workers and drones.
- From the pupa stage, adults will be born.

ADULT

- In the first day as an insect, the working bee has an incomplete physiological development.
- It needs to consume much pollen for next 6 to 8 days, for the skin to be fully pigmented, hypopharyngeal glands to develop, the sting to be operational etc.
- When growth is complete, it will not consume any more pollen, and the required nitrogen will be covered by the small amounts of protein and free amino acids present in honey.

Developmental stages	Queen (day)	Worker (day)	Drone (day)
EGG (Hatching time)	3	3	3
LARVA			
Before the cell is capped	5-5.5	5	6
Capping	1	2	3
Prepupa	2	3	4
PUPA	1	1	1
Pupa stage and emerging of adults	3-3.5	7	7
Total time (time until adult emergence from the egg)	15-16	21	24

8-8.5

10

13

4-4.5

8

8

- Activities of workers out of hive are closely related to the weather.
- The best condition for honey bees is the windless and rainless weather where the heat is 18-32 C.
- When the environmental temperature drops below 10 C, the honey bees do not work.
- They don't like windy airs.
- Under appropriate conditions, a worker bee can transport food 10-15 times in a day.
- The activities of the workers end in the late autumn and start in the early spring depending on the climatic conditions of the region.
- In the winter months, the bees consume pre-stored nutrients and their numbers go down to a few thousand.

- In winter, a queen and workers come together and form a "winter cluster".
- In this period, the drones are fired from the hive.
- As spring arrives, the mobility increases.
- The queen begins to lay egg and new generations emerge.
- In the early spring, the old queen takes some workers alongside her to keep the growing bee population at a certain level, and gives up the hive to the newborn queen.
- This is called "swarming".
- This event usually occurs at the end of July to early May in Turkey.

- During the second swarming in summer, this time the young virgin queen leaves with a group of workers from the hive.
- In a colony, if the queen gets very old and the egg yield falls, the workers will get rid of this queen and the new young queen will take over the management.
- If the swarm is not wanted, the queen bee cells can be cut.
- The artificial swarming can be done.