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Beekeeping and Associated With Products of Honey Bee

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SUMMARY

Beekeeping is a very long-standing practice in the farming communities. Apiculture is a good source of income for smallholder farmers. It plays a significant role as source of additional cash income and nutrition for many subsistence farmers. It is an integral part of the smallholder farming system. The main aim of apiculture study, therefore, was to analyze the major honey bee production challenges and opportunities.

INTRODUCTION

Apiculture (L. *apis*, bee) or bee-keeping is the practice of scientific maintenance of honey bee colonies, commonly in hives, by humans and collection of bee products and marketing them professionally. A bee-keeper is called an Apiarist. A location where bees are kept is called an Apiary. The scientific study of honey bees is known as Apiology. Apiculture aims not only for production of honey but also for production of bee wax as well as to study for artificial pollination.

History of study of behaviour and biology of honey bees

Francois Huber

It is revealed from the record that, European natural philosophers undertook the scientific study of bee colonies since 18th century to understand the complex and hidden world of bee biology. Prominent among these scientific pioneers were Swammerdam, Charles Bonnet, and the blind Swiss scientist Francois Huber. Although Huber became blind before he was twenty, he employed a secretary, Francois Burnens, to make daily observations, conduct experiments and to keep accurate notes for a period of 20 years, and revealed all the basic scientific truths of the biology and ecology of honey bees. Huber is universally regarded as the Father of modern bee-science.

Systematic Position of Honey bee

- Jointed appendages. Hence, Phylum – Arthropoda
- 3 pairs of legs. Hence, Class – Insecta
- Membranous wings. Hence, Order – Hymenoptera
- Genus - Apis Different Species of Domesticated Honey Bees

a) *Apis mellifera* (Western/European bee)
b) *Apis dorsata* (Rock bee)
c) *Apis indica* (Indian bee)
d) *Apis florea* (Little bee) Non- apis bees
a) *Nomia melanderi* (Alkali bee)
b) *Osmia spp.* (Mason bee)
c) *Megachile rotundata* (Alfalfa leaf cutter bee)

Honey Bee Colony Composition

The honey bees are social, colonial insects and exhibit highly organized division of labour. Their colony contains one queen bee (fertile female); a few thousand drone bees or fertile males; and a large population of sterile female or worker bees.

- Usually every beehive contains one queen.
- The size of the queen is comparatively larger than the other types.
- Its wings are smaller than its body.
- The abdominal end gradually tapers.
- One queen usually flights once in its lifetime, either for copulation or for swarming.
- Its only function is to lay eggs, it lays about 1500-3000 eggs per day, which includes both fertilized and unfertilized eggs.

- The queens are prepared from the fertilized eggs according to the requirement of the colony by feeding special types of food called Royal Jelly, a protein-rich secretion from glands on the heads of young workers.

Queen bee

- All honey bee larvae are fed heavily with royal jelly for the first few days after hatching but only queen larvae are fed on it exclusively throughout. As a result of the difference in diet, the queen will develop into a sexually mature female unlike the worker bees.Queens are raised in specially constructed queen cells, which have peanut like shape and texture.
- Queen cells start out as queen cups, which are larger than the cells of a normal brood comb and are oriented vertically instead of horizontally. The old queen starts laying eggs into queen cups when conditions are right for swarming or supersedure (Supersedure is the term used by beekeepers to describe the replacement of an old queen by her daughter).

Virgin queen bee

- A virgin queen is a queen bee that hasn't mated with a drone.
- Virgins are intermediate in size between workers and mated queen and are much more active than latter.
- They have very little queen pheromone and often are not recognized as queens by the workers.
- A young virgin queen on emerging from queen cell, seeks out virgin queen rivals and attempts to kill them.

Piping

- Piping describes a noise made by virgin and mated queen bees during virgin queens' development.
- Fully developed virgin queens communicate through vibratory signals: Quacking from virgin queens in their queen cells and tooting from queen free in the colony, collectively known as Piping.
- Piping is most common when there is more than one queen in a hive.
- It is postulated that piping is form of a battle cry.

Drone bee

- Drone or male bees are the idlest of the 3 members of the colony.
- Their only work is to fertilize the virgin queen bee.
- They are somewhat larger in size and stouter than workers, with powerful wings.
- They have greatly enlarged eyes, which cover most surface of the head.
- Abdomen of a male is blunt and flat.
- They don't possess any proboscis for pollen collection.
- After 10 days of emergence from the cocoon they can fertilize the female .
- Their life span is about 12-16 weeks.
- After copulation the male dies.
- In hive, they appear most plentifully in the early summer during swarming time after which the workers drive them away.

Worker bee

- Worker bees are sterile females and are most numerous.
- These are small bees but have a very well developed and powerful wings.
- They undertake all the household works of a hive.
- They possess wax glands on the ventral side of the abdomen and pollen basket on her hind legs.
- They have well developed mandibles for work in the hive.
- Young worker bees clean the hive and feed the larvae.
- A fully fledged sting is present in the last abdominal segment for protection as well as attack.
- However these stings are for single use.

- If used, the bee dies immediately.
- The worker's ovaries are small and non-functional, and the spermatheca is rudimentary. But it is evident that if required it can lay eggs for the sake of the hive.
- When their royal jelly producing gland begin to atrophy, they begin building comb cells.
- As they grow older they perform other colony tasks, such as receiving nectar and pollen from foragers and guarding the hive.

Life History/Cycle of the Honey Bee

- Virgin queen goes out on Nuptial/Mating flights away from their home colony and mate with multiple drones before returning.
- The drones die in the act of mating.
- Eggs are laid singly by the queen after mating flight, in a cell of the wax honeycomb, produced and shaped by the worker bees.
- Using her spermatheca, the queen chooses to fertilize the egg she is laying, usually depending on what cell she is laying.
- Drones develop from unfertilized eggs and are haploid, while females develop from fertilized eggs and are diploid.
- Larvae are initially fed with royal jelly produced by worker bees, later switching to honey and bee bread or bee pollen.
- The exception is a larva fed solely on royal jelly will develop into a queen bee.
- The larva undergoes several moultings before spinning a cocoon within the cell and pupating.

Swarming

- Swarming is the process by which a new honey bee colony is formed when the queen bee leaves the colony with a large group of worker bees.
- Bee language/Foraging Worker bees cooperate to find food and use a pattern of "dancing" (known as bee dance or waggle dance) to communicate information regarding resources with each other.
- In bee dance the middle course of the dance communicates to other bees the angle from the hive with reference to the Sun.
- Taking a hint from this angle they have to fly to reach the food source.

Culture Practice of Honey Bee

Gene manipulation of bees many bee breeding companies strive for selective breed and hybridized varieties to produce desirable qualities, such as :

a. Disease and parasite resistance
b. Good honey production
c. Swarming behaviour reduction
d. Prolific breeding
e. Mild disposition Some of these hybrids are marketed under specific brand names, such as

Buckfast Bee or Midnite bee. The advantages of initial F1 hybrids produced by these crosses include:

a. Hybrid vigour
b. Increased honey productivity
c. Greater disease resistance

The disadvantage is that with subsequent generation the advantages fade away and the hybrids tend to be very defensive and aggressive.

Indigenous method of bee-keeping

- Commonly used by traditional apiculturists.

- Wall or fixed type of hives in rectangular spaces in the walls with a small hole or movable boxes or earthen pitchers.
- Swarms are caught from trees, bushes, etc. and transferred to above mentioned spaces.
- When honey is ready the bees are driven away by smoking the hive.
- Then the comb is cut away and the honey is squeezed out through a piece of large cloth.

Modern hives

Langstroth Box

In modern bee keeping, the combs are built on wooden frames that are movable. This facilitates inspection and management of bee colonies. The beehive is made up of series of square or oblong boxes without tops or bottoms, set one above the other.

- The hive has the floor at the bottom with a crown board at the top and a roof over all.
- The wooden frames which are hung vertically in these boxes are filled with sheets of wax foundation on which the bees build the comb.
- Brood chamber is the only entrance to the hive, and the queen is confined within it.
- Supers are used for honey storage.

Bee Pasturage

- The plant that yield nectar and pollen are collectively termed "bee pasturage".
- The fruit trees, ornamental plants and forest trees comprise important bee pasturage.
- Nectar is the sweet secretion of the flower and is the raw material for honey.
- Pollen provides the raw material necessary for food of the brood.
- Extraction of honey Successful honey extraction requires the following instruments: Smoker and Honey Extractor.

Honey

- Honey is the food material for the bees and their larvae.
- Chemically, honey is a viscous water solution of sugar.
- Nectar is sucked from flowers and mixed with saliva.
- It is swallowed into a special region of the gut, called honey stomach.
- Inside the hive the workers regurgitate the processed nectar.
- The honey produced initially is very dilute, hence after placing it in storage cells of the hive, the bees "fan" it with their wings to evaporate the excess water and bring the honey to its required concentration.

Products from a Beehive

Economic importance

- Honey bee as economically very important insect.
- Bee keeping has developed into Apiculture industry in various countries.
- Honey bee produces honey and wax.
- Honey is used as food and also as medicinal product.
- Honey contains levulose, dextrose, maltose, ash and water.
- As medicinal substance it is laxative, antiseptic and sedative.
- Bee Waxes have several important use in manufacture of candles, Wax is used as embedding substance for microtomic sections and in all biopsy and histopathological studies.
- Bee bread is a mixture of pollen and nectar or honey.
- This substance is the main source of food for honey bee workers and larvae.
- The exact composition of the bee bread varies depending on the plants that the bees forage from.

Propolis:

- Honey bees repair their damaged combs by a waxy substance, called Propolis.
- It has some medicinal importance for human – medicines for tonsillitis, bronchitis and dental infections are made from it.

Royal jelly:

- It is used as a medicine for the treatment of human influenza, high blood pressure and respiratory infections.
- It is used a component in some skin care products.
- It is believed to have some anti-aging properties.
- The single protein royal- actin present in royal jelly is responsible for developing a queen bee.

Bee venom or Apitoxin:

- The poison of honey bee is used in the treatment of rheumatism, arthritis, etc. of man.

Some images of honey bee products:-

Honey

Bee pollens

Propolis

Royal jelly

Bee venom powder form

Bee wax

CONCLUSION

Production of honey has been the major aim of the industry. Modern beekeeping also includes production of beeswax, bee collected pollen, bee venom, royal jelly, propolis, as also of package bees, queen bees and nucleus colonies. About 10,000 tons of forest honey is produced annually.

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