

Apiculture and Honey Bees

Apiculture is the scientific rearing of honey bee for the commercial production of honey and other bee products like wax, pollen, bee venom and royal jelly. It is also called Bee keeping. Bee keepers are known as apiarist and place where bees are maintained is called an apiary.

Honey bees belong to -

Phylum: Arthropoda

Class: Insecta

Order: Hymenoptera

Family: Apidae

Genus: *Apis*

The genus *Apis* includes 4 species of eusocial bees which naturally distributed in Asia, Africa and Europe. Human beings later introduced the bees into other parts of the world mainly for beekeeping.

There are four well recognized types of bees in the world are

Apis dorsata (Rock bee),

Apis florea (Little bee),

Apis cerana (Indian bee),

Apis mellifera (European bee)

Note: A cerana, A florea and A dorsata are native species mainly found in Asian continent including India. Where as A. mellifera is an exotic species.

Apis dorsata (Rock bee): are giant bees they build a single open nest on branches of tall tree, rocks and buildings. They are the largest bees, about 20-30mm in size. Each comb may produce 20-30Kg of honey. They are highly aggressive and hence cannot be domesticated for beekeeping.

Apis florea (Little bee): or Dwarf bees also construct single open hive on twigs and branches of shrubs and woody plants close to the ground. They are the smallest, measuring about 5mm in size and produce only 100-250mg of honey hence they are not suited for bee keeping.

Apis cerana (Indian bee): They construct multiple combs in dark cavities or enclosures. They measure about 7-8mm and produce about 3-5kg of honey. They are more docile and can be easily maintained by the beekeepers.

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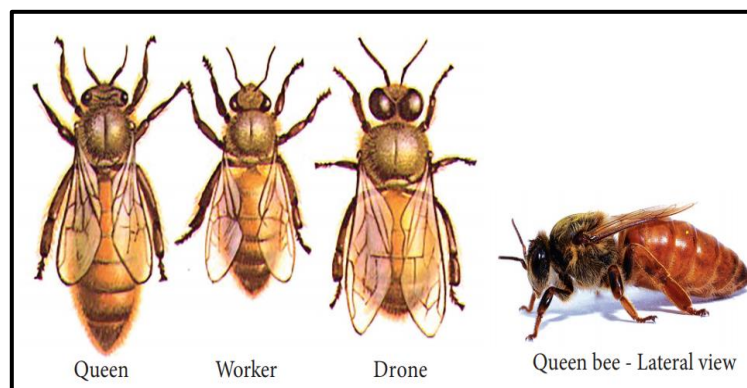
Apis mellifera (European bee): They are also called European bees as they are native to Europe. They are about 8-9mm in size and build multiple combs in dark cavities, caves and crevices. They are docile and produce about 10-20kg of honey per annum. They can also be effectively used for beekeeping.

Social organisation in Honey bees:

Honey bees are social insects They live in colonies and show division of labour. The nest of honey bee is known as the bee hive. There are three types of individuals in a colony namely the Queen bee, the drones and the worker bees. In a colony there is normally one queen, 10,000 to 30,000 workers and few hundred drones (male bees).

a. Queen Bee: Queen bee is a fertile female present in each hive and feeds on Royal Jelly. They are formed from fertilized eggs. The queen bee mates only once in her life. A unique flight called "nuptial flight" takes place by the queen bee followed by several drones. The sole function of queen is to lay eggs. In a life span of two to four years, a queen bee lays about 15 lakh eggs. When the queen bee loses its capacity to lay eggs, another worker bee larva is fed with Royal Jelly and thus develops into a new queen.

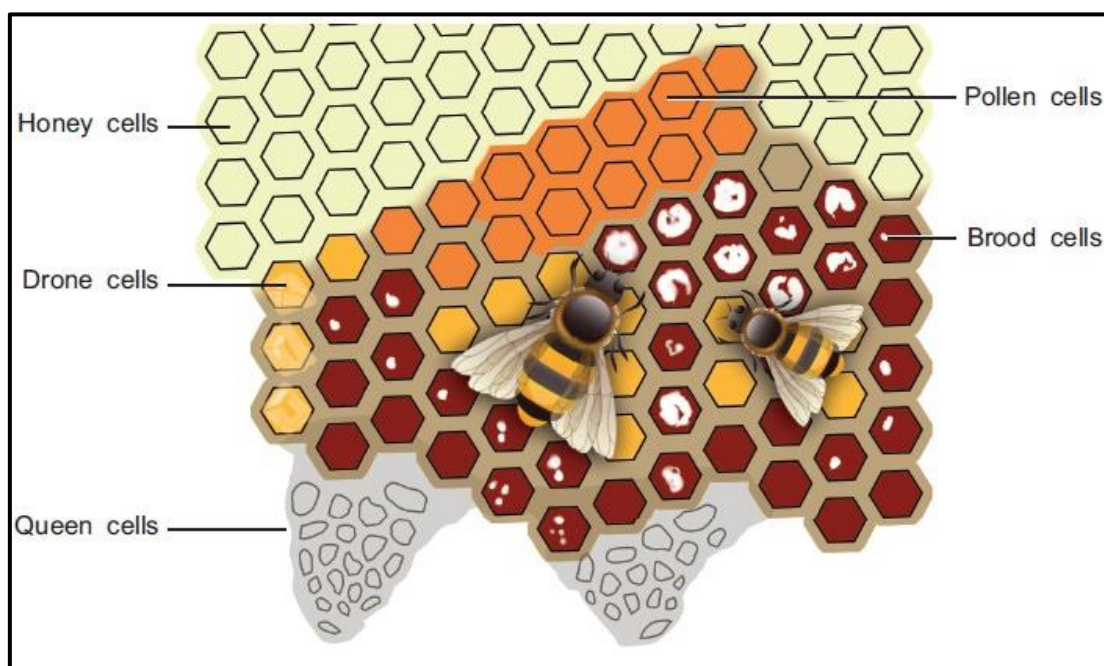
b. Drones: The drone is the functional male member of the colony which develops from an unfertilized egg. It lives in a chamber called drone cell. Drones totally depend on workers for honey. The sole duty of the drone is to fertilize the virgin queen hence called "King of the colony".



c. Worker Bees: They are sterile female bees developed from the fertilized eggs. They are the smallest and are present in large numbers in the colony. Their function is to collect honey, look after the young ones, clean the comb, defend the hive and maintain the temperature of the bee hive. Worker bee lives in a chamber called 'Worker Cell' and it takes about 21 days to develop from the egg to adult and its lifespan is about six weeks. Each worker has to perform different types of work in her life time. During the first half of her life, she becomes a nurse bee attending to indoor duties such as secretion of royal jelly, prepares bee-bread to feed the larvae, feeds the queen, takes care of the queen and drones, secretes bees wax, builds combs, cleans and fans the bee hive. Then she becomes a soldier and guards the bee hive. In the second half her life lasting for three weeks, she functions like a forager to collect the pollen, nectar, propolis and water.

Structure of Bee Comb

The comb of the bees is formed mainly by the secretion of the wax glands present in the abdomen of the worker bee. A comb is a vertical sheet of wax with double layer of hexagonal cells. The cells of the comb are of various types. The storage cells contain honey and pollen. They are built in the margin and at the top of the comb. The brood cells contain the young stages of the honey bees and they are built in the centre and the lower part of the comb. The **brood chamber** is divided into three types **Worker chamber**, **Drone chamber** and **Queen chamber** where the larvae developing into worker, drone and queen are reared.



Useful products obtained from honey bees:

Useful products obtained from honey bees are bee pollen, royal jelly, propolis and bee venom.

Honey: The foraging worker bees suck the nectar from various flowers. The nectar passes to the honey sac. In the honey sac (honey stomach), sucrose present in the nectar mixes with acidic secretion and by enzymatic action it is converted into honey which is stored in the special chambers of the hive.

Bee wax: Bee wax is the natural by-product secreted by the wax glands of worker bee to construct the combs of bee hive. It is widely used in cosmetic and pharmaceutical industries. It is used for making candles, water proofing materials, polishes for floors, furniture, appliances, leather and taps and also

Bee Venom: Bee venom is a colourless, acidic liquid. Bees excrete it through their stingers into a target when they sting. It contains both anti-inflammatory and inflammatory compounds, including enzymes, sugars, minerals, and amino acids. Bee venom is used for treating rheumatoid arthritis, nerve pain, multiple sclerosis etc.

Royal jelly: is a secretion produced by the hypopharyngeal glands of nurse bees that is used in the nutrition of larvae as well as adult queen. Royal jelly is used in the treatment of asthma and also as a dietary supplement.

Methods of Bee keeping

Bee keeping is a scientific method of keeping *A. cerana* or *A. mellifera* bees for the production of honey and other useful bee products. The main objective is to get more and more quality honey. There are two methods used by apiculturists. The traditional method and the modern method.

Traditional Method of bee keeping/ Old or indigenous method:

Traditional beehives simply provided an enclosure for the bee colony. Because no internal structures were provided for the bees, the bees create their own honeycomb within the hives, mainly clay hive or mud hives pot. The comb is often cross-attached and cannot be moved without destroying it. This is sometimes called a fixed-frame hive to differentiate it from the modern movable-frame hives. Movable hive in the pot



Fixed hive: in which bees themselves build hive in the natural space provided.

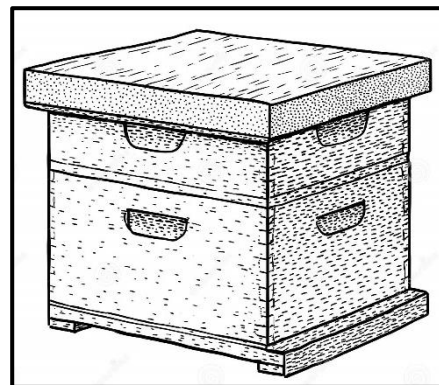
Movable hive: may be a hollow log, box or even earthen or wooden pots. The bees are collected from the wild and are placed into these hives.

Disadvantages of Indigenous method:

- Selection of species was not possible as swarming bees were used in this method.
- Bees were either killed or smoked to extract honey. This disturbed the natural population of bees.
- Honey from traditional methods was typically extracted by pressing – crushing the wax honeycomb to squeeze out the honey.

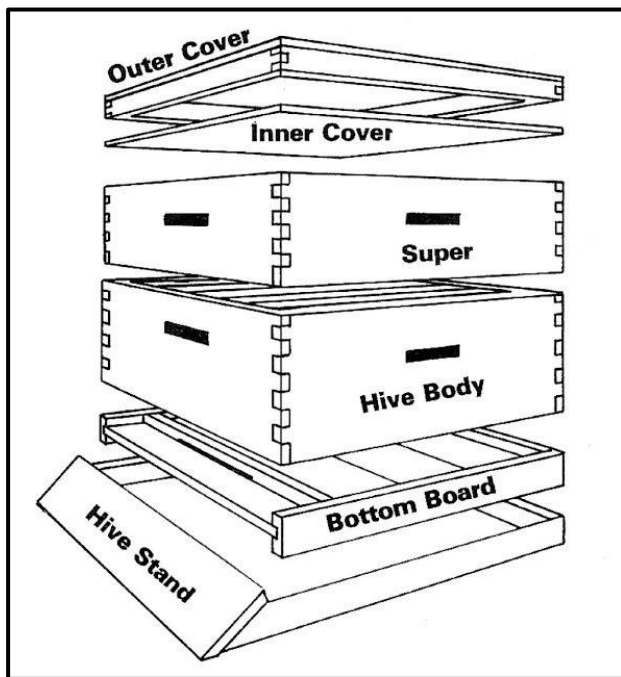
Modern method of bee keeping:

To overcome the drawbacks of the indigenous method, the modern method has been developed to improve the texture of hives. It was introduced by Rev. Lorenz Longstroth in 1851 for which he was awarded Nobel prize. In India, there are two types of beehives in practice namely, **Langstroth** and **Newton**.



The Langstroth or Newton's movable hive mainly consists of wood with basic six parts.

- 1) **Stand** is the basal part of the hive on which the hive is constructed. The stands are adjusted to make a slope for rain water to drain
- 2) **Bottom board** is situated above the stand and forms the proper base for the hive. It has a gate, gate functions as an entrance for the foraging bees to enter and leave the hive



3) **Brood chamber** (hive body) is the most important part of the hive. It is provided with 8-10 frames through which the workers can easily pass. The frame is composed of wax sheet which is held in vertical position. It is the most important part of the hive. This chamber is used for brood rearing. In addition to brood cells bees also maintain pollen cells and honey cells to store pollen and honey for brood rearing.

4) **Super or Honey chambers** are placed above the excluder depending on the honey flow and season. It is provided with many frames containing comb foundation to provide additional space honey storage.

5) **Inner cover** is a wooden piece used for covering the super with many holes for proper ventilation.

6) **Top cover** is meant for protecting the colonies from rains. It is covered with a sheet which is plain and sloping.

Besides the bee box other accessory equipment used in beekeeping are:

Bee gloves are used by bee keepers for protecting their hands while inspecting the hives.

Bee veil is a device made of fine nettings to protect the bee -keeper from bee sting.

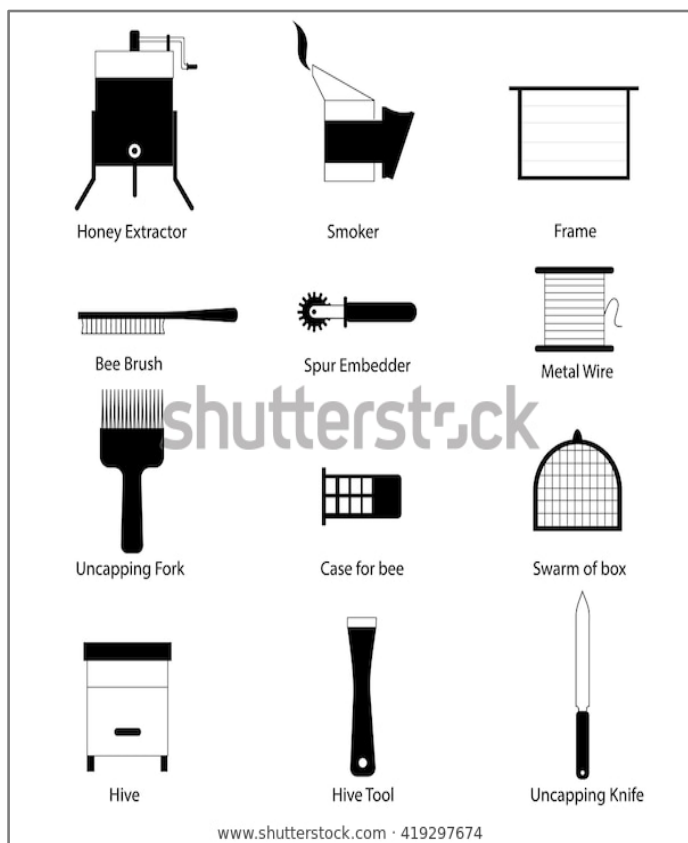
Smoker is used to scare the bees during hive maintenance and honey collection by releasing smoke.

Hive Tool is a flat, narrow and long piece of iron which helps in scraping excess propolis or wax from hive parts.

Uncapping knife is a long knife which helps in removing the cap from the combs as a first step in honey extraction.

Bee brush is a large brush often employed to brush off bees from honey combs particularly at the time of extraction.

Queen introducing cage is a pipe made of wire nets used for keeping the queen for about 24 hours for acquaintance with the hive and worker bees.



Feeder is a basin with sugar syrup covered by grass to feed the bees during drought season. The grass prevents the bees from sinking into the syrup.

Honey Extractor is a stainless-steel device which spins the combs rapidly to extract honey.

Hive Entrance Guard/ Queen gate is a device similar to queen excluder in front of the hive entrance which prevents the escape of queen during warming season.

Selection of suitable site for the hive

- The site selected should have good bee flora(flowers) which produces large quantity of superior quality nectar and pollen which is the main food for the brood and adults.
- The site should be free from the natural predators and enemies of bees like ants, spiders, wasps, birds and lizards.
- The site should be free from pollution and excessive intrusion by man.

Hygienic extraction of honey

- In Modern bee keeping practices only honey stored in the super is extracted and thus it does not disturb the brood chamber.
- Honey is extracted when honey super chambers are filled with ripened honey that are covered by a thin layer of wax (capped honey).
- The frames from the super chambers are removed and bees sitting in these frames are removed using mild smoke using the smoker.
- Honey from the honey filled frames are removed first by removing the wax cap using the heated knife.
- Uncapped frames are placed in the metallic slots of extractor machine which is rotated to create a centrifugal force. The centrifugal force removes the honey from the frames and the honey collects at the bottom of the machine.
- The collected honey can be filtered and heated (pasteurised) before filling in the sterile containers.

Questions

1. What is Apiculture? Name any two bee species used in apiculture. -3”
2. Write a note on modern method of beekeeping-10”
3. Write a note on traditional method of beekeeping and mention the disadvantages-10”
4. Name any three common honey bee species with their scientific names-3”
5. Write a note on the hygienic method of honey extraction-5”
6. With a neat labelled diagram explain the parts of the modern bee box-10”
7. Discuss on social organisation in honey bees-5”
8. Explain the structure of a bee comb-5”
9. Write any five advantages of modern method of bee keeping-5”
10. List any three uses of beekeeping-3”
11. Mention the uses of
 1. Honey
 2. Bee wax
 3. Bee venom
 4. Royal jelly

Apis dorsata



Apis cerana



Apis florea

