



SIDDHINATH MAHAVIDYALAYA

(Govt. Aided)

Estd. - 2013

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Study Materials

Programme: B.Sc.General with Zoology
(CBCS System)

Course Code: **SEC-1 (SEM-III)**

Course Name: **APICULTURE**

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Apiculture is the culture of honey bees, which belong to the genus *Apis*. Honey bees are one of the important social insects which are the rich source of honey. Honey has been traditionally used in various food preparations, Ayurvedic medicines, ointments, cosmetics, candle and house-hold bee wax items. The propolis of the bee hive is used in lip balms and tonics, whereas royal jelly is used to improve appetite, strengthen the body, preventing aging of skin and various cancer treatments. Honey bees, during foraging for pollen and nectar from flowers of different plants, enhance agricultural productivity through cross-pollination.

1.5.1. DEFINITION OF APICULTURE

Apiculture is the cultivation of bees on a commercial scale for the production of honey.

1.5.2. SYSTEMATIC POSITION OF HONEY BEES

Phylum – Arthropoda
 Sub-phylum – Mandibulata
 Class – Insecta
 Order – Hymenoptera
 Family – Apidae
 Genus – *Apis*
 Species – *indica*, *dorsata*, *florea*, *mellifera*,
adamsoni etc.

1.5.3. DIFFERENT SPECIES OF HONEY BEES

Of the different species of honey bees, generally three species are found in India. These are—Indian bee (*Apis indica*), Rock bee (*Apis dorsata*) and Little bee (*Apis florea*). Presently, in some places of India the European bees (*Apis mellifera*) have been introduced. African bees (*Apis adamsoni*) is not found in India. Description of bees, available in India, are as follows :

1. *Apis indica* (Indian bee) : They are of commonest occurrence on the plains and forests of India. They prefer to live in dark places and construct several parallel combs (about 30 cm across) in protected places like—hollow of trees, caves, in rocks, earthen

pot, thick bushes, wells, walls of the buildings etc. This species is mild in nature, so can be domesticated easily. The average output of honey is about 3–5 kg/colony/year.

2. *Apis dorsata* (Rock bee) : This is the largest Indian variety having a length of about 20 mm. They build large combs (0.9 × 15 metres) on tree branches, under roof of high buildings, under caves etc. A single comb may produce about 30 kg honey in a year. Due to their ferocious and irritable nature it is rather impossible to domesticate them for bee keeping industry.

3. *Apis florea* (little bee) : They are very small sized bees which live on plains and rarely occur above 1000 ft of sea level. They build small combs and produce about 0.5 kg honey per colony per year. They are very docile but the production does not compensate the labour undergone on it.

4. *Apis mellifera* (European bee)* : This is common European honey bee. There are several varieties of the bee but the Italian variety is reared mostly in Europe and America in artificial hives for honey. They are of docile nature and attempts are being made to domesticate and culture them in India. They yield an average of 50–200 kg of honey per year per colony.

1.5.4. CASTS OF HONEY BEES AND SOCIAL BEHAVIOUR

Honey bees are social insects and live in a colony. The nest of honey bee is known as bee hive. A well defined cast system is evident in a colony and a well developed colony contain about 30–50 thousand individuals, during summer, consisting of 3 casts—queen, male or drone and workers. A large number of broods (egg, larva, pupa) are also present in a colony. The queen is the only fertile breeding female of the colony. There are several hundred drones in a colony and the majority of the members are workers, which are actually sterile and reproductively underdeveloped females. These casts are associated with different function in the colony ; each cast possesses its own special instincts geared to the need of the colony.

1 The queen

There is only 1 queen present in a colony. The queen is the only sexual productive female in the colony and thus is the mother of all drones, workers and future queens. Her egg laying capacity is outstanding, which often exceeds 1500 eggs per day.

Anatomically, the queen is strikingly different from the drones and workers with a much longer abdomen than a worker bee and shorter wings. Her mandibles contain sharp cutting teeth. The queen has a curved, smooth stinger that she can use repeatedly without endangering her own life. The queen lacks the working tools possessed by worker bees, such as pollen baskets, bee wax-secreting glands. Her larval food consists almost entirely of a secretion called **royal jelly** that is produced by worker bees. The average lifespan of the queen is one to three years. The queen influence the colony by the production of a variety of pheromones or *queen substances*.

2 The worker bee

Worker bees are the most numerous members of the colony. A healthy colony may contain about 50,000 worker bees or more at its peak growth in early summer. Workers build and maintain the nest and care for the brood. They build the nest from wax secreted from glands in their abdomen. The hexagonal cells, constructed by the workers

* The name *Apis mellifica* was cited in some old publications but recently the scientific name *Apis mellifera* is generally used. *Apis mellifica* is the name of a homeopathic medicine.

• they possess proboscis, wax gland, pollen basket and a powerful sting.
 • which is connected to poison gland.
 • they are produced from fertilized eggs.
 • They are sterile.

are arranged in a lattice work known as comb. Combs used for storage of honey is called honey comb. Workers leave the hive to gather nectar, pollen, water and propolis, a gummy substance used to seal and caulk the exterior of the nest. They also cultivate fungus (**fungus garden**) inside comb to prepare food. They convert the nectar to

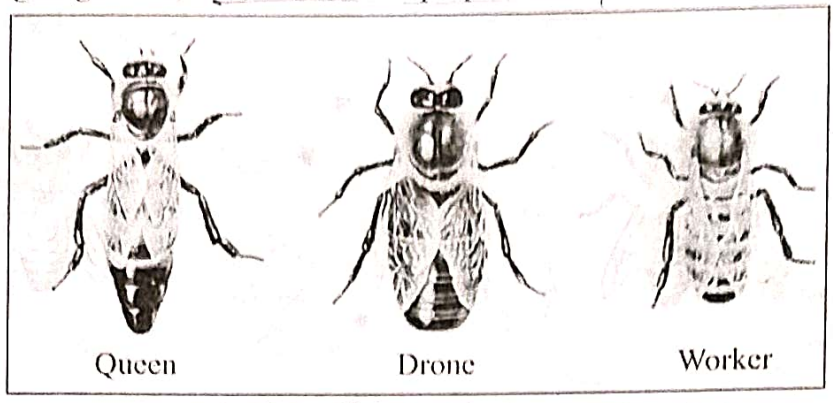


Fig. 1.24 : Members of a bee colony.

honey, clean the comb and feed the larvae, drones and queen. They also ventilate the nest and, when necessary, defend the colony with their stings. Workers do not mate and therefore cannot produce fertile eggs.

Besides gathering and storing food for all the members of the colony, the workers are responsible for maintaining the brood at 33.9°C, the optimum temperature required for hatching the eggs and rearing the young. When the hive become too hot, the workers collectively ventilate it by fanning their wings. During cool weather, they cluster tightly about the nursery and generate heat. The eggs, which are laid one per cell, hatch in three days. The larvae are fed royal jelly for at least two days and then pollen and nectar or honey.

For the first three weeks of their adult lives, they work inside the honey comb and afterwards they function as field bees and defenders of the colony. Unlike other species of bees, honey bees do not hibernate; the colony survives the winter as a group of active adult bees.

3 The drone bee

*ii) They are haploid iii) Larger than worker but smaller than queen.
 iv) Progenies, wax gland, pollen basket are not present.
 v) Produced from unfertilized eggs.*

Drones are male honey bees. They are stingless, defenseless and unable to feed themselves; they are fed by worker bees. Their only function is to mate with the queen. After mating, which always takes place on the wing in open air, a drone dies immediately. The queen usually mates with six or more drones in the course of a few days. The motile sperms of the drones find their way into a small sac like organ, called spermatheca, in the queen's abdomen. The sperms remain viable in this sac throughout the life of the queen.

Both the workers and queen develop from fertilized eggs and have **32 chromosomes (2n = 32)**. The queen is reared in a queen cell and receive richer and more plentiful diet. The workers are all potential queens—it is the feeding during larval life that makes the difference. Workers have rudimentary ovaries and may become laying workers, producing drones.

The drones develop parthenogenetically from unfertilized eggs and have **16 chromosomes**. A drone has a mother but does not have a father—however, he does have a grandfather and a grandmother. The drones that mate die — drones are killed by the workers in the autumn.

▣ Communication among bees (Bee dance) :

Bees communicate within themselves, particularly regarding food source, by a process of dancing. Performed by a worker bee that has returned to the honey comb with pollen or nectar, the dances, in essence, constitute a language that "tells" other workers where

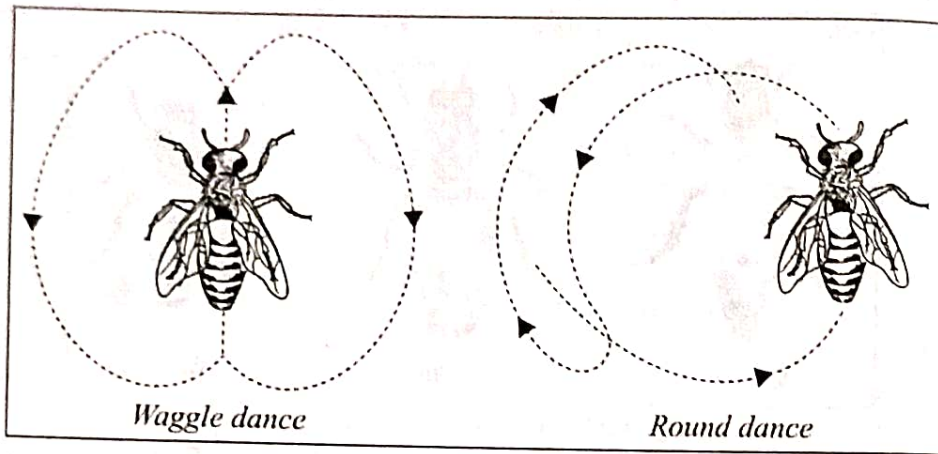


Fig. 1.25 : Bee dance.

the food is. The dancer 'spells out' two items of information—distance and direction—to the target food patch. Recruits then leave the hive to find the nectar or pollen.

Professor Karl von Frisch (1886–1973) of the department of Zoology at the University of Munich in Germany, is credited with interpreting the meaning of honey bee dance movements. von Frisch's work eventually earned him Nobel Prize in 1973. He wrote several books and articles in German and English. A few notable books written by Von Frisch are —“The dance language and orientation of honey bees (1967),” “The dancing bees—an account of the life and senses of the honey bee (1953),” etc.

Distance and direction are presented in separate components of the dance.

▣ Distance :

(When a food source is very close to the hive (less than 50 metres), a forager performs a **round dance**. She does so by running around in narrow circles, suddenly reversing the direction to her original course. A *round dance, communicate distance (for example—close to the hive), but not direction.*)

(Food sources that are at intermediate distance between 50–100 metres from the hive are described by the **sickle dance**. This dance is crescent-shaped and represents a transitional distance between the round dance and a waggle dance.)

The **waggle dance** or **wag-tail dance**, is performed by bees to indicate a food source that are more than 150 metres from the hive. *This dance communicates both distance and direction.* A bee that performs a waggle dance runs straight ahead for a short distance, returns in a semicircle to the starting point, runs again through the straight course, then makes a semicircle in the opposite direction to complete a full figure-‘8’ circuit. When running the straight line course of the dance, the bee's body, especially the abdomen, wags vigorously from side to side. This vibration of the body produces a tail-wagging motion. As the distance to the food source increases, the duration of the wagging portion of the dance (the ‘waggle run’) also increase.

▣ Direction :

The orientation of the dancing bee during the straight portion of her waggle dance indicate the location of the food source, relative to the sun. The angle that the bee

adopts, relative to vertical, represents the angle to the flower relative to the direction of the sun, outside the hive. In other words, the dancing bee transposes the solar angle into the gravitational angle. Figure 1.26 gives a few examples : A forager recruiting to

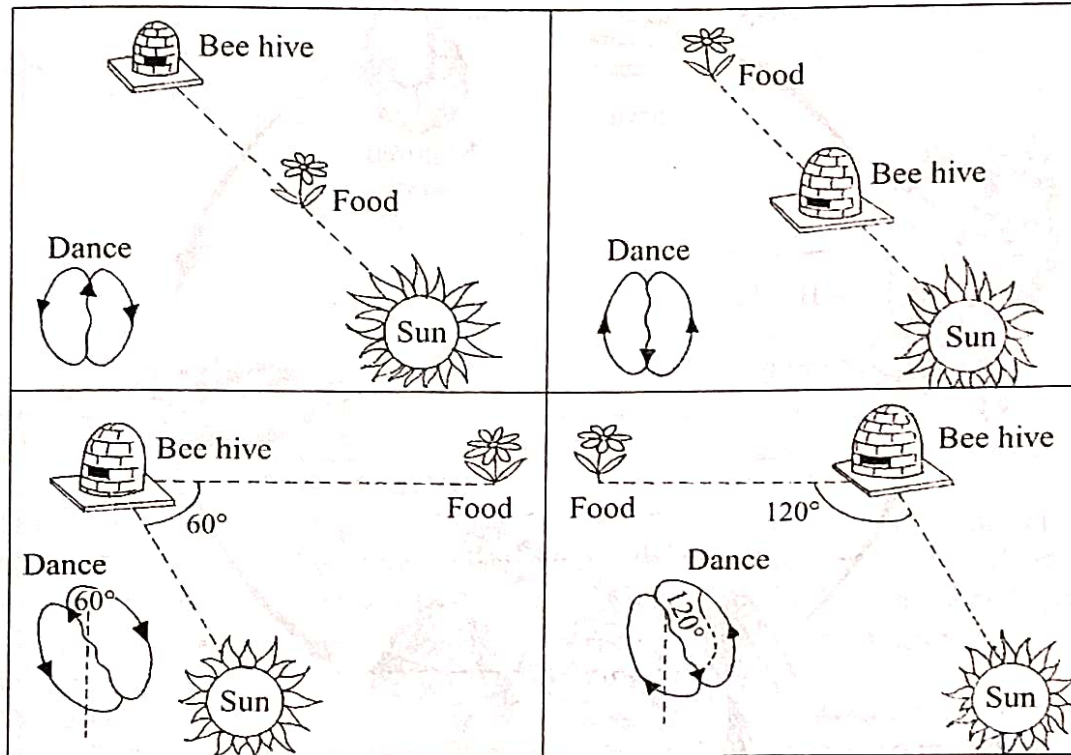


Fig. 1.26 : Waggle-run direction.

a food source in the same direction of the sun, will perform a dance with the waggle-run portion travelling directly upward on the honey comb. Conversely, if the food source is located directly away from the sun, the straight run will be performed vertically downward. If the food source is 60° to the left of the sun, the waggle run will be 60° to the left of vertical. Because directional information is given relative to the sun's position and not to a compass direction, a forager's dance for a particular resource will change during a day. This is because, the sun's position moves during the day.

1.5.5. LIFE CYCLE OF HONEY BEE

Honey bees are social insects. There are three castes of bees—**queens**, which produce eggs ; **drone or males**, which mate with the queen ; and **workers**, which are all non-reproducing females. The queen lays eggs singly, in hexagonal cells of the comb. Larvae hatch from eggs in 3–4 days and are fed by workers and develop through several stages (instars) in the cells. During first two days, after hatching from egg, all larvae are fed on a special diet—'the **Royal Jelly**', secreted by the pharyngeal glands of the young workers. After that, 'the **Bee Bread**', which is a mixture of honey and pollen grain, is given. However, the queen-forming larvae are fed on Royal Jelly throughout their larval life. Cells containing larvae are capped by workers, when the larvae pupate. Queen and drones (that develop from unfertilized eggs) are larger than workers and require larger cells to develop.

Queens complete development in 16 days, drones in 24 days and workers in 21 days for larval and pupal stages. Only one queen is usually present in a hive. New queens develop in enlarged cells by differential feeding by workers, when existing queen dies or ages or colony become very large.

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Virgin queens fly on a **nuptial flight** and are mated by drones. Queens mate with several drones during the nuptial flight. New colonies are formed when newly mated

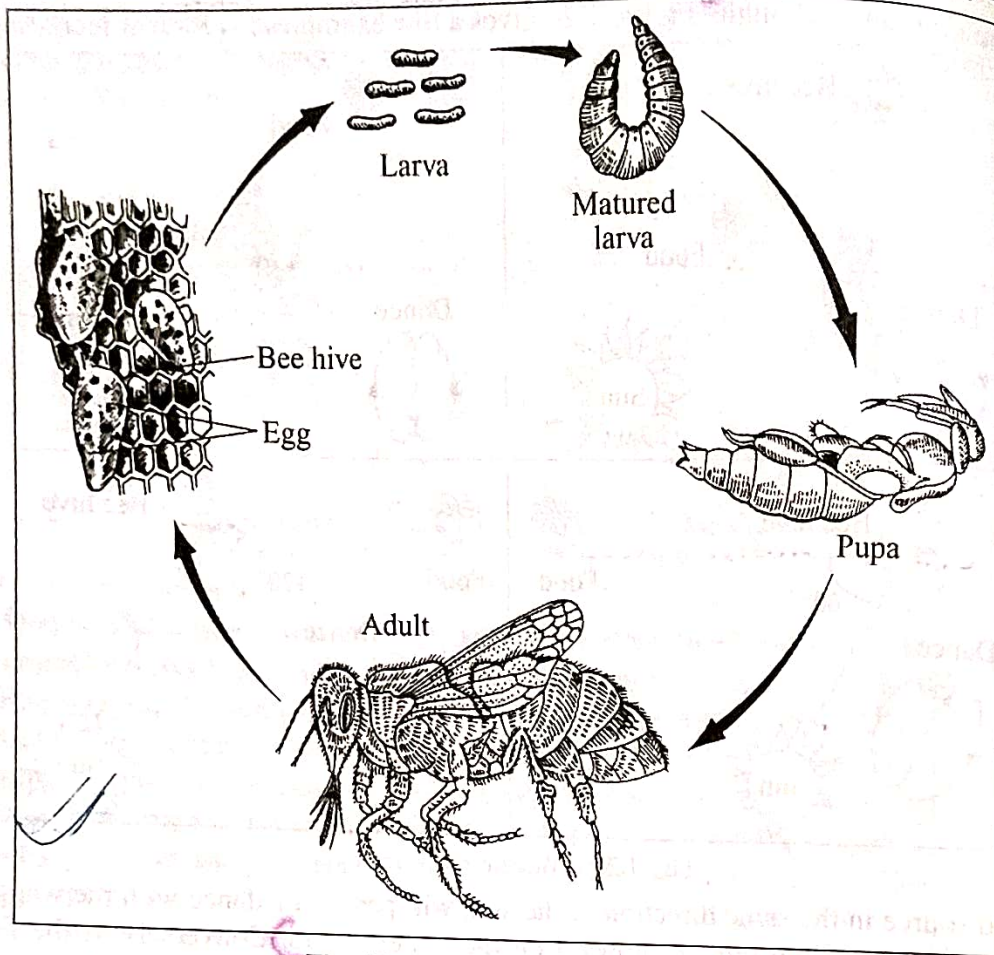


Fig. 1.27 : Life cycle of honey bee.

queens leave the colony with worker bees, a process called '**Swarming**'. Swarms of bees are often noticed and sometimes cause concern until they find a suitable nesting location. A queen may live for 3-5 years; drones usually live for 3-4 months and die before winter; and workers may live for a few months. A colony may typically consist of 20,000-50,000 or more individuals.

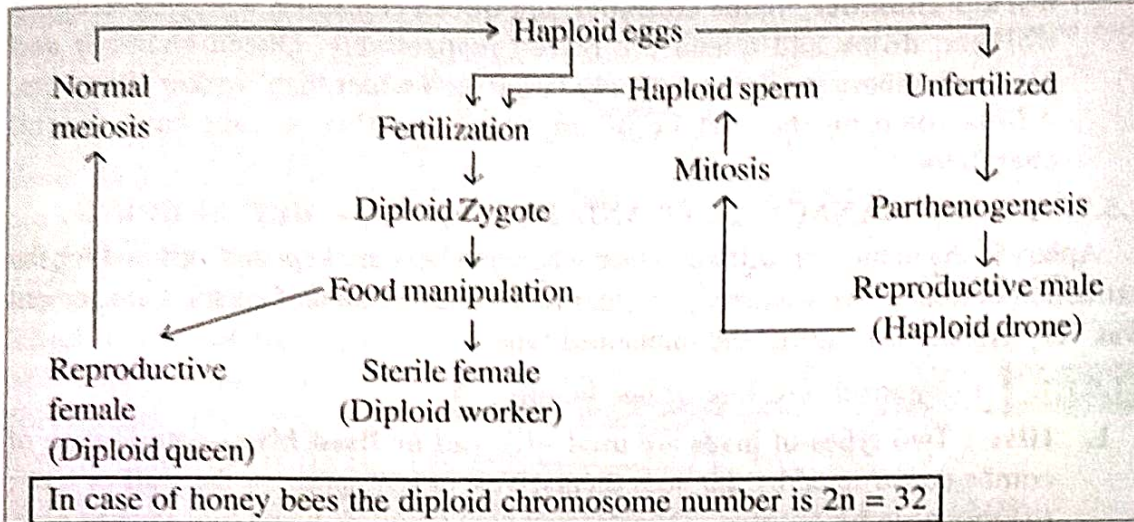
Times taken by different casts for their development is as follows—

Cast	Egg	Larva	Pupa	Total
Queen	3 days	5.5 days	7.5 days	16 days
Worker	3 days	6 days	12 days	21 days
Drone	3 days	6.5 days	14.5 days	24 days

There are two views regarding the sterility of workers, which are genetically females; these are—

1. Differential food given to larvae lead to differential growth and body size.
2. The mandibular gland of queen secrete a 'Queen substance' or pheromon, containing 9-oxodetrans-2-enoic acid which is sprayed over the body of the queen. The workers lick this substance from the body of the queen, which result in inhibition of their ovarian activities. It has been observed that if the workers are kept away from the queen, their ovary matures.

A ward diagram of the life cycle of honey bees is presented below—



1.5.6. STRUCTURE OF A HIVE

Bees exhibit highest degree of nest construction efficiency among insects. The architectural plan of the bee hive is unique. The nest is constructed by workers bees. A comb is a vertical sheet of wax from which a double layer of hexagonal cells project in both direction, making the comb hanging vertically downwards while the cells remain horizontal in position.

The wax for nest building is secreted from the wax glands, present in the abdomen of workers. The wax has a high melting point of about 60°C (140°F). The wax is masticated before use and mixed with a secretion from cephalic glands to make it more plastic. Propolis, a resinous substance, prepared from pollen is used to fill the cracks and crevices in the hive and make it waterproof.

A comb contain various types of chambers or cells, which are as follows—

- (1) **Storge cell** : Contain honey and pollen and present on the margin and top of the comb.

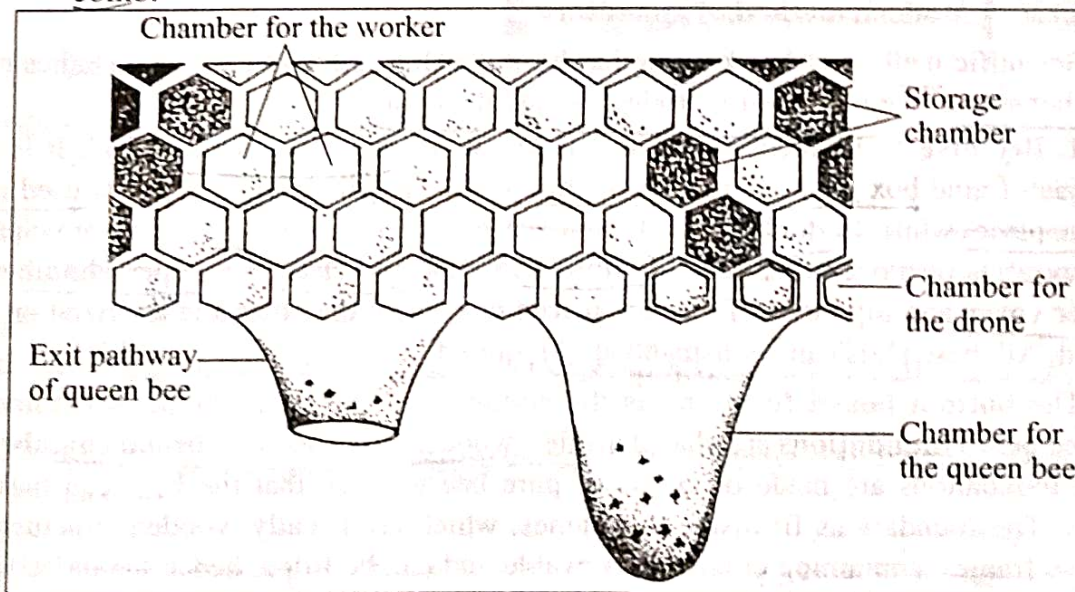


Fig. 1.28 : Chambers of a bee-hive.

- (2) **Brood cells** : Contain the young stages and situated in the centre and the lower

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part of the comb. Brood chambers are further divided into three types—worker chamber, drone chamber and queen chamber, where developing workers, drone and queen are reared respectively. Queen chamber and drone chambers are comparatively larger and wider than worker chambers. Adults roam on the surface of the comb and they do not have special chambers.

1.5.7. APIARY MANAGEMENT AND METHODS OF BEE KEEPING

Apiary is the natural or artificial place where the bees are kept and cultured for the extraction of honey, bee wax etc. The older indigenous method of apiary management was very crude, unscientific and unplanned type.

1.5.7.1. Indigenous method of bee keeping

1. **Hive** : Two types of hives are used—(i) **wall or fixed hive**—natural type of combs constructed by the bees themselves, at any space on the wall or tree ; (ii) **movable hive**—hive is constructed within hollow wood log, earthen pots, empty boxes etc.
2. **Extraction of honey** : A fire with huge smoke is produced near the hive, so as to remove or kill the bees and honey comb is squeezed to extract the honey.

Disadvantage of indigenous method :

- (i) Body parts of brood, pollen remain mixed with honey.
- (ii) Due to killing of eggs and larvae during honey extraction the colony become weak.
- (iii) Construction of new hive by the escaped bees become a matter of chance.
- (iv) The activities of the bees cannot be manipulated.
- (v) Predators may attack the hive easily.
- (vi) Climatic hazards cannot be controlled.

1.5.7.2. Modern method of apiculture

Scientific method of bee keeping has been developed due to extensive studies of bee behaviour, their mode of reproduction and their way of functioning.

1. **Bee hive** : The modern bee hive is known as '**movable frame hive**'. It is a wooden frame box having single or double walls. The single walled box is used in warm places while the double walled frame box is used in colder regions. The principal components of modern hive are—**bottom board**, **brood chamber**, **super chamber**, **inner cover** and **top cover**. These are placed one above the other and are fixed on a stand. All these parts can be dismantled, if required.

The **bottom board** functions as the entrance for the bees. Numerous frames called **comb foundations** are placed inside a wooden box known as **brood chamber**. The foundations are made of sheets of pure bee wax, so that the bees can make cells. The foundations fit inside the frames, which are usually wooden structures. These frames, containing comb, are movable and can be lifted, hence the name for the hive is 'movable frame hive'. Above the brood chamber lies the **super chamber**, inside which honey is stored. Queen is prevented from entering this chamber by

using a board, known as **queen excluders**. However, the workers can enter the super chamber through the narrow space of queen excluder. The wooden boards that are used to cover the brood chamber or the super chamber is called **inner cover**. There is a **top cover**, which can be lifted to inspect the state of colony or honey formation. The wooden hive is coloured white or yellow on the outside to aid easy recognition by the bees and keeping the chambers cool.

2. Accessory equipments :

Besides the primary equipments of bee hive, certain accessory equipments are used in bee keeping. These are—

(i) Safety dresses :

These include **bee grooves** and **bee veil** which are used to protect the bee-keeper from bee sting.

(ii) **Smoker** : This is used to release smoke to scare the bees during hive maintenance and honey collection.

(iii) **Hive tools (knife)** : This is a flat, long and narrow piece of iron which help in scrapping excess wax and propolies from hive parts during removing the comb foundation.

(iv) **Uncapping knife** : A long knife is used to remove the cap from the comb during honey extraction.

(v) **Bee brush** : A long brush is often used to brush off bees from the comb at the time of honey extraction.

(vi) **Feeder** : It is a pot containing sugar syrup to feed the bees during drought season. The syrup remain covered by grasses to prevent the bees from sinking in it.

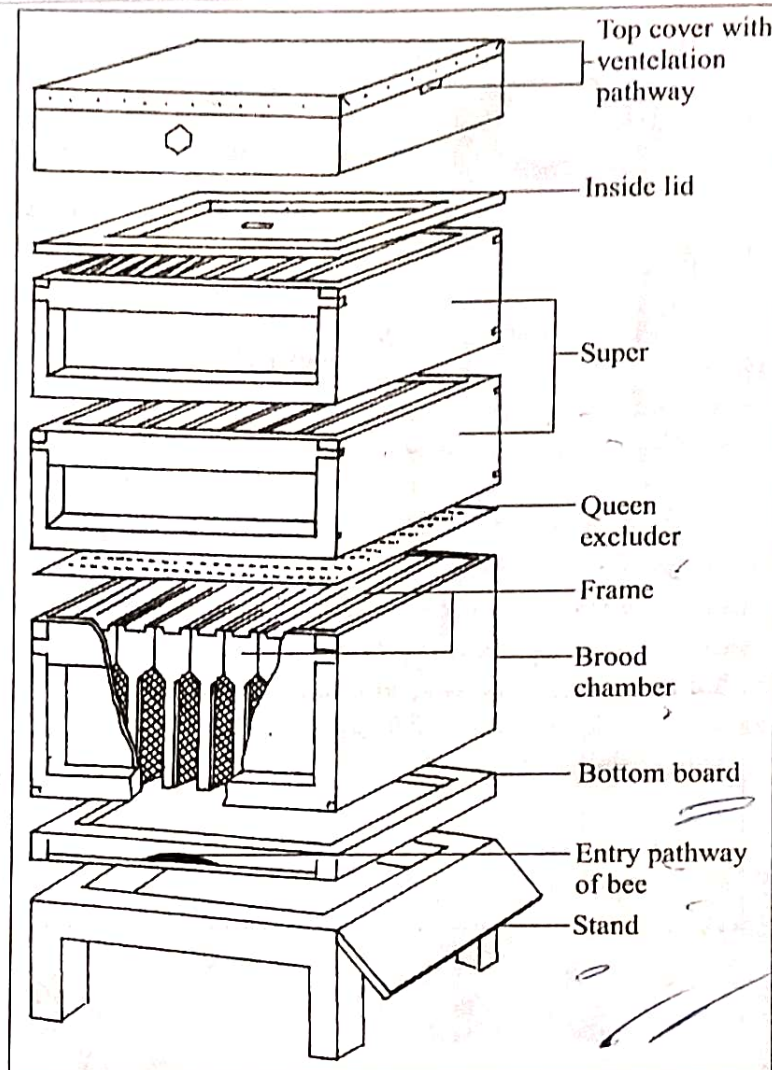


Fig. 1.29 : Movable hive.

(vii) Honey extractor : It is a stainless still equipment which spins the comb

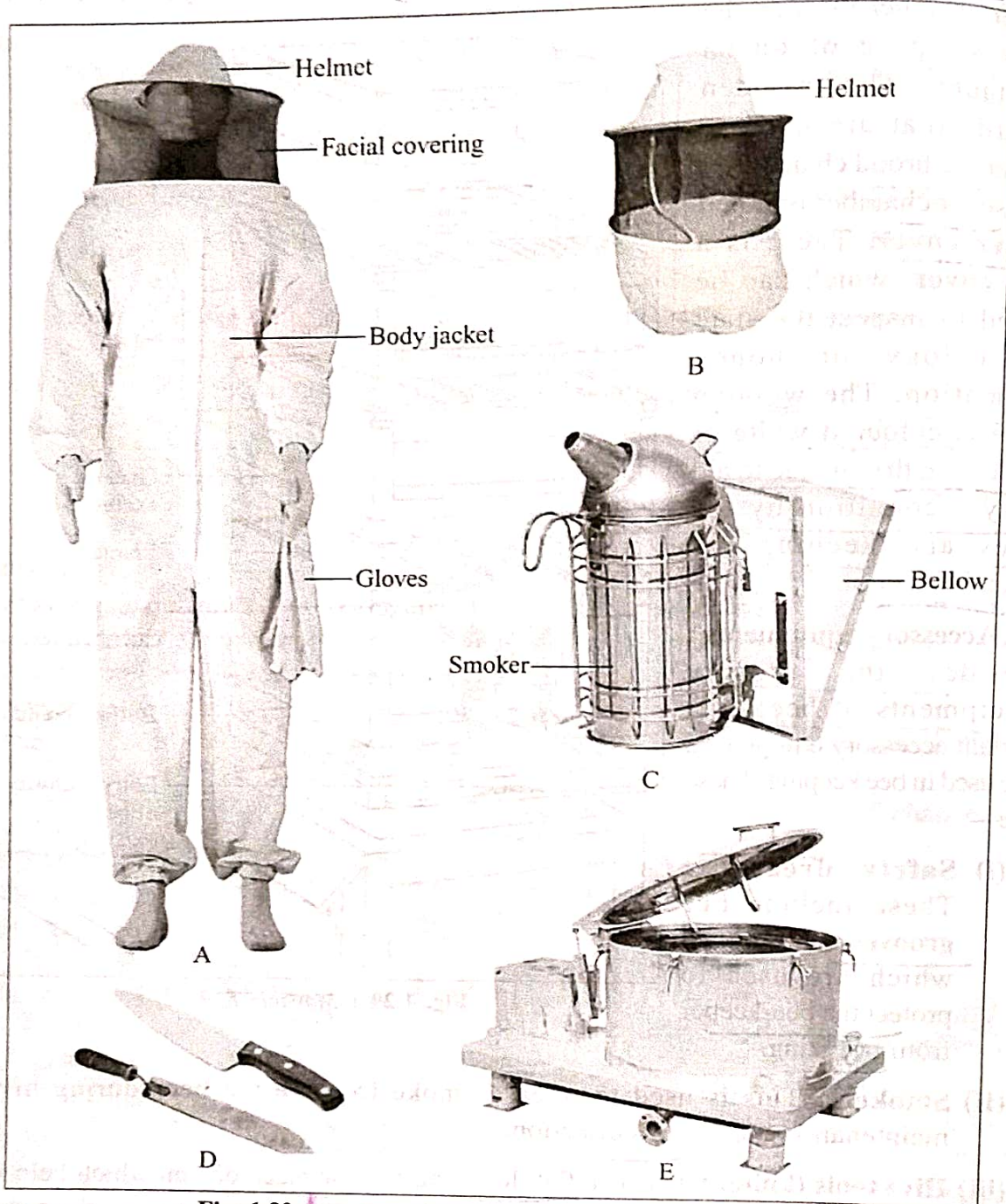


Fig. 1.30 : Equipments used in bee keeping industry :

A-Safety dress, B-Facial covering, C-Smoker, D-Knife, E-Honey extractor.

foundations rapidly to extract honey by the process of centrifugation, keeping the foundations intact and reusable.

☑ **Advantages of modern method of apiculture :**

- (i) Activities of bees can be properly watched.
- (ii) By providing sugar, syrup, pollen substances etc., to the honey bees, a strong colony can be developed.
- (iii) The same hive can be used repeatedly.
- (iv) The swarming of bees can be checked.

- (v) The hives can be transferred to suitable protected places during adverse climatic conditions.
- (vi) Large amount of pure honey can be extracted without damaging the bees.
- (vii) Protection against enemies can be provided.

1.5.8. PRODUCTS OF BEE KEEPING AND THEIR USES

Different products of apiary and their uses are given below :

1.5.8.1. Honey

What is honey :

According to Stephen Rere (1998), internationally accepted definition of honey is—
 “Honey is fluid, viscous or crystallized substance, produced by bees from nectar or blossoms or from secretions or from living parts of plants other than blossoms, which bees collect, transform or combine with substances of their own, store and leave to mature in honey comb”.

Production of honey :

The nectar, pollen and cane-sugar, containing secretions of flower are ingested by the honey bees, which get mixed with saliva and undergo some enzymatic action. During this process the sucrose (cane-sugar) is converted into dextrose and levulose. At this time, some ingredients of bees are added to the mixture and it is dehydrated to some extent. This whole mixture is regurgitated in the hive cells and is known as honey. This honey is concentrated by the workers by fanning through their wings.

Chemical composition and food value of honey :

Composition of 100 gm (roughly 5 tbsf) is as follows—

Energy	300 k cal
Carbohydrates	82.4 g
Protein	0.3 g
Water	17.10 gm
Ribofavin (vit. B2)	0.038 mg
Niacin (vit. B3)	0.121 mg
Pantothenic acid (B5)	0.068 mg
Vitamin B6	0.024 mg
Folate	2 mg
Vitamin C	0.5 mg
Calcium	6 mg
Iron	0.42 mg
Magnesium	2.0 mg
Phosphorus	52.0 mg
Potassium	52.0 mg
Sodium	4.0 mg
Zinc	0.22 mg

The sugar contents are as follows—

Fructose	38.0%
Glucose	31.0%
Sucrose	1.0%
Other sugars (maltose, melezitose)	9% _s

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Honey also contain tiny amounts of several compounds thought to function as antioxidants, including—chrysin, pinobanksin, catalase, pinocembrin etc. The specific composition of any batch of honey depends largely on the mix of flowers available to the bees that produce the honey. Honey has a density of about 1.36 kg/litre (40% denser than water).

☒ **Uses of honey** : Honey is useful to human beings in different ways, as—

- 1. Food value** : Honey is a very nutritive food. The nutritional value of 200 gm of honey is more or less equal to about 11.5 litre of milk, or 1.6 kg cream, or 330 gm meat. The sugars, minerals, vitamins and other vital elements of honey can be readily absorbed by our system. Honey may be taken by persons of any age, both healthy and ill, during any season.
- 2. Medicinal value** : Honey is used extensively in Ayurvedic and Unani medicine due to following reasons—
 - (a) honey increases body weight and is a mild laxative,
 - (b) it help in metabolism of fat and dilution of mucus present in respiration passage,
 - (c) honey is good for eye and eye sight,
 - (d) it quenches thirst,
 - (e) reduces effects of poison,
 - (f) cleans the wounds,
 - (g) it is useful in urinary tract infection, worm infection, bronchial asthma, cough, diarrhoea, nausea and vomiting.
- 3. Other Uses** : Honey has other important uses in—
 - (a) preparation of bread, cake, biscuits etc., and enhance their preserving quality.
 - (b) used in cosmetic industry in the preparation of body soap, cream, shampoo etc.,
 - (c) alcoholic drinks may be prepared from honey,
 - (d) it is widely used in poultry and fishing industry,
 - (e) it is used in laboratory for bacterial culture,
 - (f) used in religious rituals,
 - (g) in colder countries, honey is mixed with the water of car radiator to prevent freezing of water.

1.5.8.2. Beeswax

→ Waxyish coloured - Palmitic acid and myricyl alcohol.
Beeswax is a natural wax produced in the honey bee hive by young workers between 12-17 days old in the form of thin scales secreted by glands on the ventral surface of the abdomen.

Beeswax is tough wax, formed from mixture of several compounds. The main components are palmitate, palmitoleate, hydroxypalmitate and oleate esters of long chain (30-32 carbon) aliphatic alcohol. The composition is as follows—

Hydrocarbons	14%
Monoesters	35%
Diesters	14%
Triesters	3%
Hydroxy monoesters	4%
Hydroxy polyesters	8%
Acid esters	1%
Acid polyesters	2%
Free acids	12%
Free alcohol	1%
Unidentified	6%

Beeswax has a high melting point range of 63–64°C. Density at 15°C is 0.958–0.970 g/cm³.

✎ **Uses of beeswax :** → To make hive.

Beeswax is used commercially to make fire candles (mainly for Catholic churches), cosmetics and pharmaceuticals, in polishing materials and as component of modelling waxes. It is also used in laboratories for block preparation of tissues during microtomy.

1.5.8.3. Other products

A Honey dew

→ To make some sweets.

It is a nitrogenous waste product of honey bee containing different carbohydrate and amino acids. It is sweet in taste and dark black in colour.

B Nectar

It is a carbohydrate solution prepared by plants. Honey bees produce honey from nectars.

C Propolis

It is a waxy substance produced by bees to repair their honey comb. It is also used in treatments of tonsillitis, bronchitis and dental infections.

D Royal jelly

→ Prevent the sleeping problems.

It contains acetylcholine and helpful in the treatment of influenza, high blood pressure and respiratory infections.

E Bee venom or Apitoxin

→ worker bee contains a poison in their sting, and high blood pressure etc.

The poison of honey bee, used in treatment of rheumatism, iritis etc.

1.5.9. A FEW TERMINOLOGIES ASSOCIATED WITH BEE-KEEPING

A Royal Jelly

→ Nitrogenous

Royal jelly is a milky substance that turns an ordinary bee larva into a queen bee. It is made of digested pollen and honey or nectar mixed with chemicals secreted from a gland in a young nursing bee's head. For initial 2-3 days, royal jelly is the only food given to all young larvae in their nutritional process, while for the queen larvae, it is the specific food for their whole life period.

B Bee bread or bee pollen

It is the main source of food for most of the larvae of honey bees. Bee bread contains honey and pollens which are gathered by the worker bees. It also contains different types of fungi and bacteria. Bee bread is sometimes referred to as ambrosia.

C Nuptial flight

It is an important phase in the reproduction of honey bees. During the flight, the virgin queen mate with males and then land to start a new colony or continue the planned succession of an existing colony.

D Swarming

Swarming is a natural process of reproduction of honey bee colonies. In this process two or more colonies are created in place of the original single colony. During the process of swarming, the queen bee leave the colony with a large group of worker bees. The first prime swarm generally goes with the old queen. As soon as the swarm

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is established as a new colony, the bees raise a new queen, or sometimes a replacement virgin queen is already present in the swarm. *Afterswarms* are usually smaller and are accompanied by one or more virgin queens. Swarming is mainly a spring phenomenon, usually within a two or three week period.

1.5.10. DISEASES AND ENEMIES OF HONEY BEES

Honey bees are affected by large number of viral, fungal, bacterial and protozoan organisms, ecto-and endoparasitic mites, insects and non-insect enemies.

☒ Viral diseases :

- ❖ **Sac brood** : It is caused by a virus and prevents larvae from pupating.
- ❖ **Kashmir bee virus** : This disease affect all the stages of development and the infected bees die in the colony.

☒ Fungal diseases :

- ❖ **Chalk brood** : Strands of fungus invade the larval tissue and the larvae dies. The dead larvae become chalky white in colour.

☒ Bacterial diseases :

- ❖ **American foul brood (AFB)** : Caused by spore forming bacteria. The bacterium penetrates the gut wall and body tissue of the larvae. The infected larvae become dark-brown and die.

☒ Protozoan diseases :

- ❖ **Nosema** : Caused by spore forming protozoa which impares the digestion and cause dysentery.

☒ Acarine diseases :

- ❖ **Isle of Wight** : Caused by small parasitic mites due to blocking of the trachea of bees. This infection cause chronic paralysis.

☒ Enemies :

A large number of animals act as enemies to the bees. Some of these enemies are wax moth, wax beetle, snails, ants, dragon flies, termites, lizards, birds etc.