



APICULTURE





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Acknowledgement

- => This book will give a clear concept of apiculture.
- => One can learn many new things about apiculture and life style of bees.
- => This book will provide a vital information for the people who working on apiculture.
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CONTENT

<u>Concept</u>	<u>Pg:no's</u>
1)Introduction ~G. Likitha	1-2
2)History ~k. Yamuna	3-6
3)Organisms used for culture ~k. Gayatri	7-9
4)Bee colony and it's members ~B. Sushma Swaraj	10-14
5)Varieties of bees ~D.kusuma	15-18
6)Life cycle ~k. Venkata Lakshmi	19-22
7)Natural beekeeping ~R. Ujwala	23-25
8)Importance ~k. Anjali	26-29
9)Pests and diseases ~R. Ujwala	30-33
10)Safety and husbandry ~G. Dhanalakshmi	34-37
11)Economy ~D. Kusuma	38
12)Advantages and Disadvantages ~k.Yamuna	39-43
13)Precautions ~B. Sudha Rani	44
14)Government schemes ~M. Pavani	45
15)Conclusion ~G. Dhanalakshmi	46



INTRODUCTION

"Apiculture is the scientific method of rearing honeybees. " The word 'apiculture' comes from the Latin word 'apis' meaning bee. So, apiculture or beekeeping is the care and management of honey bees for the production of honey and wax.

Apiculture is the commercial production of Honey. Honey is mentioned in ancient books like Vedas, purana and epics like Mahabharata and Ramayana. It has been an important element in the sweet diet of man. Before knowing the manufacture of sugar, man depended largely on honey as sweetener. Honey is produced by honey bees.

Honey bees have been very closely associated with humans since ancient times and have reached the highest degree of domestication. The first evidence of this association between man and bees came to light from the rock paintings made by primitive humans. Thousands of years ago, Egyptians were well acquainted with beekeeping before the Christian era.

Apiculture is breeding honey bees for the production of honey and beeswax using modern scientific and commercial methods. The name apiculture is due to the scientific (generic) name of the honeybees which is 'Apis'. Bee culture or apiculture is practiced throughout the world. In India it is practiced in South as well as North India as cottage industry providing employment to lakhs of people. Two institutes namely, Khadi and Village Industries Commission and Indian Council of Agriculture research are making an effort to raise the industrial status of apiculture in India.



History

Honey-producing beekeeping dates back 10,000 years. Georgia is “Beekeeping’s Cradle” Georgia has the oldest honey. The 5,500-year-old treasure was discovered in 2003 near Borjomi, Georgia. Ceramic jars held linden and floral honey. Egyptian art from 4,500 years ago depicts bee domestication. Ancient China, Greece, and Maya had beekeeping .



Some of the earliest evidence of gathering honey from wild colonies is from rock paintings, dating to around 13,000 BC from different countries. Since early days honeybees are not cultured for honey, instead honey is collected from wild natural hives.

It is recorded that in 1882, artificial culture of honeybees were introduced in undivided Bengal following European methodologies. In 1883-84 the process was initiated in Punjab. In 1894, India Government first circulated details of information regarding the bee culture as a promotional measure. Bee-keepers Association was established in 1907 in Punjab with its Head Office at Simla. In 1939, All India Bee-keeping Association was established and very soon it spread its branches to most of the states and districts of India. Now it merges with ICAR (Indian Council of Agricultural Research) and has expanded its activities. In 1945, the Central Bee-keeping Research Station was established. It expands its research centers to Coimbatore (Tamil Nadu), Ruptela (Andhra Pradesh), Sundar Nagar (Himachal Pradesh), etc.

In 1953 Khadi and Village Industries Commission and in 1956 Bee-keeping Directorate were established by the Central Government. In 1962 Central Bee Research Training Institute was developed. After that its branches were established in Kodaikanal, Mahabaleshwar, Kangra, Kashmir and other places.



In the Indian subcontinent, bees and honey are common from the prehistoric ages. In our country, Veda, Ramayana, Quran has mentioned different uses of honey. Former Kings and Sultans used the symbol of bee as a mark of glory.

Organisms used for culture

Honey bees in the genus *Apis* are the most commonly kept species but other honey producing bees such as *Melipona* stingless bees are also kept. Beekeepers (or apiarists) keep bees to collect honey and other products of the hive: beeswax, propolis, bee pollen, and royal jelly. Pollination of crops, raising queens, and production of package bees for sale are other sources of beekeeping income. Bee hives are kept in an apiary or "bee yard".



The keeping of bees by humans, primarily for honey production, began around 10,000 years ago.[citation needed] Georgia is known as the "cradle of beekeeping" and the oldest honey ever found comes from that country. The 5,500-year-old honey was unearthed from the grave of a noblewoman during archaeological excavations in 2003 near the town Borjomi. Ceramic jars found in the grave contained several types of honey, including linden and flower honey. Domestication of bees can be seen in Egyptian art from around 4,500 years ago; there is also evidence of beekeeping in ancient China, Greece, and Maya.



In the modern era, beekeeping is often used for crop pollination and the production of other products, such as wax and propolis. The largest beekeeping operations are agricultural businesses but many small beekeeping operations are run as a hobby. As beekeeping technology has advanced, beekeeping has become more accessible, and urban beekeeping was described as a growing trend as of 2010. Some studies have found city-kept bees are healthier than those in rural settings because there are fewer pesticides and greater biodiversity in cities.



THE BEE COLONY AND ITS MEMBERS

The bees are divided into queen, drone and worker. **The queen bee** lays thousands of eggs, the **worker bee** collects nectar and the **drone bee** fertilizes the eggs laid by the queen bee.

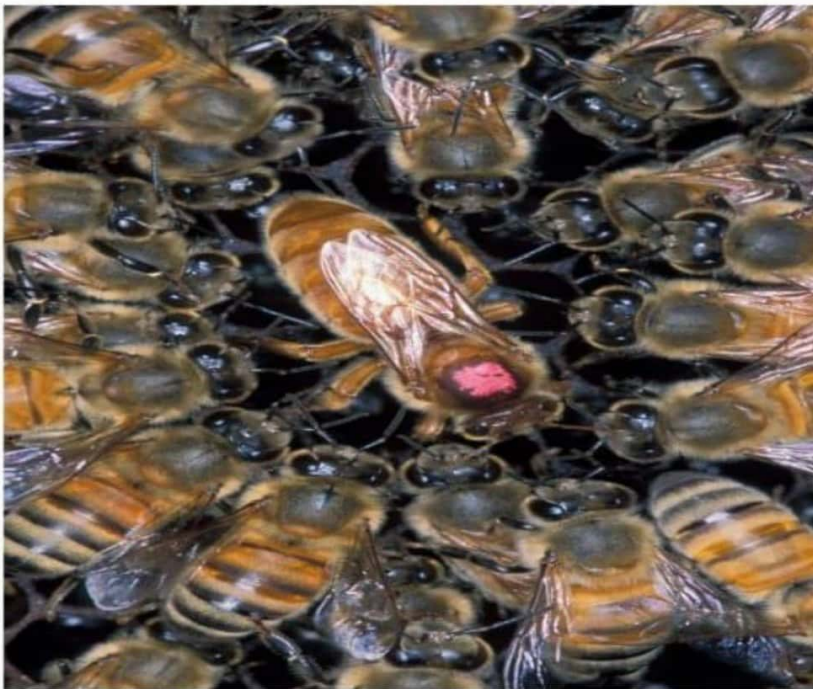


The Queen bee

The following are the qualities of the Queen bee :

- It is a diploid, fertile female.
- The presence of queen is a must in a colony
- The size of the body of queen is much larger than other castes of bees of the colony
- Her legs are strong as she always has to walk about on the comb

- The queen has a sting, curved like a sword at the tip of the abdomen, which is a modification of the egg-laying organ known as ovipositor. The sting serves as an organ of defense. She never uses it against anybody except her own caste
- The queen is responsible for laying eggs for a colony. She lays about 1000 to 1500 eggs every day and lives for about two to three years. She lays both fertilized eggs (from which females develop) and unfertilized eggs (from which males develop).



The Worker bee

The following are the qualities of the worker bee

- It is a diploid, sterile female.
- The size of a worker is the smallest among all the other castes but they constitute the majority population of the bees in a colony.

The functions of worker bees are as follows,

- Collection of honey,
- Producing royal jelly for feeding the community.
- Raising larvae and young ones,
- Cleaning the comb,
- Making wax,
- Constructing the beehive,
- Defending and protecting the hive,
- Clearing the debris and dead bees,
- Maintaining the temperature of the hive

Worker bees are again of different types depending on the type of work they do,

Laying worker:

These worker bees lay unfertilized eggs in the absence of the queen bee.

Nurse workers:

They serve the queen with royal jelly, larvae and drones with honey and beebread.

House workers:

They perform house cleaning, comb building, accepting nectar and pollen for foragers and finally guard the hive.

Field workers:

They travel to distant places to collect the nectar, pollen grains and resin from the flowers.

The Drone bee

The following are the qualities of the drone bee,

- It is a haploid, fertile male.
- The drones are born out of unfertilized eggs in the brood chamber.

- The males are larger than workers and are quite noisy.
- They have large wings, robust bodies and reduced mouthparts.
- They are unable to gather food, but they voraciously eat the food fed to them by the worker bees.
- They are stingless and their sole function is to fertilize the queen during the nuptial flight after which they are starved to death.
- The number of drones in a colony varies from 200-300.
- The drone develops parthenogenetically from unfertilized eggs.
- Drones live only for a short period of time.



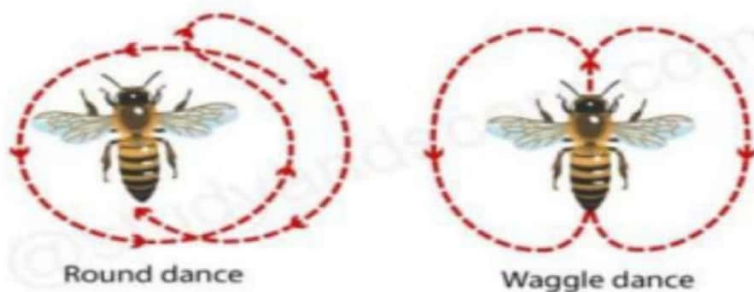
THE BEE DANCE

Just like any other animal, bees locate their food through sensory input and an understanding of the features of their environment. They can find their food both by scent and sight. According to Prof. Karl Ernst Von Frisch, an Australian scientist, the foraging bees return to the hive and indicate their inmates about the sources of nectar and pollen by performing certain rhythmic body movements called as the bee dance or bee dance language. This bee dance is readily understood by other bees of the colony.

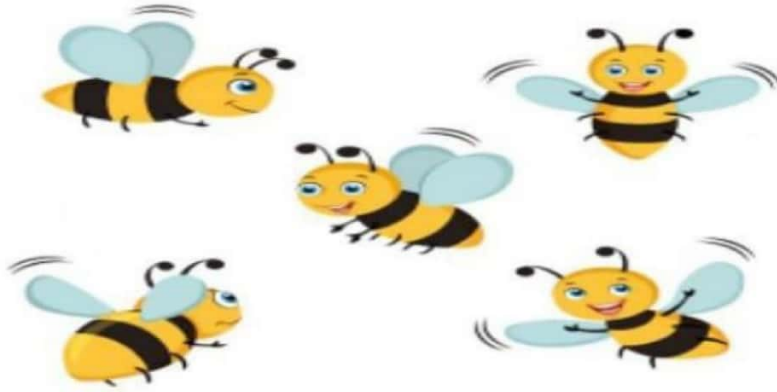
The life of a solitary bee depends on her ability to find food, gather it and return it to the nest. On the other hand the life of a social bee depends on the same things, along with her ability to tell her hive mates about the location of food. Honeybees communicate and teach each other how to find food, water, resin and new nest sites by dancing. When a honeybee finds food, it uses two known tools to understand the location.

Solar Compass: This tool helps her remember location of the food or hive in relation to the sun. The bee's ability to see polarized light lets her determine where the sun is even though when sun is covered by clouds.

Internal Bio-clock: This tool helps her keep track of how far she has flown and how much the sun moved during her journey. In other words, when she returns to the hive, she can tell her sisters exactly where the food is in relation to the current position of the sun. As a bee matures, she also learns about the sun's path across the sky during different seasons of the year and at different latitudes if her hive is moved.



VARIETIES OF HONEY BEES



The beekeepers rear only the following varieties of bees because only they can produce honey:



- *Apis florea*
- *Apis indica*
- *Apis dorsata*
- *Apis mellifera*

(1)*Apis dorsata*: It is also referred to as the rock bee. It is a giant bee and produces about 38 to 40 kg of honey per colony.



(2)*Apis indica*: It is also referred to as the Indian bee. It can be easily domesticated and is most commonly used for honey production. The annual yield of honey is 2 to 5 kg per colony



(3)*Apis florea*: It is also referred to as the little bee. It rarely stings and thus honey extraction from its hive is easy. It produces about 1 kg of honey per colony per year.



(4)*Apis mellifera*: It is also referred to as the Italian bee. This species has a very typical dance routine to indicate food availability, and like the little bee, stings less. As the common name suggests, this species is not local. However, because of the high amount of honey produced, it is often reared by beekeepers.

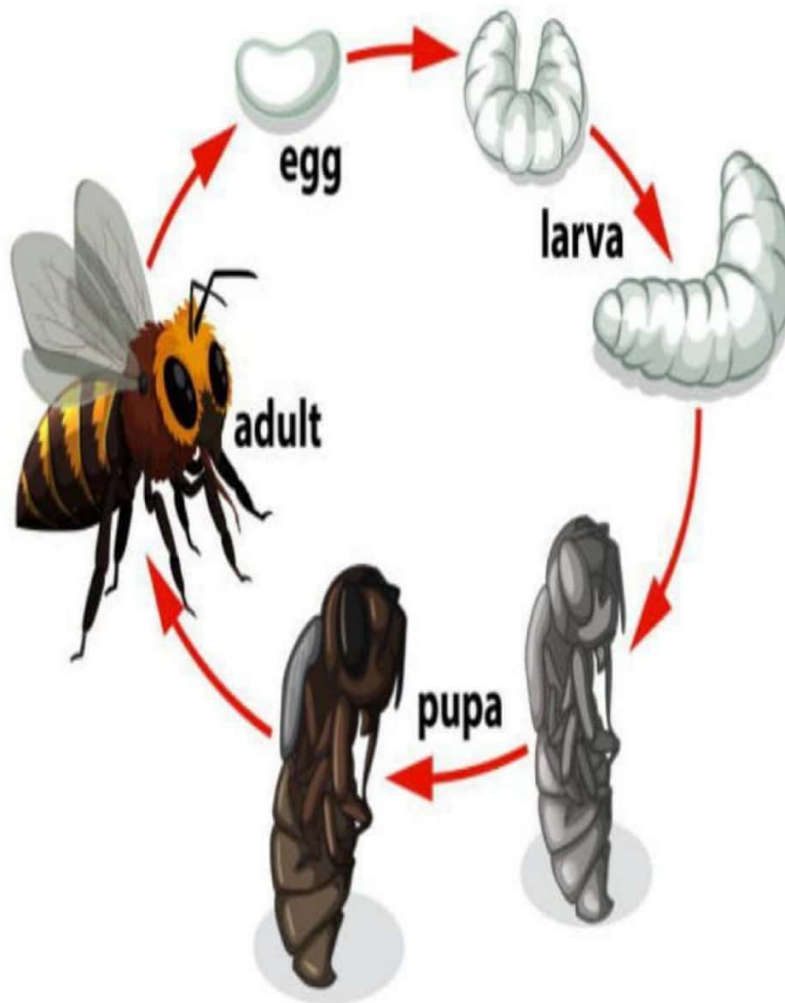


Life cycle

Life Cycle of Honeybee

The life cycle of honey bees is divided into four stages: the egg, the larval, the pupal and the adult stage.

Life Cycle of a Honeybee



Stage 1 – The Egg Stage:

Queen bee is the only bee in the colony who is capable of laying about 2,000 to 3,000 eggs in one day. The egg is positioned upright and falls on the side by the third day. The queen bee lays both fertilized egg and unfertilized egg. The fertilized egg develops into female bees or queen bees. The unfertilized egg hatches and male bees are born; also known as drone bees.



Stage 2 – The Larval Stage:

The difference between a worker and the queen bee is made three days after the egg transforms into larvae and six days after the egg is laid in the beehive. The “royal jelly” is fed to all the larvae, i.e., the female bees, the workers and the drone bees during their initial three days as larvae. The larva sheds skin multiple times throughout this stage. Later, the royal jelly is fed only to the female larvae, which eventually becomes a queen bee. Finally, the worker bees cover the top of the cell with beeswax to protect and facilitate the transformation of the larvae into a pupa.



Stage 3 – The Pupal Stage:

Here the bee has developed parts like wings, eyes, legs and small body hair that physically appears close to an adult bee.



Stage 4 – The Adult Stage:

Once the pupa is matured, the new adult bee chews its way out of the closed-cell. The queen bee takes 16 days from the egg stage to form into an adult. The worker bee takes 18 to 22 days for complete development, and drone bees take 24 days to develop into an adult bee.

Indoor beekeeping

Modern beekeepers have experimented with raising bees indoors in a controlled environment or in indoor observation hives. This may be done for reasons of space and monitoring, or in the cooler months, when large commercial beekeepers may move colonies to "wintering" warehouses with fixed temperature, light, and humidity. This helps bees remain healthy but relatively dormant. These relatively dormant "wintered" bees survive on stored honey, and new bees are not born.

Experiments in raising bees indoors for longer durations have looked into more precise and varying environment controls. In 2015, MIT's "Synthetic Apiary" project simulated springtime inside a closed environment for several hives throughout the winter. They provided food sources and simulated long days, and saw activity and reproduction levels comparable to the levels seen outdoors in warm weather. They concluded such an indoor apiary could be sustained year-round if needed.

A vertical top-bar hive is the Warré hive, based on a design by the French priest Abbé Émile Warré (1867–1951) and popularized by David Heaf in his English translation of Warré's book *L'Apiculture pour Tous* as *Beekeeping For All*.

Urban and backyard beekeeping



Honey bee in Toronto

Related to natural beekeeping, urban beekeeping is an attempt to revert to a less-industrialized way of obtaining honey by using small-scale colonies that pollinate urban gardens. Some have found city bees are healthier than rural bees because there are fewer pesticides and greater biodiversity in urban gardens.[76] Urban bees may fail to find forage, however, and homeowners can use their land to help feed local bee populations by planting flowers that provide nectar and pollen. An environment of year-round, uninterrupted bloom creates an ideal environment for colony reproduction.

Natural beekeeping

The natural beekeeping movement believes bee hives are weakened by modern beekeeping and agricultural practices, such as crop spraying, hive movement, frequent hive inspections, artificial insemination of queens, routine medication, and sugar water feeding.[73] Practitioners of "natural beekeeping" tend to use variations of the top-bar hive, which is a simple design that retains the concept of having a movable comb without the use of frames or a foundation. The horizontal top-bar hive, as promoted by many writers, can be seen as a modernization of hollow log hives, with the addition of wooden bars of specific width from which bees hang their combs. Its widespread adoption in recent years can be attributed to the 2007 publication of *The Barefoot Beekeeper*[74] by Philip Chandler, which challenges many aspects of modern beekeeping and offers the horizontal top-bar hive as a viable alternative to ubiquitous Langstroth-style movable-frame hive.

1.Honey

Honey has medicinal values and is also used as a food additive.

Medicinal values of honey

- In addition to its use as a natural sweetener, honey is used as an anti-inflammatory, antioxidant and antibacterial agent. People commonly use honey orally to treat coughs and topically to treat burns and promote wound healing.

Benefits:

- Useful in Weight Management.
- Strengthens Immune system.
- Nourishes your skin and face.
- Boosts your memory.
- Home Remedy for Cough.
- Natural home remedy for Dandruff.
- Used for Healing Wounds.
- Acts as a Natural Sleeping Aid.



2. Beeswax:

In foods and beverages, white beeswax and beeswax absolute (yellow beeswax treated with alcohol) are used as stiffening agents. In manufacturing, yellow and white beeswax are used as thickeners, emulsifiers, and as stiffening agents in cosmetics. Beeswax absolute is used as a fragrance in soaps and perfumes.

Beeswax has fantastic skin-softening properties and enhances skin elasticity, helping reduce the signs of ageing. 3.

Beeswax is anti-allergenic, anti-inflammatory, anti-oxidant, antibacterial and germicidal. These properties make beeswax a highly stable base ingredient, thus extending the product's life.



3. Propolis and Balms - Propolis and balms are also obtained from the apiculture process. These products are utilized in repairing the comb. Propolis (Bee glue) are developed from the mixing of saliva and beeswax with exudate taken from tree buds or sap flows. Propolis works by bridging the gaps in the beehive. They have dark brown color but can even vary sometimes.

4. Royal jelly - Worker honeybees generate a milky secretion called Royal jelly. It includes proteins, vitamins, sugar, fats, water, salts and amino acids. Other bees utilize it to nurture queen bees and thus it is called royal jelly. Royal jelly also has medicinal properties like honey. It is even used in making homeopathic and ayurvedic medicines.

5. Bee Venom - Bee venom is a poisonous product obtained from honey that makes the bee stings painful. It also has medicinal properties, it can be used to treat rheumatism, arthritis, Parkinson's disease, etc.

Pests and diseases

The common agents of disease that affect adult honey bees include fungi, bacteria, protozoa, viruses, parasites and poisons. The gross symptoms displayed by affected adult bees are very similar, whatever the cause, making it difficult to ascertain the causes without microscopic identification of microorganisms or chemical analysis of poisons. Since 2006, colony losses from colony collapse disorder (CCD) have been increasing across the world, although the causes of the syndrome are unknown. In the U.S., commercial beekeepers have been increasing the number of hives to deal with higher rates of attrition.



Parasites

Nosema apis is a microsporidian that causes nosemosis, also called nosema, the most-common and widespread disease of the adult honey bee.

Galleria mellonella and *Achroia grisella* wax moth larvae hatch, tunnel through and destroy comb that contains bee larvae and their honey stores. The tunnels they create are lined with silk, which entangles and starves emerging bees. Destruction of honeycombs also results in leakage and wasting of honey. A healthy hive can manage wax moths but weak colonies, unoccupied hives and stored frames can be decimated.



Small hive beetle (*Aethina tumida*) is native to Africa but has now spread to most continents. It is a serious pest among honey bees unadapted to it.[98]

Varroa destructor, the Varroa mite, is an established pest of two species of honey bee through many parts of the world and is blamed by many researchers as a leading cause of CCD.

Tropilaelaps mites, of which there are four species, are native to *Apis dorsata*, *Apis laboriosa*, and *Apis breviligula*, but spread to *Apis mellifera* after they were introduced to Asia. *Acarapis woodi*, the tracheal mite, infests the trachea of honey bees.

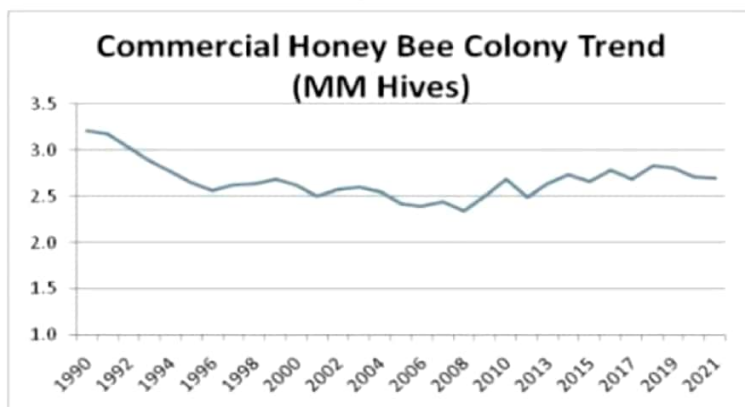


Predators

Most predators prefer not to eat honey bees due to their unpleasant sting. Common honey bee predators include large animals such as skunks and bears, which seek the hive's honey and brood, as well as adult bees.[102] Some birds will also eat bees, (for example, bee-eaters, as do some robber flies, such as *Mallophora ruficauda*, which is a pest of apiculture in South America due to its habit of eating workers while they are foraging in meadows.

Decreasing lifespan

A 2022 study by researchers at University of Maryland, College Park observed the lifespan of caged worker bees is half as long as that observed 50 years ago, and hypothesized decreased worker-bee life spans should correlate to decreased honey production.



Safety and husbandry

Some beekeepers believe pain and irritation from stings decreases if a beekeeper receives more stings, and they consider it important for safety of the beekeeper to be stung a few times a season. Beekeepers have high levels of antibodies, mainly Immunoglobulin G, caused by a reaction to the major antigen of bee venom, phospholipase A2 (PLA). Antibodies correlate with the frequency of bee stings.



The entry of venom into the body from bee stings may be hindered and reduced by protective clothing that allows the wearer to remove stings and venom sacs with a simple tug on the clothing. Although the stinger is barbed, a worker bee's stinger is less likely to become lodged into clothing than human skin.

Symptoms of being stung include redness, swelling and itching around the site of the sting. In mild cases, pain and swelling subside in two hours. In moderate cases, the red welt at the sting site will become slightly larger for one or two days before beginning to heal. A severe reaction, which is rare among beekeepers, results in anaphylactic shock.



If a beekeeper is stung by a bee, the sting should be removed without squeezing the attached venom glands. A quick scrape with a fingernail is effective and intuitive, and ensures the venom injected does not spread so the side effects of the sting will go away sooner. Washing the affected area with soap and water can also stop the spread of venom. Ice or a cold compress can be applied to the sting area.

Bees maintain the internal temperature of their hive at about 35 °C (95 °F). Their ability to do this is known as social homeostasis and was first described by Gates in 1914.[66] During hot weather, bees cool the hive by circulating cool air from the entrance through the hive and out again; and if necessary by placing water, which they fetch, throughout the hive to create evaporative cooling. In cold weather, packing and insulation of the beehive is believed to be beneficial.



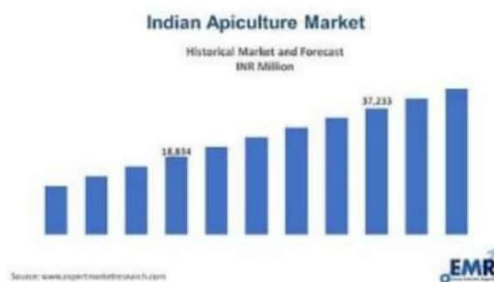
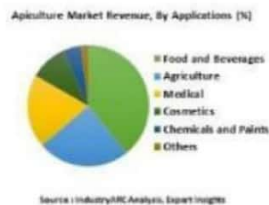
Location of hives

There has been considerable debate about the best location for hives. Virgil thought they should be located near clear springs, ponds or shallow brooks. Wildman thought they should face to the south or west. All writers agree hives should be sheltered from strong winds. In hot climates, hives are often placed under the shade of trees in summer. Researchers in the U.S. found domestic honey bees placed in national parks compete with native bee species for resources. A further review of the literature concluded large concentrations of beehives on continents where they are not native, such as North and South America, could compete against the native bees; this, however, was not as strongly observed in areas where domestic bees are native such as Europe and Africa, where the different bee species have adapted to have a narrower overlapping of forage preferences.

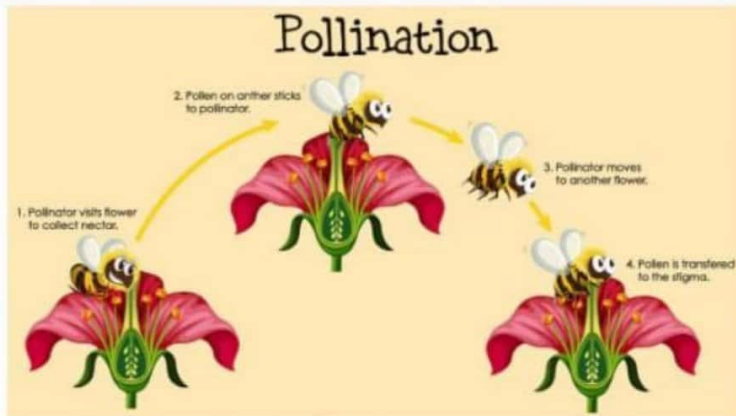
Economic importance

Five points which are very important for a successful bee- keeping or Apiculture are as follows:

- a) Knowledge of nature and habit of bees.
- b) Selection of a suitable location for keeping the beehives.
- c) Catching and hiving of swarms (the group of bees).
- d) management of beehives during different seasons.
- e) Handling and collection of honey and beeswax.



Moreover, beekeepers can also earn an income from other sources of beekeeping, which include the Pollination of crops, raising queens, and production of package bees for sale.



2. They help in getting useful by-products

Raw honey is always in demand, and wax and propolis are valuable by-products of bee production. Making candles, waxing wooden furniture, shining concrete worktops, protecting bronze and copper, and waterproofing leather are among the things that can be done using beeswax. Furniture wax and vehicle wax are frequently created from propolis, resin-like material bees produce from tree sap. Propolis, raw honey, pollen, beeswax, and raw honey can all be purchased as natural antibiotics and health supplements.



Advantages and Disadvantages

Advantages of apiculture

There are several benefits of apiculture such as they act as great pollinating agents, it provides the best nutrition in the form of honey, it also provides beeswax in cosmetics and pharmaceuticals, as well as their venom is used in the treatment of arthritis and snake bites. It is explained in detail in the following points.

1. Plant pollination

Bees move pollen from plant to plant as they gather nectar to bring to their colonies, aiding in the pollination of flowers, vegetables, and fruits in the garden. Honeybees' fuzzy bodies attract pollen, which they then smear on the flowers they visit for nectar. The pollen exchange promotes plant reproduction and the development of fruit and seeds. Fruit and seed harvests will be minimal if feral bees aren't there to pollinate flowers and crops.

3. Beekeeping is for profit

Up to 100 pounds of harvestable honey might be expected from a vigorous hive each year. A reduced yield, however, might be brought about by a variety of circumstances. Less honey may be produced because of temperature, weather, and illness.

Disadvantages of apiculture

1. Non-Native Bees

Honey bees are non-native species. Therefore, many beekeepers who raise them for their ability to pollinate and honey, there is a quite concern that they will take over native species.



2. Getting Stung

Honey Bees have stings to protect themselves. It gets attached immediately when perceived as a threat. However, honey bees don't only sting for the sake of it. Honeybees also die a horrific death when they use their stinger.



3. Having To Wear A Beekeeper's Suit!

You cannot manage your beekeeping task without wearing a beekeeper's suit, without it, you are likely to get stung.



4. Getting Through The First Year

In the first year, it is difficult to get enough results from the honeybees, as they simply won't have had a chance to produce enough to feed the colony and you.

The first year only includes making wax, raising their young and generating honey for food over winter. So, it requires patience while the hive establishes itself.

5. Risk Of Disease

The main problem that arises in rearing bees is disease. Bees with diseases can quickly spread and kill off the entire colony. Further, the infected bees from one hive can spread the disease to neighboring hives.



Precautions

Following precautions are necessary for honey bee culture or Apiculture:

- Plants of fruits and flowers should be within one kilometre only from the hives.
- Artificial beehives should be kept in cool & shady area.
- Source of freshwater must be in the nearest vicinity.



Government schemes

Govt. of India has approved a new Central Sector Scheme entitled “National Beekeeping & Honey Mission (NBHM)” for 2 years for overall promotion and development of scientific beekeeping in mission mode to achieve the goal of “Sweet Revolution” in the country by giving thrust on capacity building & trainings, specific focus on women, input support for promotion & production, setting up of Integrated Beekeeping Development Centres (IBDCs), other Infrastructures, Digitization /online registration, etc., processing, value addition, market support, etc. & R&D under 3 Mini Missions (MMs)-MM-1, MM-2 & MM-3.

Conclusion

- Apiculture is a vast scientific subject related to agriculture, food, nutrition, industrial products & environment.
- Honey quality can be improved by training beekeepers to respect hygienic conditions.
- The development of beekeeping in tropical regions can be achieved using local methods by beekeepers who like honeybees.
- Rural development plays a vital role as one of the economic activities.



THANK YOU NOTE



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Honey hive in our (St. Ann's)
college campus

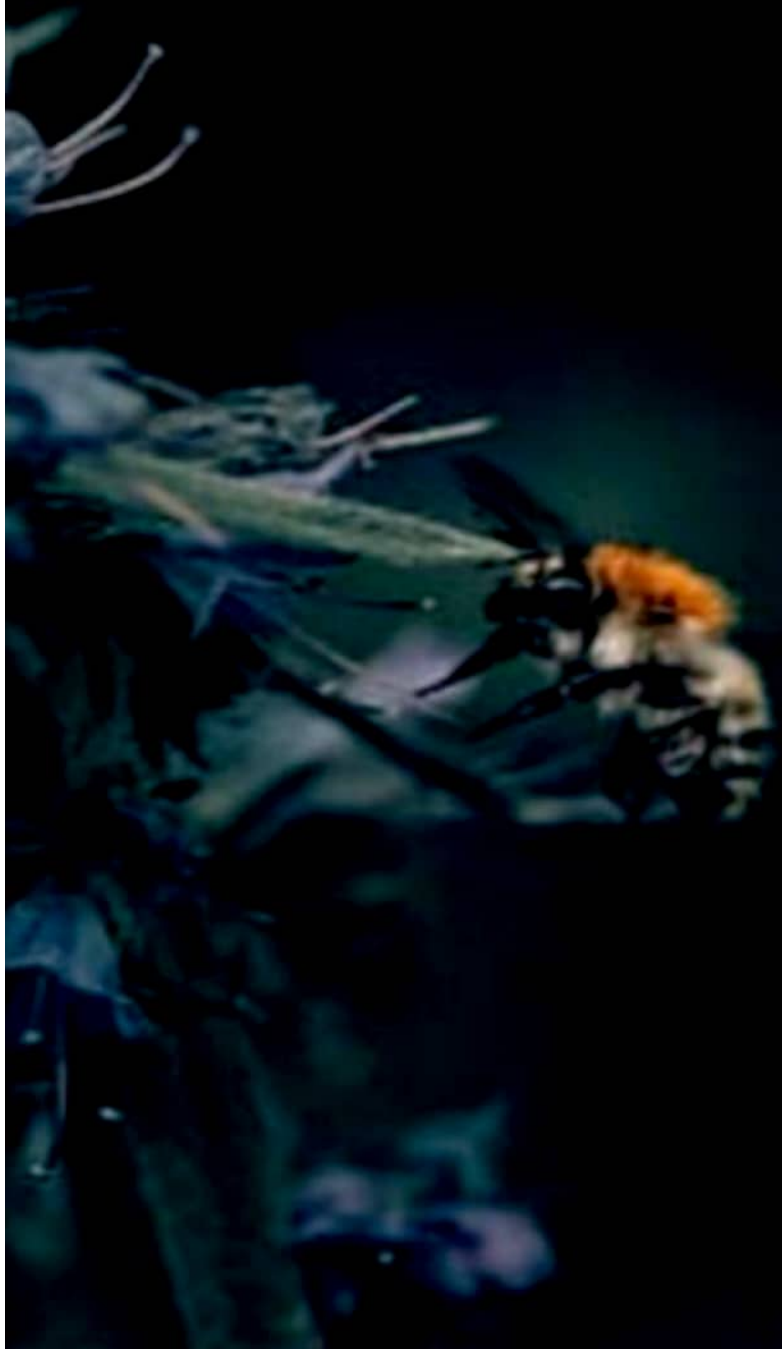
REFERENCES

- Library of St. Ann's college for women , malkapuram is considered as a main place which helps in our project.
- Google is the major reference used in making this book.
- Learning apps like Byjus and **toppr** are very useful in our research on apiculture.
- Many websites of Google and chrome are used for data collecting.

<https://en.m.wikipedia.org/wiki/Beekeeping>

Thank you!!

-----x-----



Thank you!!

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