

# **ZOO: SEC-101**

Course Title: **Apiculture**

Credits: 3

Contact hours: 60

Marks: 100

## **THEORY**

Credits: 2

Contact hours: 30

Marks: 50

(All units are of equal credits)

***Learning Objective:*** *To inculcate skills in apiary management*

### **Unit 1: Biology of Bees**

1. History, Classification and Biology of Honey Bees
2. Social Organization of Bee Colony

### **Unit 2: Rearing of Bees**

1. Artificial Bee rearing (Apiary), Beehives – Newton and Langstroth
2. Bee Pasturage, Selection of Bee Species for Apiculture
3. Bee Keeping Equipment
4. Methods of Extraction of Honey (Indigenous and Modern)

## **Unit 3: Diseases and Enemies**

1. Bee Diseases and Enemies
2. Control and Preventive measures

## **Unit 4: Bee Economy**

1. Products of Apiculture Industry and its Uses (Honey, Bees Wax, Propolis), Pollen

## **Unit 5: Entrepreneurship in Apiculture**

1. Bee Keeping Industry – Govt initiatives and recent efforts
2. Modern methods in employing artificial Beehives for cross pollination in horticultural gardens

# Apiculture



# Introduction:

- *Apiculture (Bee keeping) is the maintenance of honey bee colonies, by humans in order to collect products like honey, beeswax, propolis etc.*
- A location where bee colonies are kept is called an apiary or "*bee yard*".
- Honey bees are highly organized social insects and their systematic position is as follows -

- Kingdom - Animalia
- Phylum - Arthropoda
- Class - Insecta
- Order - Hymenoptera
- Family - Apidae
- Genus - *Apis*





# History:

- Apiculture is thought to have been practiced as early as 13,000 BC.
- The medicinal importance of honey is mentioned in QUARAN in SURAH NAHL in chapter 16 verse no 68 and 69.
- Use of honey has also been mentioned in religious scriptures like Vedas, Puranas, Ramayana and Mahabharata.



Tomb of Pabasa(Dynasty 26<sup>th</sup>)Egypt

## ❖ Species of Honey bees:

### 1. Apis dorsata (*The rock- bee*)

- This is the largest honeybee.
- Builds single large open comb on high branches of trees and rocks.
- Produces large quantity of honey, but this bee is difficult to domesticate.



### 2. Apis cerana indica (*The Indian bee*)

- Medium – sized.
- Hive consists of several parallel combs in cavities of tree trunks, earthen pots, etc.
- This bee is not so ferocious and can be domesticated.





### 3. *Apis florea* (*The little bee*)

- Small – sized.
- Builds single small combs in bushes, hedges, etc.
- Honey yield is poor.



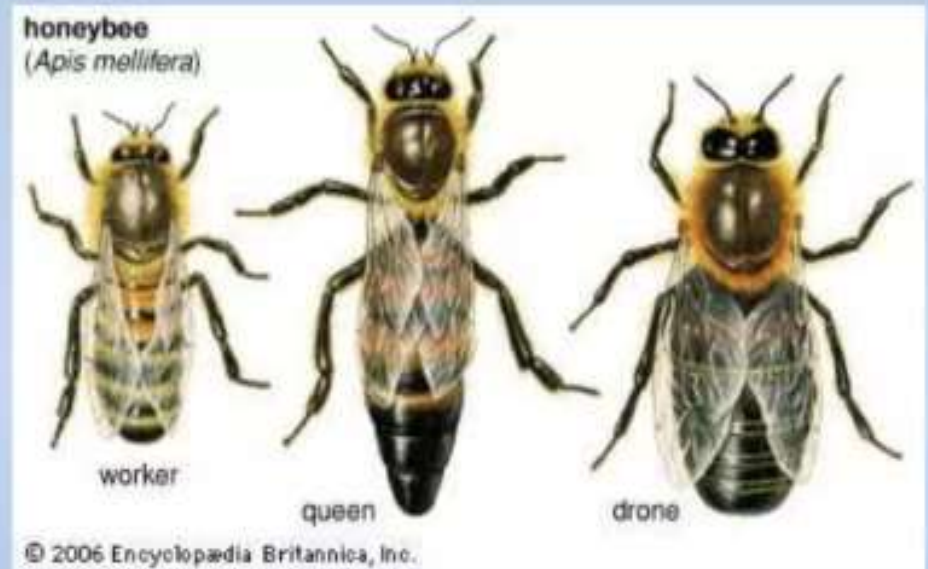
### 4. *Apis mellifera* (*The European bee*)

- Somewhat look likes the Indian bee (*Apis indica*).
- This has been introduced in many parts of the world including India.
- It is easily domesticated.



# The Bee colony

- *A honey bee colony has three castes – Queen, worker and drone.*



## (i) Queen Bee

- Queen bee is the only fertile female in colony
- She is largest in size.
- No wax glands.
- Live for about 3 - 4 years.
- May lay eggs at the rate of 1500-2000 per day



## **(ii) Drones**

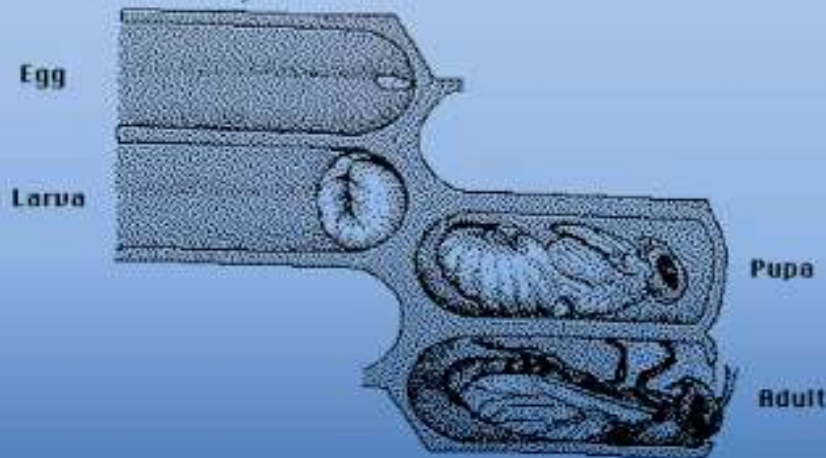
- Drones are the male member of colony.
- Drones can live up to about 60 days.
- Sting and wax gland absent.
- Develops from unfertilized egg.
- The sole duty of drone is to fertilized the virgin queen.

## **(III) Worker Bee:**

- Have well-developed sting and Hind legs have “*pollen basket*” for collecting pollen.
- They perform different duties depending upon their age which are as follows:
- **Day 1-14:** Activity inside the hive such as cleaning the hive, feeding the larvae, etc.
- **Day 14-20 :** Guard the entrance of the hive
- **Day 21- 35:** Foraging, i.e. collecting the nectar and pollen from the surrounding.

# *Life cycle & Development*

- ✓ The 7 days old virgin queen goes out from hive along with some drones for mating. This is called as *Nuptial or marriage flight*.
- ✓ Only one drone mate with queen and she stores spermatophore in her *spermatheca*.
- ✓ Mating takes place while flying and after mating drone dies and queen returns to the hive.
- ✓ The queen has ability to control the release of the sperms from her spermatheca (sperm store).

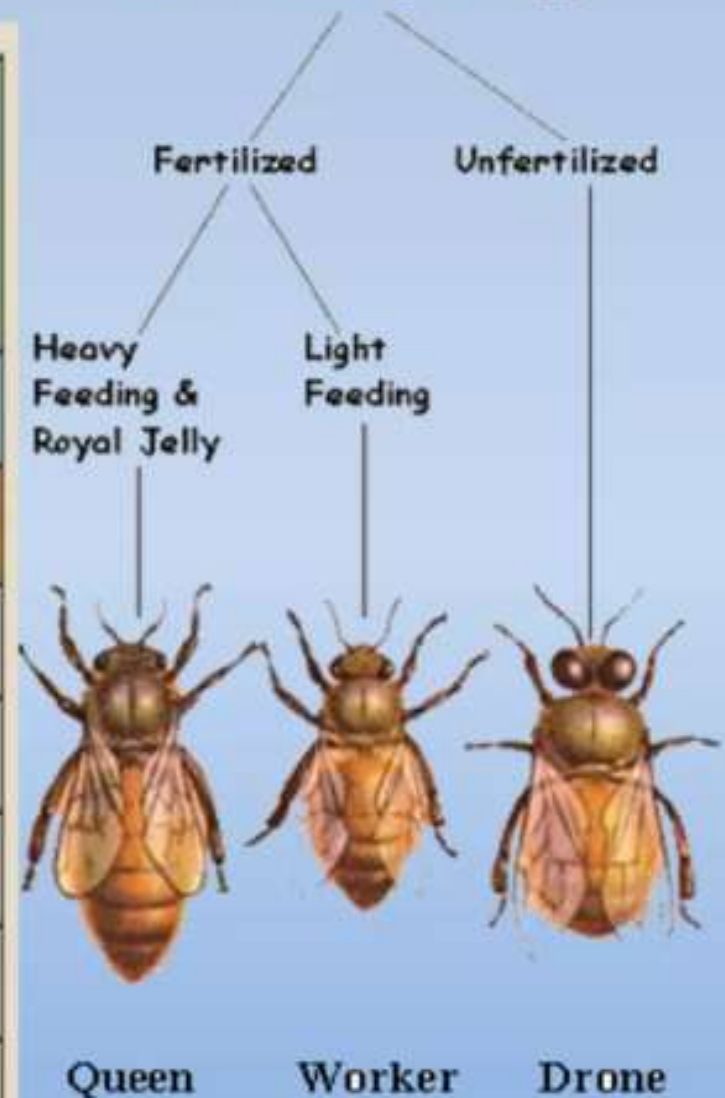


## Honey Bee Development

Stage	Days After Laying Egg		
	Worker	Queen	Drone
Hatching	3	3	3
Cell Capped	8	8	10
Pupa	11	10	14
Adult	20	15	22.5
Emerges From Cell	21	16	24

Stages of Development

The Queen lays an egg



Type of Development



# ❑ *Methods of Beekeeping*

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- (A) *Indigenous methods of bee keeping*: This is an old method and the two types of hives used are in these method as follows –

- ❖ (i) *wall or fixed hive* - It is purely natural type of comb because bees prepare the hive themselves on the wall or trees.
- ❖ (ii) *movable hive* - It comprises wooden boxes or earthen pitchers.

The traditional beekeepers catch clustered swarms from trees, bushes, etc and transfer them to the above-mentioned spaces.



**Fixed Hive**



**movable hive**

## **(b) Modern method of apiculture:**

- The modern Bee hives were designed based on “Bee Space theory” by L.L.Langstroth in 1851.
- *Bee space is the optimum distance to be left in between two adjacent comb surfaces in a bee hive which is essential for normal movement and functioning of bees.*
- **Types of hives:** In general for *A. mellifera* we use Langstroth hive and for *A. cerana*, BIS (Bureau of Indian Standard) hive A and B type .



Lorenzo Lorraine Langstroth



## ➤ **Parts of typical movable hive:**

1. **Stand:** To support bottom board.
2. **Bottom board:** It forms proper base for the hive having an entrance for bees.
3. **Brood chamber:** Chamber used for rearing of brood. Frames are placed in this chamber on which bees raise combs.
4. **Queen excluder:** Perforated zinc sheets assembled in such a way that workers can pass through them but a queen cannot.
5. **Super:** It is provided with many frames containing comb foundation to provide additional space for expansion of hive.
6. **Inner cover:** A board which acts as a partition between brood/super chamber and the roof.
7. **Top cover:** A type of lid acting as roof placed over inner cover.

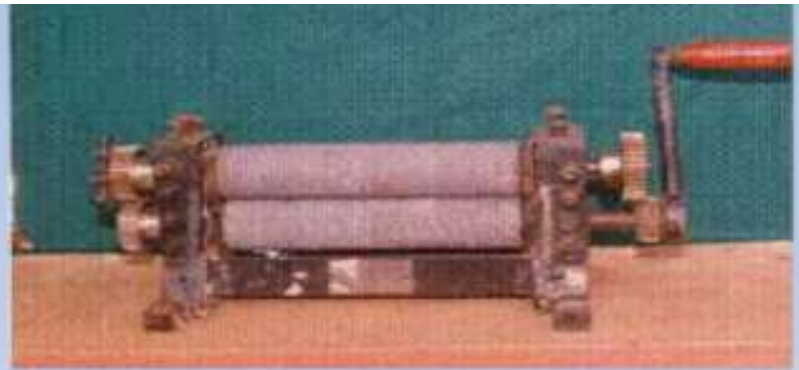


**Typical movable hive(Langstroth type)**



## Other equipments:

- *Comb foundation mill:*
  - Used to print natural cell size of desired comb foundation sheet.
- **Bee veil:** Used for preventing bee stings on face and neck.
- **Smoker:** Used to calm down the bees while opening the hive.



- Uncapping knife: Large sized knife used to uncap the frames before honey extraction.



***Uncapping knife***

- Honey extractor: It is used for extraction of honey from comb and is function on the principle of centrifugal force.



***Honey extractor***

# ❖ Products of apiculture

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## (a) Honey:

Bees produce honey from Nectar of plants through enzymatic activity, regurgitation, and water evaporation.



## ➤ Uses:

- **Food :** Honey is a nutritious food, rich in energy and vitamins.
- **Medicines:** It is used to prevent cold, cough and fever.

## • Composition of honey:

Levulose	38.9%
Dextrose	21.28%
Maltose & other sugars	8.81%
Enzymes and pigments	2.21%
Water	17.20%



## **(b) Beeswax:**

- Beeswax is secreted by the wax glands located on the underside of the last four abdominal segments (4th to 7th) of the worker bee.

### **➤ Uses:**

- making of candles.
- used in creams, lotions, lipstick.
- formation of comb foundation (wax foundation in apiaries).



**Wax scales from  
wax glands**

### *(c) Royal Jelly:*

- The glandular secretions of young worker bees (4-10 days old), produced by the hypopharyngeal gland in the head.



- **Uses:** Used in treatment of diabetes, osteoporosis etc. It also aids in healing wounds and boosts immunity.

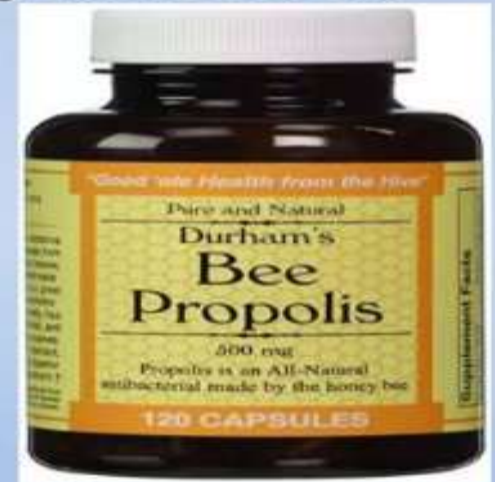
### **(d) Bee Venom:**

- Bee venom is a bitter colourless liquid, containing proteins, which causes local inflammation.

➤ **Uses:** Bee venom is given as a shot for rheumatoid arthritis, nerve pain (neuralgia), multiple sclerosis (MS), desensitizing the people allergic to bee sting.

### **(e) Propolis:**

It is a resinous mixture that honey bees produce by mixing saliva and beeswax with exudate gathered from tree buds.



➤ **Uses:**

- It is used by bees to seal unwanted spaces in hive.
- Used to treat cough and throat irritation.



# ❖ Bee Enemies & Diseases

## • **Enemies of Honeybees:**

1. **Wax Moth** (*Galleria mellonella*): The caterpillars live in the silken tunnels made by the bees, feed on the propolis, pollen, and wax in the combs.
2. **Wasp**: It waits near the entrance of the hive; catches bees as they come out, macerate them for feeding the juice to its young ones.
3. Other enemies are wax beetle, birds, ants etc.



Comb infested by wax moth



Wasp feeding on bee



Bird eating honeybee

- **Diseases of Honeybees:**

Type of Diseases	Causative Agent	Causes
<b>Acarine</b>	<i>Acarapis woodi</i>	Infest the tracheal system of bee.
<b>Varoasis</b>	<i>Varroa destructor</i>	Sucks the haemolymph of bees.
<b>American foulbrood</b>	<i>Bacillus larvae</i>	Death of bee larvae.
<b>Nosema</b>	<i>Nosema apis</i>	Destroys stomach cells & interferes with digestion.



*Acarapis woodi*



American foulbrood



Nosema disease



# Agencies involved in apiculture in India

- ❑ **Agricultural Products Export Development Authority (APEDA)** under the aegis of the Ministry of Commerce and Industry helps to promote exports of honey.
- ❑ **National Bee Board (NBB)** under the Ministry of Agriculture has contributed to overall development of scientific beekeeping in India.
- ❑ The **Central Bee Research and Training Institute,(Pune)** provide training to bee keepers.



APEDA head office in New Delhi



Training held by NBB



- ❑ **Khadi and Village Industries Commission (KVIC)** provide training and developed several appropriate technologies suited to Indian beekeeping in rural areas.



**Training held by KVIC**