



Diseases & Enemies of Honey Bees and Their Management

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The study to analyze the disease and enemies of honey bees and their management. The households also listed the major diseases, pests and predators of honey bee and were captured using rank index; ants, death head hawk moth, birds, honey badger and lizard. Despite these limitations, there are many opportunities for beekeeping in the study area; access of bee hives, sustainable honey market price, healthy bee colonies and good infrastructure. In order to sustain the beekeeping activities of the study area, it is recommended that there should be affordable and appropriate extension service, supplying cheap bee keeping inputs, capacitating to beekeepers i.e. pests, diseases and predators control mechanism.

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". Beekeeping (or apiculture, from Latin: *apis* "bee") is the maintenance of honey bee colonies, commonly in hives, by humans. A beekeeper (or apiarist) keeps bees in order to collect their honey and other products that hive produces (including beeswax, propolis, pollen, and royal jelly), to pollinate crops, or to produce bees for sale to other beekeepers. Depictions of humans collecting honey from wild bees date to 15,000 years ago; efforts to domesticate them are shown in Egyptian art around 4,500 years ago. It wasn't until the 18th century that European understanding of the colonies and biology of bees allowed the construction of the moveable comb hive so that honey could be harvested without destroying the entire colony. Previously the method of extraction of honey was very much crude but after the invention of artificial hive by Longstroth (1951), it became scientific and commercial.

LIST OF DISEASES OF HONEY BEES

S.N.	Name of Diseases	Causal Agent	Place/part of Infection	Infected Stage
1.	Nosema	Fungus (<i>Nosema</i> sp.)	Stomach	Adult bee
2.	Amoebic Disease	Amoeba (<i>Malpighamoeba mellificae</i>)	Malpighian tubules	Adult bee
3.	Acarine Disease	Mite (<i>Acarapis woodi</i>)	Trachea & body fluid	Adult bee
Brood Diseases				
4.	European foul	Bacteria (<i>Melissococcus</i>)	Comb cells	Larvae



	brood	<i>plutonius</i>)		
5.	American foul brood	Bacteria (<i>Bacillus larvae</i>)	Comb cells	Larvae
6.	Sac brood	Virus (<i>Sacbrood virus</i>)	Comb cells	Larvae
7.	Stone brood	Fungus (<i>Aspergillus sp.</i>)	Comb cells	Larvae
8.	Chalk brood	Fungus (<i>Ascosphaera apis</i>)	Comb cells	Larvae
9.	Colony collapse disorder or varroosis disease	Varroa mite or Pesticidal effect		Adult bee

LIST OF enemies OF HONEY BEES

S.N.	Common Name	Scientific Name	Stage/Part/Place of Attack
1.	Hawk moth	<i>Acherontia styx</i>	Honey
2.	Greater wax moth	<i>Galleria mellonella</i>	Wax
3.	African small bee hive beetle	<i>Aethina tumida</i>	Wax
4.	Lesser wax moth	<i>Achroia grisella</i>	Wax
5.	Wax beetle	<i>Platylolium alvearium</i>	Wax
6.	Predatory wasps	various spp.	Adult bee
7.	Birds		Adult bee
8.	Ants		Various stages and parts

Nosema disease

- Nosema disease is caused by two fungi namely *Nosema apis* and *Nosema ceranae* (Higes *et al.*, 2008).
- The pathogen penetrates mid gut and grows by absorbing nutrients from mid gut cells (Higes *et al.*, 2009).
- Heavily infected worker bees can contain an excess of 50 million spores. Nosema infections have specific negative effects on honey bees (Meana *et al.*, 2013).

Management

- Sterilization of brood boxes and frame with glacial acetic acid or formalin (40%) should be done .
- Keep the hive dry.
- Try to avoid moving hives during winter.
- Only one antibiotic, fumagillin (trade name Fumidil B) is reported successful in controlling nosema disease. (Soroker *et al.*, 2011).

Amoebic Disease

- This disease is caused by *Malpighamoeba mellificae*.
- The disease is spread similarly to *Nosema*.
- Disease cause infection in Malpighian tubules (Wilkins *et al.*, 2007).



- This amoeba reported to cause dysentery in adult bees (Bailey *et al.*, 1983).

Disease management

- Disinfection of equipments by 2% carbolic acid.
- Transfer of bees in fumigated box after infection.
- Sterilization of brood boxes and frame with Glacial Acetic acid should be done in the month of September (Thakur, 1991).
- Formalin (40%) is also used for this purpose.

Acarine Disease

- Caused by a parasitic mite *Acarapis woodi*.
- Acarine disease is a winter problem.
- The Acarine or tracheal mite is a tiny microscopic creature.
- *Acarapis woodi* spends its entire life cycle within the breathing tracts of the bee (Villa *et al.*, 2005).
- The mites prefer young bees to infect.

Disease Diagnosis its cure

- Diagnosis done by examination of trachea of suspected bees under the microscope.
- Exposing the affected colonies with safrol oil, Nitrobenzene and petrol (1:2:2) is helpful in control of *Acarapis woodi* (Eischen *et al.*, 1989).
- Menthol crystals are used as a fumigant.
- Sulphur is used by some beekeepers against acarine mites.
- Apiguard is used for the control of both acarine mites and varroa mites (Pettis *et al.*, 2005).

European foulbrood

- EFB is a bacterial disease that affects honey bee larvae.
- EFB is characterized by dead and dying larvae, appeared as curled upwards (Forsgren *et al.*, 2013).
- The EFB bacteria does not produce spores.
- Often, when the nurse bee to larvae ratio becomes unstable, the disease occurs (Roetschi *et al.*, 2008).
- Spotty brood pattern is a common symptom of EFB.

Life cycle of European foulbrood

- Caused by bacteria, *Melissococcus plutonius*.
- Larvae become infected by consuming infected brood food.
- The bacterial populations multiply in the larval midgut.
- The degree of larval mortality, is directly related to the duration or amount of bacteria that was fed to the larva (Bailey and Collins, 1982).
- The larvae pupate abnormally.

American foulbrood

- Caused by *Bacillus larvae*.
- AFB infections start when nurse bee's feeds developing larvae by her infected mouthparts (Genersch, 2010).
- 24 hours old larva is the most susceptible stage.

Symptoms

- Irregular and patchy brood pattern.
- Brood may appear sunken.
- Capping may also be perforated by bees trying to remove the dead brood.
- Infected hive also have a Sulphur's smell due to the decomposing broods. (Palmer and Oldroyd, 2003).

Management of American and European foulbrood

- Replacement of diseased combs.



- Always try to minimize the stress of food.
- Supplementing the colony's diet with sugar syrup and fresh uncontaminated pollen when nutrition is poor.
- Hives should be placed in a well-ventilated, dry areas.
- Sterilization of tools or equipment is important.
- Use of oxytetracycline hydrochloride (OTC).

Sac brood

- Caused by a virus of Iflavirus genus.
- The virus mostly affects larvae but can infect adult honey bees also (Bailey, 1969).
- The virus multiplies within the infected larvae.
- The Sacbrood virus can remain viable for long time in dead larvae, honey or pollen.

Symptoms

- Uneven brood pattern, discolored, sunken or perforated cappings.
- Infected larvae fail to pupate.
- The larva dies with its head characteristically raised toward the top (banana shape).
- After death, infected larvae change from a healthy pearly white, to yellowish, then to a brown colour. (Bailey and Woods, 1997).

Management

- Honey bees are usually able to control Sacbrood virus in most colonies through hygienic behavior and the ability to detect and remove infected larvae.
- Add worker bee population, or by providing sugar syrup or pollen.
- If Sacbrood virus is detected in more than 5 per cent of the brood re-queening should be considered.
- As a precautionary measure, brood combs should also be replaced after every 3-4 years by beekeepers.

Stone brood

- Stonebrood is a fungal disease, caused by *Aspergillus flavus*, *Aspergillus fumigatus* and *Aspergillus niger*.
- It causes mummification of the brood of a honey bee colony.
- The pathogen is common soil inhabitants and are also pathogenic to plants, birds, and mammals (Steinhaus, 2013).
- It cause respiratory damage to adult bees.

Symptoms

- Dead larvae turn black and become difficult to crush.
- Fungus forms mycelium all over the body of larvae.
- The affected adult bees show restlessness, feebleness and paralysis, abdomen gets dilated and then mummified (Steinhaus, 2013).
- Younger bees die earlier.

Management

- There is no chemical control.
- Removal of mummies by bees results in natural control of the diseases.
- Collect and burn the mummified larvae.
- Improve ventilation and reduce humidity.
- Replace old, blackened brood combs.
- If a colony lacks sufficient food stores, supplement with good quality of food.

Chalk brood

- Caused by spore-forming fungus, *Ascospaera apis*.
- Spores remain viable for years.
- The disease is most prevalent in the spring.
- It affect only broods.



- Three - four days old larvae are more susceptible. (Tarpy *et al.*, 2016).

Symptoms

- Diseased larvae are stretched out in their cells in an upright position.
- Larvae are often covered with cottony filaments, hence the name chalk brood (Rangel *et al.*, 2015).
- Diseased larvae can be mottled with brown or black spots.
- Chalk brood mummies once dry, are loose in the cell, and can be removed easily.
- Often, a few of these mummies are visible on the ground at the entrance to the hive.

Management

- There are no registered chemicals available to control Chalkbrood disease.
- Healthy bee colonies are able to tolerate Chalkbrood disease.
- Replace diseased comb with new combs.
- Clean away mummified larvae.
- Hives should be placed in a well-ventilated, dry area.

Colony collapse disorder

- A phenomenon that occurs when the majority of worker bees in a colony disappear and leave behind a queen with plenty of food.
- Bee CCD affect worker bees, they simply don't come back.
- Some scientists believe that it is caused by varroa mite (*Varroa destructor*) and some believe that insecticides are responsible for it.
- The syndrome was renamed CCD in late 2006.

Signs and symptoms

- Presence of capped brood in abandoned colonies.
- Presence of food stores, both honey and bee pollen.
- Comb is not immediately robbed.
- Presence of the queen bee.
- Insufficient workforce to maintain the brood that is present.
- Workforce seems made up of young adult bees only.

Causes

- Due to infestation of varroa mite (Steinhaus, 2013).
- Israeli Acute Paralysis virus and the gut parasite *nosema*.
- Pesticide poisoning in-hive or field (Higes *et al.*, 2011).
- Transportation to multiple locations.
- Changes to the habitat where bees forage.

Management

- Do not combine collapsing colonies with healthy ones.
- Do not use same equipments for other colonies.
- Use varroa control (fluvalinate) in honey bee colonies.
- Keep colonies strong by practicing best management practices.

Greater and lesser wax moth

- *Galleria mellonella*, the greater wax moth or honeycomb moth, is a moth of the family Pyralidae.
- *Achroia grisella* family pyralidae is smaller moth than the greater wax moth and has a silver-grey to dull-yellow, slender body.
- Larvae are creamy white, but turn grey on reaching their fully grown size.
- After hatching, the small very active larvae tunnel in comb.
- Fully developed larvae spin silky cocoons that may be found in a mass of webbing in the comb (Reddy, 2010).
- They feed on combs, pollen and litter found on the hive floor.



- LWM larvae are usually solitary, whereas GWM larvae often congregate in large numbers (Caron, 1990).

Management

- Apiary hygiene and colony management.
- Equipment cleaning.
- Light and ventilation.

Wax beetle

- This Tenebrionid reported in hives of the Indian honey bee at Coimbatore and described as *Platylolium alveanum* (Mahadevan, 1938).
- The larvae feed on the particles of wax on the floor-board.
- Larvae also feed on pollen.
- Adults feed on the combs and bore into the cells. (Prasad, 2009).

Small hive beetle

- The small hive beetle (*Aethina tumida*) is a pest of bee hive belonging to family Nitidulidae.
- It cause damage to comb, stored honey and pollen (Higo (1983).
- Both grub and adult cause damage.
- This pest of bee hive is not yet reported in India.

Management

- Cultural and mechanical controls, changing infested hive etc.
- Apiary hygiene and colony management.
- Equipment cleaning.
- Chemical control by Guard Star @3-5ml/ltr. water/hive (Ellis, 2005).

Hawk moth

- *Acherontia styx*, the death's head hawk moth is a pest of hive.
- It is very fond of honey, and bee keepers have reported finding dead moths in their hives as a result of bee stings.
- They can mimic the scent of bees so that they can enter a hive unharmed. (Davis, 1978).

Predatory wasps

- Several species of wasps predate on honeybees causing severe damage to bee colonies and leads to loss of entire apiaries (Ghosh, 2012).
- The largest of the social wasps of genus *Vespa* sp. are physically capable of preying on honeybees.
- *V. tropica* is a fast flier wasp and mostly catches the forager bees (Garg and Kashyap, 1998).
- Some species wait on the back of the hive and capture bees.

Management

- *Apis mellifera* and *A. cerana indica* bees kill wasps through shimmering behavior (Sharma *et al.*, 1980).
- Destruction of wasp nests near the apiary.

Birds

- Various types of birds feeds on honey & bees, major birds associated with honeybees are *Merops* sp., *Dicrurus macrocerus* and *Passer domesticus* (Cobb, 1979).
- They are broadly classified into two categories: Bee eaters and honey eaters.

Ants

- Ants are not usually serious pests in honeybee colonies.
- Occasionally, however, certain species may enter colonies to search for food or establish nesting sites (Subhapradhan, 1961).
- Ants specially *Eciton* sp., *Anomma* sp., *Dorylus* sp. and fire ants kill honeybees. (Dubois and Collart, 1950).
- *Camponotus compressus* (carpenter ant) is occasionally a serious pest of bee colonies in India. (Singh, 1962).



Management

- Many times honey bees are capable of defending hives against ants by fanning.
- They use propolis to fill cracks and crevices otherwise closing through artificial material (resin) is also advisable (Subhapradhan, 1961).
- Effective control of ants were recorded when legs of stands were placed in water bowl or mercuric chloride (May, 1961).
- Natural repellants like *Nepeta cataria*, *Chrysanthemum*, *Juglans regia* and dusting with turmeric powder is also used by many bee keepers to keep ants away. (Abrol and Kakroo, 1998).

Conclusion

Trend toward industrial beekeeping. Growing resistance to antibiotics, threats of pesticides. More sustainable options. Proper control and management tactics apply in beekeeping. Reduce maximum natural mortality factors.

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