Published on *TECA* (http://teca.fao.org)

# Beekeeping in Africa: Responding to common bee diseases

**SUMMARY:**
This entry gives an overview over common brood (like the American and European Brood Foul) and adult bee diseases (like Nosema and the Acarine disease). It enables the beekeeper to identify them and also provides very practical advice on measures to prevent the spread of bee diseases. This technology is part of a series on hive management derived from the FAO publication Beekeeping in Africa.

**KEYWORDS:**
beekeeping [1]
disease control methods [2]

**CATEGORY:**
Livestock production [3]

**DESCRIPTION:**

***This technology/practice is from the publication:***

*Adjare, Stephen O., 1990, Beekeeping in Africa,FAO Agricultural Services Bulletin 68/6,Food and Agriculture Organisation of the United Nations, Rome, 1990, chapter 5 (see link below)*

Like all other living creatures, the honeybee suffers from diseases. In many parts of the world, research is underway for means of combating or preventing them, but the African bee industry is in its infant stage and not much research has been carried out on bee diseases in Africa. It is believed that some of the diseases found in temperate and sub-tropical regions of other parts of the world may be present on the continent.

Some sub-tropical African countries (e.g. Algeria, Egypt, Libya, Morocco and Tunisia), have some of the known diseases; it is therefore important that beekeepers study the diseases described here and watch for their symptoms in their apiary. Such discoveries should be reported to the International Bee Research Association (IBRA), 18 North Road, Cardiff CF1 3DY, UK.

**(1) Brood diseases**

The life cycle of the honeybee starts with an egg, which hatches in three days. It then passes through larval and pupal stages before emerging as an imago or a young bee. During the brood stage, the insect may be attacked by bacterial, viral or fungal diseases.

The beginner cannot detect any brood disease unless he knows what a healthy brood comb looks like. It is usually clean; it may be black, brown or white. Good, healthy queens lay their eggs in clean cells. The laying pattern must be watched. It usually takes the form of concentric circles. First, the eggs are laid at the centre of the comb and then outward in rings to the comb edges. The capping of the pupae follows the same pattern from the centre to the edges. The regularity of the brood in the cells should also be noted. Good brood comb cells are usually compactly filled by the fifth and sixth days before sealing takes place. An irregular brood comb may signal brood disease. Care must be taken, however, because an irregularity may also be the result of brood emerging.

Watch a healthy larva carefully. It coils like a "comma" in the cell and is fleshy, glistening, juicy white in appearance. It does not move from place to place in the cell. It does not look brown, black or assume any

other colour except white. The larva should not be misshapen or found dead. Pupae must remain capped; the seal should not be punctured or sunken.

Any of these irregularities suggests that something has gone wrong, and this may be caused by a disease. Some diseases are serious and can wipe out an entire colony; they can gradually spread into other colonies and destroy a whole apiary. Some are seasonal and mild and cause only a small loss of the total population.

The brood diseases the beekeeper must watch for are American foul brood (AFB), European foul brood (EFB), stone brood, chalk brood, and sac brood.

American foul brood is the most serious of all brood diseases, followed by European foul brood. They are so called not because they are peculiar to each of these continents but because the two diseases were studied separately by American and European researchers at the same time.

American foul brood was present in Algeria, Morocco and Tunisia in 1982, and its presence was suspected in several other African countries. In the same year, European foul brood had been reported from at least ten African countries, north and south of the Sahara, and this suggests that it is common throughout the continent. Sac brood was found in Egypt and in southern Africa in 1982, but chalk brood was reported only from Tunisia.

***American foul brood (APB)***

AFB causes heavy losses to the colony's population. It can wipe out not only a single colony but all the colonies in an apiary, and it can easily spread quickly from one apiary to another. It is not seasonal and may occur at any time.

The disease is caused by Bacillus larvae. The bacteria form strong resistant spores. The organisms attack the larva, which dies after it has been capped (i.e. pre-pupa). The dead insect becomes brown and finally dries up into a hard scale which is difficult to remove from the cell.

The normally convex cell cap becomes moist, dark and sunken, and later perforated. The perforation of the capped cells is the result of the attempt by the workers to uncap it to remove the decomposing remains. The brood combs of an affected colony become patchy in appearance, owing to the presence of the dead larvae. The decomposed brood has an unpleasant smell. When a match-stick is thrust into the cell of the decomposed pupa, it draws out a ropy thread several centimetres in length.

If he finds AFB in his apiary, the beekeeper should contact the local bee station, the Ministry of Agriculture or any office responsible for apiculture in the locality. Where such contact is not possible, he should burn the beehive and all its contents, including bees, combs, top-bars and frames, and bury the ashes deep in the soil. Drugs such as sulfathiazole and oxytetracycline (terramycin) can be used both as preventives and as remedies if available.

***European foul brood (EPB)***

The bacterium Melissococcus pluton (formerly referred to as Streptococcus pluton) is believed to be the primary causative agent, but the larva's death is also accelerated by the presence of Bacterium eurydice and others. The young larva is infected by taking in food containing the bacteria, which multiply in its gut; the larva dies on the fourth day, and the worker bees may leave the cell containing the dead larva uncapped. Sometimes the infected larva does not die until it is sealed, and this may result in sunken and perforated cappings.

Symptoms: A healthy bee larva remains coiled in the cell, but not a larva infected by EFB. Shortly before death, the infected larva moves about inside its cell. As a result, the dead larva is found in an unnatural coiled position across the mouth of its cell, sometimes twisted spirally around the walls or stretched lengthwise from the base to the mouth. The dead larva is porridge-like in appearance, as if it has been

decomposed. Its plump, fleshy appearance is completely loaf. It turns yellowish-brown and eventually dries up into brown scales. Sometimes sick larvae sealed in the cells can be seen lying in sunken capped cells. The regular laying pattern of the queen is lost, and different age groups are scattered throughout the comb. The smell of the decomposed larvae varies according to the species of secondary bacteria which invade the dead larvae.

Treatment: Larvae reared in unfavourable conditions are more susceptible to EFB than those reared in favourable conditions. The disease may be seasonal and usually occurs during and immediately after the seasonal rainfall, gradually diminishing until the population of the colony rises again in October. The honey yield of the affected colony will drop. Such drugs as streptomycin, penicillin and terramycin control the disease. Immediately after the disappearance of the disease, the queen should be removed and the colony requeened.

***Stone brood***

Stone-brood disease is caused by a mould belonging to the genus Aspergillus. It attacks the brood and transforms the larva into a hard, stone-like coloured object which is found lying in open cells. Adult bees may also be attacked and are also killed in the process. The disease has not yet been reported in Africa, but beekeepers must keep alert.

***Chalk brood***

The name "chalk brood" derives from the chalky appearance of the dead brood. This fungal disease, caused by Ascophaera apis, may cause serious problems to bee colonies in humid areas. Spores of the fungus are ingested in the brood food. The spores germinate in the gut, and the growth of the fungus causes the death of the brood, which occurs in the pre-pupal stage.

***Sac brood***

This is a virus disease. Larvae infected with sac brood die in their sealed cells. They become light yellow in colour, with tough skins. The skin darkens and the outer layer becomes loose, forming a "sac" which encloses a watery fluid. The brood lies stretched out lengthwise in the sealed cell. After the death of the insect, the cell is partly or fully opened, and the worker bees remove it from the hive.

The virus is spread in the nest by the house bees evacuating the dead brood. The virus does not survive long, and the disease may disappear during the honey-flow period. Serious outbreaks are not common, and usually no control action is necessary. If control is needed, then the colony must be requeened.

***Other brood abnormalities***

Two other brood disorders, which are not diseases, are chilled brood and bald brood.

Chilled brood, sometimes called overheated or starved brood, is caused either by cold or by overheating. When the colony's population declines, fewer house bees are available to protect the brood combs. Some brood is exposed to cold air, and this reduction of heat in the hive can kill larvae, eggs and capped pupae. Overheating can have a similar negative effect. When the interior of the hive is overheated, house bees will go outside and leave the brood unfanned.

Chilled brood may also be the result of pesticide poisoning. The bees decrease in population so that there are insufficient bees to cover the brood combs.

The obvious way to combat chilled brood is to strengthen the affected colony.

Bald brood is a secondary effect of the infestation of the hive by the wax moth (see pp. 105-107). It will be remembered that as the wax-moth larva tunnels through the comb, it produces a web-like material to form a

cocoon. The tunnelling can have two results on the bee brood. If the sealed brood is uncovered, the pupae will die of the untimely exposure. But if the brood becomes entangled in the web, it will be unable to emerge, and it too will die in the cell or, if it does manage to emerge, it will be dried out to some extent, with shrivelled wings or malformed legs which will make it unable to survive.

***Genetic faults***

Occasionally, a queen's eggs may fail to hatch, the young larvae may be eaten by nurse bees, or the pupae will die or fail to emerge. This may be caused by inbreeding, and the only way to overcome the problem is to requeen the colony by inserting a capped queen cell, but not an emerged queen.

**(2) Adult bee diseases**

***Nosema***

Nosema disease, among the most serious of the bee diseases, is caused by a microscopic organism, a protozoan called Nosema apis, which is believed to exist in all parts of Africa. The parasite passes its active reproductive life cycle within the digestive cell lining in the mid-gut of the adult bee. After entering a cell, the parasite multiplies quickly, competing with its host bee for its food supply until reproduction stops after a few days, with the formation of a large number of spores. The cell then ruptures and the spores enter the bee's digestive system, finally passing out in the bee's droppings. The parasite, which is in its resting stage, is then picked up again by another bee and swallowed. The spores germinate on passing from the honey sac of the bee into the mid-gut. The parasites then emerge from the spores, pass through the lining of the mid-gut and start another phase of intracellular growth and multiplication. The spores may remain viable for several months, as long as they remain in the brood combs in the hive.

The affected bee cannot utilize her protein reserves, and consequently very little royal Jelly or brood food can be produced. Therefore, only a small percentage of the potential brood can be reared. The disease causes the young bee to grow prematurely and to forage earlier than usual. Her life span is greatly reduced. The quantity of water in her body increases; she becomes lethargic and may begin to soil the hive. She later becomes a crawler and subsequently collapses.

The ovaries of the affected queen bee soon degenerate. Her egg production decreases, and finally stops completely. Her life span is also reduced, and the result may be a queenless colony or one in which the old queen is replaced by supersedure.

Since a microscope is needed to confirm the presence of the parasite, it is impossible for the average beekeeper to diagnose the disease. The only visible sign is that the colony becomes weaker and weaker as the bees fail to build up when conditions are favourable. Swollen abdomens should also be watched for.

Treatment: Nosema is best treated by giving the colony a new set of combs and requeening the hive. The affected colony can also be given fumigillin (Fumidil-B): 100 mg active ingredients in four litres of a 1:1 sugar solution. If the medication given cannot be obtained, the only option left is to burn the colony to avoid spreading the disease to other hives or even to other apiaries.

***Acarine "disease"***

This so-called "disease" is caused by a microscopic mite, Acarapis woodii. The mite enters the bee's breathing apparatus (the tracheal system), multiplies there and interferes with the bee's respiration. It also derives nourishment from the host's blood. The bee's flying ability is greatly hampered; it begins to crawl, and finally dies. The disease may not kill a whole colony in one year; the trouble can remain in a colony for several years, causing little damage, but combined with other diseases and/or poor bee seasons due to poor environmental conditions, it can so weaken the colony that it dies.

Since acarine disease can be transferred from one bee to another, it can be transported into another colony by robber or drifting bees. The mite is present in practically every beekeeping country in the world.

**(3) Measures against spreading bee diseases**

The beekeeper and the honeybee are the two main agents that spread diseases among bees and between colonies and apiaries. Dead larvae, spores and dried scales transported for removal by the worker are sometimes dragged along the combs before they are disposed overboard. The beekeeper removes combs from a weaker colony and exchanges them with combs from a stronger colony. Sick and weak colonies are united. This transfer of bees and combs sometimes takes place from one apiary to another, thereby spreading diseases.

Further, honey contaminated with spores and parasites may be fed to a healthy colony, or the beekeeper may drop such contaminated honey-combs and bee products where they will be robbed by bees. Drones and workers straying into other colonies are also guilty of spreading diseases. The beekeeper must watch these thieves carefully and act in the interest of his own business. The following points are worth noting when there is an outbreak of disease:

1. The apiary must be kept clean. Honeycombs, wax, propolis and other hive products must not be thrown away near the apiary.
2. The beekeeper must not transfer infected combs from hive to hive or from apiary to apiary. Combs must be exchanged with great care.
3. Old hive parts, as well as used apiary equipment bought or acquired from doubtful sources, must be disinfected.
4. Unknown swarms should never be accepted when there is an outbreak of a bee disease. The beekeeper should set up a quarantine apiary four kilometres away from the nearest apiary, and make sure the swarm is disease-free before transporting it to the apiary.
5. Bees should never be fed with honey from a doubtful source.
6. If a colony dies of unknown causes, the hive should be closed pending an examination of a sample comb. The remaining stores in the hive should be protected from robber bees.
7. Robbing must be prevented. Place syrup or food for a colony inside the hive or in a properly designed feeder to prevent robbing.
8. Brood combs should be regularly inspected for signs of disease.
9. Hives should be spaced reasonably far apart. The beekeeper should try to arrange his hives so that it will be easy for every bee in the apiary to find its way into its own colony. This will help minimize drifting.

Please also take note of related technologies and practices in TECA:

1. Beekeeping in Africa: Traditional and modern beehives and beekeeping equipment
2. Beekeeping in Africa: Site selection for bee hives
3. Beekeeping in Africa: Installation of bee hives ((with particular focus on the top bar hive)
4. Beekeeping in Africa: Colonization of a bee hive
5. Beekeeping in Africa: Colony management I ? examining the colony and controlling swarming

6. Beekeeping in Africa: Colony management II ? dividing, uniting and feeding a colony
7. Beekeeping in Africa: Colony management III ? record-keeping, brood-nest control and preventing robbery
8. Beekeeping in Africa: Honey harvesting
9. Beekeeping in Africa: Honey and bee wax extraction
10. Beekeeping in Africa: Using bees for pollination
11. Beekeeping in Africa: Choosing and rearing a queen

**FURTHER READING:**

For the an online version of the publication Beekeeping in Africa, click here
http://teca.fao.org/resource/beekeeping-africa [4]

**SOURCE:**

**Food and Agriculture Organization of the United Nations (FAO) [5]**

**Country:**
Italy

---



**Links:**
[1] http://teca.fao.org/keywords/beekeeping
[2] http://teca.fao.org/keywords/disease-control-methods
[3] http://teca.fao.org/technology-categories/livestock-production
[4] http://teca.fao.org/resource/beekeeping-africa
[5] http://teca.fao.org/partner/food-and-agriculture-organization-united-nations-fao-0