



REPUBLIC OF KENYA



PREVENTION AND MANAGEMENT OF HONEY BEE DISEASES AND CONDITIONS



Bee infections

Bees are infected by bacteria, fungi, protozoa, parasites and viruses which cause various diseases. With increased beekeeping activities, disease challenges may increase in Kenya. This is associated with increased domestication of bees, reduced swarming and increased bee populations, among others.

Bee viruses (Kashmir Bee Virus (KBV), Israeli Acute Paralysis Virus (IAPV), Chronic Paralysis Virus (CPV), Acute Bee Paralysis Virus (ABPV), Deformed Wing Virus (DWV), Varroa destructor-I Virus (VDV-I), Sac brood virus (SBV) and Black Queen Cell Virus (BQCV) may affect bee brood as well as adult bees. Some viruses are transmitted by Varroa mites such as DWV, acute bee paralysis virus complex, and slow bee paralysis virus.

Viral infection may not present any symptoms. However, signs of infections include, weak colony, increased numbers of dead and dying bees and/or brood, trembling and uncoordinated, hairless, shiny, greasy-looking adult bees, small newly emerged bees with opaque appearance, small-bodied adults with shriveled, malformed wings, several signs can indicate Varroa Mite Syndrome (VMS), including too few adult bees to cover brood, spotty brood pattern, dying larvae off colour and “snot-like” in appearance, sickly appearing adults, high Varroa mite infestation, mite frass in the cells of emerged bees, and/or immature mites visible in cells.

Economic importance

Diseases weaken bee colonies, reducing their capacity to perform optimally and the bees more vulnerable to biotic and abiotic stresses. Farmers in Kenya have reported few challenges with bee diseases.

Predisposing factors to infections

Various factors make bees vulnerable to disease infections. Examples are:

1. Robbing bees: Bees that move to other colonies to rob them of nectar or pollen. These bees can bring into the hive an infected pathogen.
2. Lost bees: Sometimes bees find their way into hives that they do not belong to. If they are infected, they will spread the disease.

3. Weak colonies: These colonies become vulnerable to infections, are unable to clean hives or remove diseased bees and bee brood, hence contributing to increased the infections.

The following are important bee infections

1. Black Queen Cell Virus (BQCV)

This is a devastating disease primarily affecting queen pupae and larvae. Dead queen bee larvae turn yellow and the skin of the pupae becomes sac-like. At later stages of infection, the dead queen bee may change to brown-black. The BQCV is usually associated with Nosema disease which infects the adult bee gut.

The infection can potentially be confused with Sacbrood virus as the pupae show the same symptoms of yellow colouration, the skin becoming plastic-like and the dead pupa becoming a fluid filled sac. However, as its name suggests, BQCV usually affects queen bee pupae, while Sacbrood virus mainly affects developing worker bee larvae.



Black queen cell virus (Source: IZSLT/Giovanni Formato)



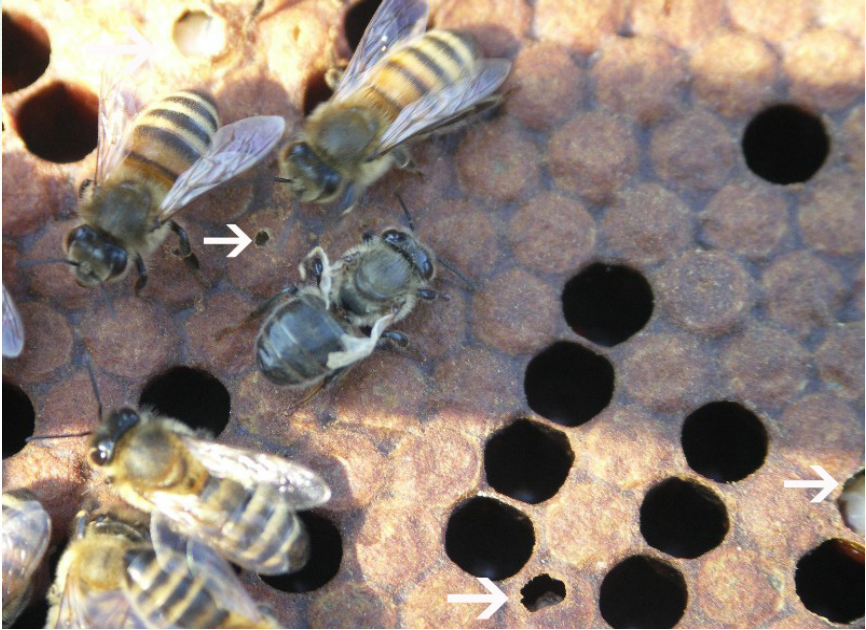
Healthy queen brood (left) and queen brood (right) infected by the BQCV (Source: Rob Snyder, www.beeinformed.org)

2. Israeli Acute Paralysis Virus (IAPV)

The Israeli Acute Paralysis Virus (IAPV) is a new virus largely associated with colony collapse disorder. The infected bees show ‘shivering’ wings, darkened hairless abdomens and thoraxes, which progresses into paralysis and death. Bees often die outside the hive.

3. Acute Bee Paralysis Virus (ABPV)

Acute Bee Paralysis Virus (ABPV) virulence is directly associated with Varroa infestation. It is transmitted in larval jelly from asymptomatic infected adult bees to developing larva. Further, it can be transmitted through Varroa mites to larvae and pupae. The virus causes infections with no obvious symptoms when transmitted orally from adult to the brood. The infected pupae die before emerging, which makes the appearance of paralysis symptoms less obvious.



Arrow showing punctured cell capping happens when adult worker bees detect a brood disease. (Source: The Food and Environment Research Agency (FERA))

Prevention and control of the viral diseases (BQCV, ABVP and IAPV)

- Maintain healthy and strong colonies, which are capable of defending themselves and removing dead broods and adults.
- Conduct frequent inspections to ensure early detection and removal of any infestations that may be found.
- Maintain good sanitation.
- Requeening colonies to strengthen their genetic diversity and productivity.
- Destruction of heavily infected colonies and sterilization of the hives before re-use.
- Avoiding transfer of brood combs across hives in the same apiary or different apiary unless you are sure they have no disease.

4. Sac brood

Sac brood is caused by a virus which mainly occurs early in the brood-rearing season when the ratio of brood to bees is high. Both worker and drone larvae are affected. Pupae may be killed occasionally, but adults are asymptomatic. Affected larvae disintegrate into a brown watery sack that is held together by the leathery larval outer skin. Head (outer) end of decaying larvae are darker in colour. Decaying larvae are easily removed with distinctly sac-like appearance. Dead brood is often scattered among healthy brood. Nurse bees may spread the disease by carrying the virus from cell to cell. Robber bees may spread the disease by taking contaminated honey from one colony to another.

Larvae are the only honey bee stage that shows obvious symptoms from sacbrood virus infection. The virus is passed to larvae by infected adult nurse bees during feeding. Infected larvae may die shortly after capping, before they pupate. The larvae change from white to yellow, and then brown. Larvae usually die in the cells with their heads facing up—the head and mouthparts usually turn black. The skin of the larvae hardens but the inside of the larvae becomes watery fluid-filled sac that can often be removed from the cell intact. The larvae may eventually dry out and form a loose scale that is easily removed from the cell. Adult bees may have shortened lifespans if they become infected with sacbrood virus.

Control

Maintain strong, healthy colonies with high-performing queens. When colonies are placed under stress by food scarcity, poor-performing queens, cold conditions or if they are affected by other diseases, then sacbrood can become a problem. Regular hive inspections will help to identify if sacbrood levels have become a problem. If many larvae are affected then steps should be taken to increase hive strength, such as supplementary feeding or re-queening. Remove severely affected brood combs. Avoid bee robbing and drifting to control disease spread.



Larvae infected with sac brood virus (Source: Fera Science Limited, Crown Copyright and M. E. Wilson, eXtension.org)



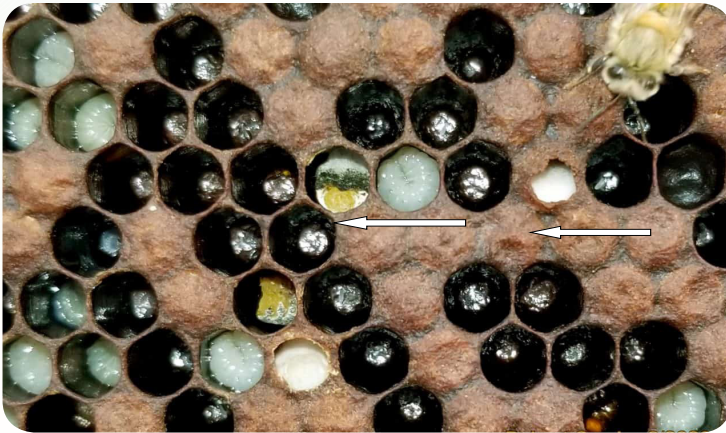
Bee brood infected by sacbrood virus (Source: ©www.beeinformed.org/ Rob Snyder)

5. Chalkbrood

This is a fungal brood disease caused by a spore-forming fungus, *Ascospaera apis*. The disease affects unsealed and sealed brood. It can be triggered by a change in brood-nest temperature. Stress of any kind can result in chalk brood: high or low temperatures, wet or dry conditions, an increase in carbon dioxide, poor nutrition, a failing queen, poor hive management and movement of hives.



Dark and white chalkbrood mummies. The black mummies contain millions of new infective spores. (Source: A B Jensen)



Chalk brood mummy that has started to sporulate shown by the white arrow (Source: Robert Snyder)

Control of chalk brood disease

- Beekeepers should replace diseased comb with new combs (with new foundation) because the diseased comb can act as a reservoir for Chalkbrood disease spores.
- Clean away mummified larvae from the bottom boards and around the entrance of the hive.

- Keep colonies tilted slightly forward so that rain water does not collect inside as well as ensuring that the colonies receive adequate sunlight may reduce the excess moisture in the colony.
- Colonies should not be sited in low, damp, cool areas. Colonies can be ventilated by placing a small block of wood underneath the edge of the outer cover to encourage air flow.
- Improving the nutritional health status of the colony through supplemental feeding can help the colony fend off infection.

Pesticide poisoning

This occurs through the use of pesticides in habitats where bees forage, e.g., in the crop farming, or acaricide effects on foraging livestock. Pesticides have lethal and/ or sub-lethal effects. Lethal effects affect foraging bees more and usually kill the bees in the field. Sub-lethal effects can go unnoticed and will have longer effects on the colony. In both cases, colonies become weakened and vulnerable to other stressors.



Bee poisoning showing all the dead bees at the front of the hive (Source: Bryn Jones, Crop Pollination Association)

Colony collapse disorder

This occurs when there is a rapid loss of adult worker bees in the affected colonies, resulting in weak colonies, which may end up dying. During scouting, there may be relatively more brood cells compared with adult

worker bees. The loss of worker bees is not justified e.g., there are no noticeable dead worker bees in hives or the surrounding environment. There is also no noticeable stressor responsible for the adult bee loss e.g., the presence of pests and diseases.

Prevention and management of bee health conditions

Various methods are used to reduce the stressors and their effects on the bees. These include:

Apiary sanitation: Ensure the cleanliness of the apiary; avoid disposal of hive materials such as propolis, combs and honey on the ground which bees collect and take to their hives.

Hive inspection: This will help identify the condition and the beekeeper can take appropriate actions. At least twice monthly will be a good interval for the inspections.

Lobbying for justifiable use of pesticides: Farming communities in beekeeping areas should be made aware of the negative effects of pesticides on bees. The community should also be guided on appropriate pesticides to use and the timing of use.

Cleaning of affected hives: Hives hosting bees that experience a certain condition should be cleaned and sanitized to avoid further colony effects.

Keeping strong colonies: Strong colonies are able to manage and withstand various stressors. If a colony is weak, it is advisable to re-queen or destroy it. The colony can also be given chance to regain strength, as long as the beekeeper keeps close eye on it to confirm it is not the disease.

Reporting Infections

Beekeepers who suspect infections of their colonies should report immediately to the address below. Take representative images where possible and include the images in reporting the infections.

Compiled by: Kasina, M.J, Kimitei, R.K, Toroitich, D., Mulwa, J.M., Onyango, I.A., Guantai, M.M., Ndung'u, N.N., Kinyanjui, J.M. and Kimani, C.W.

Editors: Nyabundi, K.W., Mukundi, K.T., Omondi, S.P., Maina, P., Wanyama, H.N., Mugata, R.K., Mungube, E., Nyambati, E., Changwony, K., Ilatsia, E. and Kasina, M.J.

For further information, contact:

Institute Director
Apiculture and Beneficial Insects Research Institute
P.O. Box 32-30403 MARIGAT
Director. ABIRI@kalro.org

Design and layout by Emma. Nyaola

KALRO/NAVCDP/Apiculture/ Pamphlet No.015/2024