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Non-infectious disorders of honey bees

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Introduction

All brood and adult stages of queens, workers and drones may exhibit symptoms similar to those caused by disease pathogens or pests but which are due to other causes. Non-infectious and non-pest-related disorders can result from neglect, overheating, chilling, poisoning from plants or pesticides, or from queen failure.

Neglected brood

Under normal conditions nurse bees feed sufficient food to the larvae and maintain the temperature and humidity in the area of the brood nest suitable for brood survival and growth. When this system fails, for example when there is a sudden loss of adult bees, there are fewer adult bees to feed the larvae and maintain temperature and humidity control. These situations often result in larvae and pupae becoming neglected and dying from chilling, starvation or overheating.

Chilled brood

Chilled brood is often observed in early spring once the queen has commenced expanding the brood area to a size where the number of adult bees present is not able to cover it adequately. Unexpectedly cold 'false spring' weather results in the adult bees contracting to cover and warm the central core of brood, leaving the outer edges of the brood unprotected and becoming chilled.

The management practice of spreading brood frames and introducing empty frames into the brood area in early spring in order to stimulate brood nest expansion may contribute to the outer frames of brood becoming chilled if the temperature cools, because there may be insufficient bees to cover the outer brood combs.

Chilled brood may result following brood inspections in cold weather when frames are left exposed outside the hive for extended periods of time during inspection.

Chilled larvae and pupae are yellow, tinged with black on their margins, or they are dull white with black or brown patches. The remains are pasty or watery. In extreme cases where sealed brood has been affected, brood cells may be punctured or uncapped. Usually, affected brood is at the outer edges of the nest area, with healthy brood remaining in the centre.

Treatment: Remove excess supers and feed sugar syrup if required.

Starved brood

Under dearth conditions for nectar and pollen, larvae and pupae are often removed or eaten by adult worker bees. There is little or no brood, honey or pollen present. Dead adult bees may be present inside the hive, often facing headfirst into cells. Freshly dead adult bodies break apart easily.

When a sudden shortage of adult bees occurs and there are insufficient adult bees to feed the brood, then the brood is starved. Larval stages crawl out of their cells or move to abnormal positions in their cells—little or no brood food is present in the cells with the larvae. Larvae lose their fat layer and become dull grey. Individual body segments are easily seen, and internal cotton-like threads of the trachea become visible. In some situations, newly emerging adult bees may become starved and die when partially out of the cell; often their tongues will be extended.

Treatment: Feed sugar syrup and protein supplement as required. Add frames containing mature brood, young bees, and disease-free honey and pollen.

Overheating

Overheating of brood occurs when there is loss of control of the temperature and humidity within

the brood nest area. This occurs when there is a sudden loss of adult bees, for example due to a loss of nectar-foraging and water-foraging bees from pesticide poisoning. Overheating also occurs when adult bees and brood have been confined to their hives during hot weather or during transport without suitable ventilation or access to water.

Larvae are found hanging out of the top of their cells. Larvae dying from overheating are brown to black in colour with a watery consistency. Pupae have a black, greasy appearance. Newly emerged adult bees may be wingless. Cappings on brood cells may appear melted.

Adult bees become sticky or greasy, dark coloured, and run about noisily fanning their wings. Dead adults may be found on the hive floor and between the frames.

Treatment: Provide shade and ventilation. Ensure colonies have access to water—badly affected colonies may require feeding internally with water or a dilute sugar**:**water syrup. Remove excess supers and dead adult bees. Add frames of mature brood and young bees.

Plant poisoning

Some plants produce nectar and pollen which are attractive to bees but which are toxic to the adult and brood stages. An example is Darling Pea *Swainsonia galegifolia*. When this plant predominates, heavy mortality may occur to bee brood; in some cases it may cause the loss of many colonies. Symptoms of affected larvae are similar to, and may be confused with, the virus infection called ‘sacbrood disease’.

Treatment: Move hives from the area. Feed sugar syrup if required.

Pesticide poisoning

Poisoning of bees generally occurs after a pesticide has been applied to a crop or weeds that contain flowers or secretions attractive to bees.

- The pesticide may be applied directly onto bees foraging on the crop.
- Bees may fly to the treated plants and collect contaminated nectar and/or pollen.
- Bees may collect water near treated crops, or forage on a cover crop associated with a treated crop, for example clover in an orchard.
- Pollen-collecting bees may collect the pesticide or contaminated pollen and return them to the hive.
- At times, pesticides drift from their point of application onto nearby flowering plants, or across apiaries.

Depending on the type of pesticide, foraging bees may die on the return flight to their hive, resulting in a severe reduction in the field population. When bees are able to return to their hives with contaminated nectar before dying, or bring back contaminated pollen, the common feature is large numbers of adult bees dead on the ground in front of the hives.

The following field symptoms are a guide for determining pesticide poisoning:

- Most or all of the hives in the apiary are affected.
- Adult bees die within a few days of each other. Usually, deaths do not occur over a long period of time although this can occur with certain pesticides.
- Dead adults typically, but not always, have their wings unhooked, tongues fully extended, and their hind pair of legs outstretched behind them.
- In severe cases, dead adults will be present inside the hive between the frames and on the hive floor.

Laboratory analysis is required to *confirm* pesticide poisoning.

Affected adult bees may move slowly or behave abnormally. Brood may be dead from neglect or from being fed contaminated nectar or pollen, and queen failure or supersedure may occur within 30 days.

Some pesticides, for example systemic pesticides, have a less noticeable but debilitating effect, resulting in an overall weakening of the colony. Bee population numbers reduce, and stages of the brood cycle, or complete brood cycles, are missing.

Treatment—management of affected apiaries: Move hives away from the sprayed area, remove excess supers, and feed colonies inside the hive with a dilute sugar**:**water syrup, since a loss of field bees results in a lack of fresh nectar, water and pollen being brought into the hive. Be prepared to manage the hives for queen failure or supersedure problems. Do not requeen until you consider the chemical is no longer active in the hive. Frames inside the hive that have been contaminated from pesticide drift or contain contaminated nectar and/or pollen will need to be replaced. In extreme cases hive materials, brood boxes etc. will need to be replaced or cleaned thoroughly before reuse.

Queen bee problems

Queen present

Eggs laid by a queen are identified by one egg per cell laid in the middle of the bottom of the cell. The queen is present but may be physically

damaged, for example during hive inspection or transport, or the queen has failed—it has a reduced capacity to lay sufficient numbers of fertilised eggs as a result of a disease infection or because of its age or from poor mating.

- The brood area reduces in size and has a scattered appearance, with brood of mixed ages in the same area.
- Excess pollen may be present in the brood area.
- Bee population numbers decrease and large numbers of drones may be reared in worker cells.
- Drone brood in drone and worker cells may not be fed sufficiently and may die, displaying symptoms similar to European foulbrood disease infection.
- A small number of supersedure queen cells may be present, usually positioned on the upper third of combs in the brood nest area.

The supersedure cells may hatch, resulting in one or more virgin queens present in the hive with the original queen. Generally, one supersedure queen will survive, mate successfully, and replace the original queen. The colony will then build up in strength.

Treatment: Find and remove the original queen, queen cells and any emerged virgin queens. Requeen the colony with a mated queen or queen cell, or unite the colony over a strong colony using a sheet of newspaper between the two joined colonies to prevent fighting between adult bees and to assist the uniting process.

Queen absent

If the queen is not present, having been either accidentally killed or lost during a hive inspection or during transport, or superseded, with the young supersedure queen failing to return from the mating flight, then the hive is termed 'queenless'. In a queenless hive:

- there may be present older stages of brood but not young stages;
- pollen stores build up in the brood nest area;
- the hive bees emit a loud buzzing sound when the hive is opened.

Brood, particularly drone brood, may be neglected and die, and have the appearance of European foulbrood disease. After a few weeks a small number of laying worker bees will be present. Laying workers are worker bees whose ovaries have developed slightly and are able to lay small numbers of unfertilised eggs in worker cells in the brood area. Signs of laying workers are:

- many eggs per cell;
- eggs laid around the side walls of the cell and not squarely in the bottom of the cell—these eggs develop into small, fully functional drones.

Treatment: A colony containing laying workers should be united above a strong, healthy colony using the 'newspaper' method. It is difficult to requeen a colony which contains laying workers, as the new queen is often rejected.

Further reading

This Primefact should be read in conjunction with the following publications:

- *European foulbrood and its control* (Agnote DAI-124)
- *Honey bee nutrition and supplementary feeding* (Agnote DAI-178)
- *Samples for bee disease diagnosis* (Agnote DAI-209)
- *Spring management of bees* (Agnote DAI-122)
- *Wintering bees* (Agnote DAI-121)

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