Bee Diseases

Varroa

(This is a currently notifiable disease)

(To be removed from notification list in due course) The varroa mite, *Varroa destructor*, is an external parasite of the honeybee *Apis mellifera* and feeds on the bees haemolymph (blood). Its natural host is the Asian honeybee Apis cerana which has evolved with the mite to develop a natural resistance. It has spread to the European honeybee by beekeepers taking colonies to the Far East to improve honey production. There was a natural transfer of the mite and beekeepers then moved the infested colonies around the world eventually reaching the UK in 1992 where it is now widespread and its management routine practice.

Recognition:

Varroa destructor is a member of the Arachnidae - a group containing spiders and other mites. The adult female mite is a reddish brown colour, oval in shape and measures about 1.1mm X 1.6mm and has 8 legs. On close inspection it is possible to see the mites in drone cells, on drone larvae and on adult bees with the naked eye.

Life Cycle

Adult female Varroa mites enter a brood cell just before it is capped. Drone cells are preferred and the drone brood produces a kairomone (smell) which is more attractive to the mite than that produced by the worker brood.

The mite squeezes past the larva and becomes immobile, immersed in the larval food at the bottom of the cell. Only the breathing tubes (peritremes) are exposed. Once the cell has been sealed and the brood food consumed by the larva, the mite is released and then pierces the exoskeleton of the larva to feed on its haemolymph.

Egg laying begins about 60 hours after the cell has been sealed. The first egg to be laid is haploid (7 chromosomes) and develops into a male. Subsequent eggs laid at about 24 hour intervals are diploid (14 chromosomes) and develop into females. The actual timing may vary due to external effects. A 6 legged larva develops in the egg and hatches into an 8 legged protonymph. This then moults into a deutonymph and finally to the adult form. Average numbers of female mites developing are as follows

- Worker cell 2.2
- Drone cell 4.2

Recent work at the Central Science Laboratory (CSL) indicates an average of 1.45 viable female mites from a worker cell. The male mite does not eat and its sole purpose is to mate with its sisters and it then dies and remains in the cell. The mated females live on the young host bee until they enter cells to reproduce. In the summer mites live about 2-3 months but much longer in the winter. When they are on the adult bee they are described as phoretic. In summer mites can manage 2 reproductive cycles producing ~ 8 daughters if using drone brood.

Vectors

- Robbing - When a colony is severely affected it becomes a target for robbers. Not only do they take any stores but also pick up large numbers of mites.
- Drifting - Poor apiary design will allow young bees to drift into neighbouring colonies. This is particularly important with drones are they are accepted into any colony.
- Migration - Bees from collapsing colonies abscond from their own hive with the robbers and increase the mite load in the robbers hive.
- Swarming - A swarm from an infested colony will always carry mites with it. It is essential to test any swarm for the mite and treat it before introducing it to the apiary.
- Feral Swarms - Swarms from feral colonies are no more likely to be free than those from managed colonies but can spread the mite naturally by 3-5km per year.
- Beekeepers - Careless manipulative management by the beekeeper can transfer affected bees to other colonies in the apiary and to other apiaries. Migratory beekeeping can cause a rapid spread throughout a country.

Effects on Apis mellifera colonies

Apis mellifera has no natural defences against the Varroa mite which feed on larvae and adult bees weakening them and spreading other harmful pathogens throughout the colonies. Left untreated, colonies of bees will eventually die.

It is unlikely that any signs will be noticed until the colony has been affected for about 3 years. It is very difficult to see the mite on the adult bee as it lives in the intersegmental region of the lower abdomen. As it breeds in the sealed cell it cannot be seen unless the cell is opened and the contents examined. As the infestation progresses small malformed bees begin to appear and brood patterns are affected.

Signs of colony collapse:

- A sudden decrease in adult bees
- Bees with deformed wings and abdomens
- Numerous mites on the remaining bees and in brood cells
- Abnormalities of brood Bald brood
- Poor brood pattern
- Neglected and dead brood
- Discoloured and partly removed brood

Please note: These symptoms are also seen in foul brood and should be checked by a bee inspector.

How to Manage Varroa

Apis mellifera has no natural defences against the varroa mite which feed on larvae and adult bees weakening them and spreading other harmful pathogens throughout the colonies. Left untreated, colonies of bees will eventually die.

Please obtain an up to date copy of the CSL 'Managing Varroa' booklet by visiting the DEFRA website or downloading direct from the EMBA website.

Detection

Examination of the floorboard / hive debris - This method is not very reliable particularly when infestation is light. The small number of mites which drop are easily missed.

Uncapping Brood - This is done on the drone brood during a normal colony inspection. Note that if the mites are very young they will not be as dark as the adults and easily missed. A frame of drone foundation can be used in the brood chamber to make examination easier and can also be used as a method of control

Bayvarol/Apistan Mite Drop Test - With a sticky paper insert on the floor one strip of Bayvarol/Apistan is placed in the brood chamber and left for 24 - 48 hours. The strip can then be used on other colonies being aware that it could spread other diseases. Examine the insert carefully for the presence of the mites. This is an ideal method for testing swarms and if positive can be used as a treatment.

Monitoring

Once the mites have been detected the use of an open mesh Varroa floor can be used to determine natural mite drop. Regular examination of drone brood can also be used. Monitor more than 1 colony in the apiary to make sure you have a representative result. The benefits of monitoring are to show if your control methods are working.

Controls - Biotechnical

Open Mesh Floors –

Mites cannot survive long without contact with their hosts. Mites falling or rubbed off bees and comb fall through the mesh floors and out of the hive. Use of an Open Mesh Floor serves to stop these fallen mites re-entering the hive and reduces the overall mite population while also reducing debris on the hive floor, improving hive ventilation, and discouraging other pests such as wax moth.

Note: While Open Mesh Floors are an integral part of Varroa management and can be used with a tray to measure mite drop, they are not sufficient on their own and must be used with other methods of mite control.

Comb Trapping –

The queen is caged for 9 days on three combs in succession. These are left in the hive for a further 9 days to allow the mites to enter. The combs with the mites trapped in the sealed brood are removed and destroyed. To reuse the combs place them in a deep freeze for a couple of days to kill the brood and mites. Then uncap and wash the contents out of the cells.

Drone Brood Removal –

Using sheets of drone foundation in the brood chamber or a super frame to allow drone comb to be drawn underneath it causing the queen to lay drone brood. This is more attractive to the mite and once capped can be removed and the contents disposed of. Like the method above there is a danger that if you are unable to remove the sealed comb and it hatches you will have increased the mite population rather than reduced it. Hard Chemical Controls Bayvarol (flumethrin) and Apistan (fluvalinate) are synthetic pyrethroids which act as a nerve poison. When used according to the manufacturers instructions they are more toxic to the mites than

the bees. Both chemicals act on the same metabolic pathway so that resistance to one will mean resistance to the other.

Note:It is very important to remove the strips exactly as per manufacturers instructions to reduce the risk of resistance developing.

Controls - Soft Chemical

The only licensed soft chemical is 'Apiguard' which contains thymol. Used as per manufacturers instructions can obtain a 90-95% efficiency. It would be particularly useful used alternatively with the hard chemicals. Acids are not yet 'approved' for treatment of varroosis.

Organic Acids –

Formic Acid, Oxalic Acid and Lactic Acid have shown efficiencies of up to 90% but are best used in broodless conditions as they can cause brood loss and even the loss of the queen.

Essential Oils Controls –

The effective chemical here is a terpene but is unreliable as a sole treatment and can be irritant.

Combination Therapy -

Many of the methods described above can be used in conjunction with one another. Particularly using a biotechnical and chemical combination.

Note: Great care must be taken if chemical treatments are combined as the combined effect may well be toxic.

Resistance - Resistance is when the mite will not respond to the treatment and is the beekeepers worst nightmare! To reduce the risk:

- Always follow the manufacturers guidelines
- Apply treatments only when needed
- Always use the full recommended dose
- Always remove varroacide strips at the end of prescribed treatment
- Do not re-use strips (except as a diagnostic aid)
- Alternate treatments using unrelated authorised products whenever possible

Note: If you use a product which is not licenced (or is used inappropriately) you could damage your bees and contaminate your honey and wax. Honey samples are regularly taken from beekeepers to test for residues and if found could lead to a hefty fine.

Integrated pest Management

This is a well tried, tested and recommended practice throughout agriculture and uses a variety of controls applied throughout the season. The benefits are:

- Control at several points makes it harder for the mites to reach harmful levels.
- Including a biotechnical method can slow mite reproduction and reduce the need for Varroacides.
- Using 2 or more unrelated varroacides will delay the development of resistance

- Control strategy can readily be adjusted to reflect changing infestation levels

The table below sets out some examples

Treatment	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Mesh Floor												
Brood Trapping												
Artificial Swarm												
Comb Trapping												
Apigaurd / Formic Acid												
Bavarol / Apistan												
Lactic / Oxalic Acid												

Good Apiary Housekeeping:

- Always maintain a high level of hygiene in all your beekeeping practices
- Carry out methodical health inspections on a regular basis, checking for brood disease particularly in spring and autumn.
- Never transfer combs between colonies without checking for brood diseases
- Systematically replace old brood combs in your hives melting down the old comb to maintain clean and healthy brood.
- Never bring colonies or equipment into your apiary without establishing their origin, condition, and disease status.
- Sterilise any secondhand equipment or hive components before introducing them into your apiary
- Discourage drifting and robbing in the apiary
- Suspect stray swarm health until you know otherwise
- Report any incidence of disease or suspicious conditions immediately to your local association