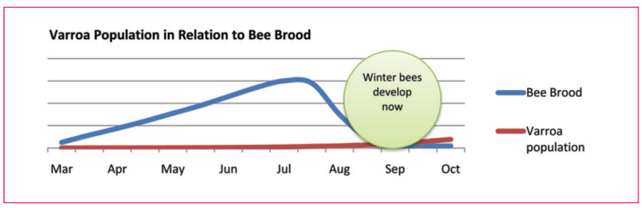
Varroa

All beekeepers must manage varroa in their stocks. If they fail to do this then colonies will collapse and die. Primary details of biology and control methods can be found in the Fera/NBU booklet *Managing Varroa*, which is available on-line at www.nationalbeeunit.com. This sheet highlights best practice and some important considerations in developing a management programme.

Know your enemy

Study and understand varroa. The basics are précised as follows:

- Varroa feeds on haemolymph by piercing the cuticle of honey bees and grubs with their mouth parts. This feeding activates and spreads various bee viruses and other disease problems.
- It is generally considered that varroa as a sole bee pest will probably not kill the colony for a number of years, though it does impact on honey bee social cohesion, their ability to function and it can debilitate bees by depriving them of nutrition. However, when varroa is acting in concert with viruses and other bee disease it becomes fatal quite rapidly. One colony can therefore live happily with thousands of mites while another will collapse with only a thousand.
- As a honey bee colony collapses the remaining bees that can fly, numbering many thousand, leave with phoretic varroa mites (i.e. those which are carried on adult bees) and enter nearby colonies. This creates large surges in mite populations in neighbouring colonies and is often referred to as re-infestation.
- Varroa mites can reproduce in either the worker or drone brood of the western honey bee *Apis mellifera*, but has a preference to enter drone brood in which, due to the longer development period, more varroa progeny emerge. In worker brood, on average, 1.3 of the progeny will mature to reproduce while in drone brood this becomes 2.6. Each mature mite is capable of up to three reproduction cycles. While significant brood is present mite populations will double every three to four weeks so this exponential growth means that honey bee colonies can collapse very rapidly if mite numbers are allowed to exceed the treatment threshold. Learn the early signs of colony damage as these can be used to trigger an unscheduled or emergency control.
- During spring and early summer mite and bee brood populations increase but bee brood peaks in July while mite populations will continue to double. After this peak more varroa mites are entering a reducing number of bee brood cells causing an increase in multiple mite entries and in viral and other bee disease levels. If this situation continues into September and October then the lifespan of individual overwintering honey bees will be significantly shortened. This will cause dwindling and possible collapse of the colony in late autumn or winter, even though varroa was controlled in late summer. The following graph illustrates these populations.



Use integrated pest management (IPM)

- IPM involves using different control methods at different times of the year to maintain varroa levels below the treatment threshold. With proper planning and monitoring, bio-technical or management methods will be the first controls used and chemical treatments will become the last resort.
- The use of these different methods enables more effective control. It also reduces chemical use and resultant residues in hives and bees.

Thresholds

- It is not possible to eradicate varroa and they will always be in honey bee colonies. Try to maintain varroa populations at below 1,000 mites, which is the UK recommendation to keep all colonies safe.
- Do not allow mite levels to exceed 2,500 as this will put a colony at significant risk of collapse, especially if viruses are also present.

Above: Worker bees, which won gold prize at Apimondia 2011 in Argentina. Inset left: Varroa, which won the 4th prize at Apimondia 2011. Both photos by prize-winner Simon Croson.

Monitor varroa infestation levels

- Learn to monitor infestation levels. As a minimum use open mesh floors and drone brood uncapping. These are described in the *Managing Varroa* booklet.
- There is no need to monitor all the time but rather at key points during the year.

In February or March assess the mite population going into the spring. This enables informed decisions about the need to control varroa.

- Very low infestations will require no action.
- Light infestations can be controlled by using open mesh floors and drone brood removal to slow the mite population growth.
- Heavier infestations can be controlled by using Queen Trapping, Artificial Swarm methods, Shook Swarm, or in extreme cases varroa medicines.

In late spring and summer infestation levels of drone brood can be checked to monitor progress or detect mite invasion.

In July decide if an autumn treatment is required. This treatment should be carried out in early August after removal of the honey crop.

In October assess the effectiveness of the autumn treatment and to decide if a winter treatment is required.

- While examining colonies during the season look for early signs of brood damage, known as Bee Parasitic Mite Syndrome, and check adult bees for signs of Deformed Wing Virus. This can help to detect when an unscheduled or emergency control may be needed.

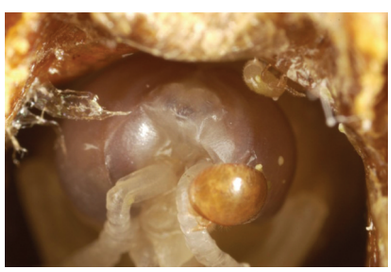
Use approved varroacides

- APISTAN®, BAYVAROL®, APIGUARD®, API LIFE VAR® and THYMOVAR® are all approved for use in the UK. An up-to-date list can be found on the VMD website http://www.vmd.defra.gov.uk/public/bee.aspx.
- APISTAN® and BAYVAROL® are pyrethroid-based and where mites are not resistant they are 99% effective, so one treatment per year may be sufficient. However, in many parts of the UK mites are resistant so if you wish to use them check that the mites are susceptible. A simple resistance test is described in *Managing Varroa*.
- Other modern varroacides are not as effective so do not assume that one treatment per year will be sufficient. Where possible use different varroacides in successive years. Ringing the changes by using varroacides containing different active ingredients helps to reduce resistance selection. Never use the same varrocide year after year.
- Always follow the label instructions.
- Current UK-approved varroacides only affect phoretic mites (those which are carried on adult bees) so mites that are in brood cells during their reproductive phase are unaffected. Some products require two applications to ensure that all mites in the colony are exposed to it. To ensure this follow the recommended time periods.
- Varroacides should not be used:
  - With supers or section crates on the hive. (In an emergency there are exceptions so check the label instructions).
  - When there is a nectar flow.
  - Some should not be used when feeding. (Check the varroacide label instructions).

  Consider a withdrawal period between the cessation of treatments and putting supers or section crates on the hive. Some varroacides set a time period so check label instructions.
- You must maintain a record of varroacide holdings and use, including where you purchased it, the type, batch number, expiry, your specific use and its disposal.

Resistance

- Varroa mites can rapidly develop resistance to treatments especially with repeated use. Mites that are resistant to APISTAN® and BAYVAROL® are present in many parts of the UK. At the time of writing, resistance to other treatments has not been confirmed in the UK.
- After treatments have been completed it is wise to monitor mite drop to check effectiveness. If you suspect that mites are resistant to a treatment other than APISTAN® and BAYVAROL® please inform your local National Bee Unit Bee Inspector or the National Bee Unit laboratory.



Immature mites on a pupa. Photo courtesy of The Food and Environment Research Agency (Fera), Crown Copyright; images supplied by the National Bee Unit at Fera.

Be flexible

- Methods that work well in some circumstances may not work well in others so be prepared to adapt.

Talk to neighbouring beekeepers

- Varroa is a communal problem so talk to your neighbours and co-ordinate treatments.
- Mites from collapsing colonies will re-infest controlled colonies nearby.

Select tolerant bees

- Some bee colonies appear to show a tolerance to varroa. Retain these colonies and incorporate them into queen-rearing programmes.

Keep up-to-date

- Knowledge of varroa is increasing all the time and together with new controls becoming available it is essential to keep up-to-date by reading the bee press, using the internet, attending relevant lectures and discussing varroa with colleagues.

The very least approach

Unless beekeepers are monitoring and controlling varroa by best practice the very least that successful beekeepers now do to control varroa is:

- In early August treat bees by using an approved varroa treatment such as APIGUARD®, APILIFEVAR® or THYMOVAR® immediately after honey crop removal.
- Between late November and January when there is little or no bee brood apply oxalic acid by the 'trickling' method.

Oxalic acid

At time of writing there is not a commercially prepared treatment containing oxalic acid approved for use in the UK. Oxalic acid is an 'Annex II' substance which can be prescribed when approved products are not effective or suitable, and is applied by trickling, spraying or sublimation. It removes phoretic mites for up to about 48 hours, which means that it is very effective if no or little brood is present but ineffective in the presence of significant quantities of brood.

It is safest and most practical to obtain a proprietary, pre-mixed and ready-to-use solution of oxalic acid from a bee supply company. 'OXUVAR®' is available, which is approved for use in at least one EU Country. (Consult the VMD website to check its current status in the UK http://www.vmd.defra.gov.uk/public/bee.aspx). It is used in late November, December or January when there is little or no brood. The crown board is removed and five millilitres of the solution is dribbled onto each seam of bees in the cluster using a calibrated syringe or drench gun. It is only used once in the winter and is best carried out with the outside temperature greater than 3°C. This treatment cleanses the colony of the majority of the remaining varroa mites so that it will probably require no further controls until the following August.

Is there an alternative to using oxalic acid?

Some beekeepers are using a single tray of APIGUARD® in winter or early spring before supers are placed on the colony. They report satisfactory results.

Mention of a treatment should not be taken as an endorsement of efficacy, safety or a recommendation to treat. It is referred to because it is commonly available and used by many beekeepers.

National Bee Unit, Best Practice Guideline