Animal & Plant Health Agency

National Bee Unit

Best Practice Guideline No. 11.

April 2024

Varroa

It is important to be able to recognise and manage *Varroa* mites in honey bee colonies. If mite numbers are not controlled, a colony may collapse within two to three years. The purpose of this factsheet is to provide an overview of *Varroa* biology and the best practices for *Varroa* management.

Know your enemy

- The parasitic mite, *Varroa destructor,* feeds on the fat body (an internal honey bee organ similar to a human liver) of developing honey bee brood. It reduces the lifespan of the developing bee and vectors the deadly viral pathogen, deformed wing virus (DWV).
- High levels of DWV can kill pupae or cause deformed wings in adult bees. Bees that emerge with deformed wings will die within two to three days of emerging. Even healthy looking bees may have high levels of DWV, which can cause learning and memory problems.
- *Varroa* mites can reproduce in worker and drone brood, but they have a preference for drone brood due to its longer developmental time, which allows greater reproductive success for the mites.
- Each mated female mite can produce an average of 1.5 new mites in worker brood, and 2.6 new mites in drone brood; and they can complete up to three cycles of reproduction. This means that mite populations can approximately double every brood cycle.
- The honey bee brood population usually peaks in July. After this peak, the honey bee brood population starts to drop, but the mite population keeps on increasing due to the abundance of brood to reproduce in. This means that high levels of

infestation can quickly arise in August, when the winter bees are developing. Damage caused to the fat body by *Varroa* can reduce the longevity of winter bees. This means that heavy infestation of the colony during August can increase the risk of winter colony collapse. Therefore, it is especially important to control mite populations at this time.

- Uncontrolled *Varroa* infestation may not kill colonies in the first year, but is likely to cause colony collapse after two to three years.There is some variability in how many mites a colony can tolerate, with some colonies succumbing to the effects of *Varroa* faster than others.
- When a colony is collapsing due to excessive *Varroa* infestation, any adult bees remaining alive will still be host to phoretic mites. These bees can interact with neighbouring colonies and apiaries, through robbing or drifting. This can result in the spread of mites to neighbouring colonies, worsening the infestation in those colonies. For this reason, it is recommended to treat all colonies in an apiary for *Varroa* at the same time; even though the number of mites per colony may vary.


Left: A female *Varroa destructor* mite
Right: A honey bee with deformed wings

Integrated pest management (IPM)

- Integrated pest management (IPM) involves using different control methods at different times of year to maintain *Varroa* levels below a threshold that damages the colony.
- Treatment options are varroacides, that utilise an active ingredient to kill mites, or husbandry options that involve a husbandry-based disruption of the mite life cycle.
- Effective husbandry methods for mite control include the removal of drone brood or queen trapping. For more detailed information, please read our fact sheets on drone brood removal and queen trapping.
- At the core of successful IPM is monitoring. Monitoring is important to ensure that treatments are applied only when necessary.
- A thoughtful combination of husbandry methods and varroacides can be used to to manage mite levels to the greatest effect. For example, using oxalic acid treatment on colonies made broodless through queen trapping or shook swarming in the spring, significantly enhances the effectiveness of either strategy alone.

Monitoring *Varroa* infestation levels

- It is not possible to eradicate *Varroa*, they will always be present in honey bee colonies. It is generally recommended to keep *Varroa* populations below 1, 000 mites to prevent serious damage to the colony. A level of approximately 2, 500 mites leads to irreversible damage and significant risk of colony collapse.
- Monitoring infestation levels is important for the appropriate timing of treatments. Methods include: counting the daily mite drop rate, drone brood uncapping and

ethanol-wash or sugar-roll of adult bees. These are described in more detail in the fact sheet entitled 'Estimating *Varroa* mite populations'.

- Monitoring can be performed throughout the year, but there are some key times when it is especially important:
    - In February and March: it is important to ensure the mite population is as low as possible at the beginning of the season before the colony expands and honey supers are added. Presence of honey supers will limit the treatment options available.
    - In late spring: mite levels will be doubling every brood cycle in strong colonies. Monitoring will help determine the timing of husbandry methods to control mite levels, which are usually most appropriate during this time.
    - In late July: monitoring is crucial to ensure low levels of mites are present when the winter bees begin developing in August. If treatment is needed in July, only one varroacide (MAQS) can be used when supers are present, otherwise honey must be harvested before treatment Note that MAQS cannot be used when the outdoor temperatures exceed 30°C.
    - In October: assessing the effectiveness of the late summer/autumn treatment will help determine if a winter treatment of oxalic acid is required.
- While examining colonies during the season, look for early signs of brood damage caused by parasitic mite syndrome and check adult bees for deformed wings, which indicates high levels of DWV. This can help inform if an emergency treatment may be needed.

Use approved varroacides

- An up-to-date list of all varroacides approved for use in the UK can be found on the VMD website.
- Varroacides can be categorised into two types of products: those using synthetic pesticides as their active ingredient, and those derived from organic acids or essential oils.
- Synthetic varroacides cannot be used repeatedly, as the mites become resistant to them quickly. Synthetic pesticides currently available for use in the UK are Apivar, Apitraz and Apistan. It is important to use these products sparingly, and always alternate their use with another product.
- Varroacides that do not contain synthetic pesticides consist of products derived from the organic acids, oxalic and formic acid, or the essential oil, thymol. These varroacides should be the first choice for treatment as there are no reports of mites becoming resistant to them.
- Always follow the instruction for varroacides. The effectiveness and safety of the product can only be assured through correct application. Each product has different useage guidelines and restrictions. For example, some varroacides are less effective on larger colonies, while others need to be used on larger colonies as they can overdose those that are too small.
- It is a legal requirement to keep a record of varroacide products used on colonies, including: the product name, where it was purchased, the date it was used, the dose, the batch number and its disposal. These records must be kept for a minimum of 5 years, even if the treated colony is no longer in your possession.

Disposal

- Please ensure that spent varroacides are disposed of responsibly.
- Synthetic pesticide strips, such as Apivar or Apistan, may still contain some active ingredient, even after the product has been in the hive for the recommended treatment period. This means that they can contaminate the environment if not correctly disposed of. They are not suitable for household waste, and should be taken to a local recycling or waste disposal centre for professional disposal.
- Any waste with remnants of thymol should be discarded at a waste disposal centre as thymol is not suitable for household waste.
- The formic acid based products, MAQS and Formic Pro, are compostable and can be placed in compost piles, but should be kept away from water sources, such as streams or ponds.

Best practice recommendations

- Monitor regularly, at least four times per year, and treat when necessary.
- Ensure winter bees are protected by monitoring, and treating if necessary, in late July.
- Avoid synthetic pesticides and focus on using treatments with active ingredients derived from organic acids or thymol.
- Use a combination of varroacides with husbandry techniques to manage mites in the most effective way
- Only use licensed veterinary medicines for treatment of *Varroa,* and keep a record of their use for at least five years.
- Co-ordinate treatments with neighbouring beekeepers, as mites from collapsing colonies will re-infest nearby colonies.
- Select any honey bee colonies that appear to show resistance to *Varroa*. Retain these colonies for queen-rearing.

Further reading

- For more detailed information about the biology and management of *Varroa*, please view our advisory leaflet entitled 'Managing *Varroa'*.

Are you registered on BeeBase?

BeeBase is a FREE online service provided by the National Bee Unit to help protect you and your fellow beekeepers from pests and diseases that threaten the health of honey bee colonies.

If there is a disease outbreak in your area, the NBU team uses BeeBase to contact local beekeepers to arrange precautionary inspections to check for any signs of infection and to advise on what to do.

Register today at: www.nationalbeeunit.com

This leaflet was produced as part of the Healthy Bees Plan. The Healthy Bees Plan aims to address the challenges facing beekeepers in sustaining the health of honey bees and beekeeping in England and Wales. It has been jointly developed by governments, beekeepers, their associations and other stakeholders.

For more information on the Healthy Bees Plan, please visit:
www.nationalbeeunit.com/bee-health-improvement/the-healthy-bees-plan-2030/

Data Protection:
For information on how we handle personal data visit www.gov.uk and search Animal and Plant Health Agency Personal Information Charter.

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