

Varroa

Varroa (*Varroa destructor*) are tiny red/brown parasitic mites which can feed and live on adult honey bees. However, they mainly feed and reproduce on the developing brood. Female varroa seen on bees, feasting on bee's fat body. Male Varroa mites exist only in brood cells, and are smaller and pale in colour. Immature female mites are also found inside cells, and are paler than their adult counterparts. They are both deaf and blind, so rely on their sense of smell to find brood.

Varroa destructor have been present in UK honey bees for over twenty-five years having transitioned from the Asian honey bee (*Apis Cerana*). One of the main issues with varroa in western honey bees (*Apis Mellifera*) is that they do not possess the same natural defences present in the Asian honey bee. The Asian honey bee naturally exhibits extensive grooming behaviour which leads to removal of the mite. It will also actively remove it from worker brood (even after capping).

As a rule of thumb, in colonies with brood, mite populations double about once a month -- and even quicker when the colony has large amounts of drone brood. In a feral colony (without beekeeper interference drone brood will account for up to 20%, In managed colonies where space is restricted that can be as low as 2-4%.

The life expectancy of Varroa mites depends on the presence of brood and will vary from 27 days to about 5 months. During the summer Varroa mites live for about 2-3 months during which time, providing brood is available, they can complete 3-4 breeding cycles. In winter, when brood rearing is restricted, mites over-winter solely on the bodies of the adult bees within the cluster, until brood rearing commences the following spring.

Life Cycle

- Adult female Varroa mites enter honey bee brood cells (especially drone brood) at the pre-capping stage and lay two to five eggs after the brood cell is capped.
- 0.5 mm long eggs are laid on the bottom of the cells, on the walls, and sometimes directly on the larvae.
- The first egg laid is a male, and subsequent eggs are female.
- After hatching Varroa mites pass through two larval stages (called a 'protonymph' and a 'deutonymph') before developing into an adult. It takes about 5–6 days for male Varroa mites to develop and 7–8 days for female mites to develop.
- Mating occurs in the brood cell. The male Varroa mite dies inside the cell shortly afterwards.
- Young female Varroa mites and the mother Varroa mites emerge from the brood cell with the emerging honey bee.
- The daughter Varroa mites will lay eggs in other brood cells after 2 weeks. Adult female Varroa mites usually live for 2 months, but can overwinter between the sclerites of adult honey bees.

Symptoms of Varroosis

Severe infestations of Varroa may lead to:

- Deformed wings which are shrivelled and adopt a 'spaghetti' like appearance;
- Stunted abdomens;
- General weakening of the colony;
- Patchy/ pepper pot brood patterns;
- High level infestations can be a direct cause of colony loss;

- The mite is also a vector of a number of viruses. Although bee viruses usually persist as unapparent infections and cause no overt signs of disease, they can dramatically affect honey bee health and shorten the lives of infected bees under certain conditions.

Calculating Varroa Levels

Researchers agree that in the UK it is wise to aim to keep the Varroa population below 1000 mites/colony; above this level the risk of damage from the mites increase.

Time of monitoring - Objective

Early spring Early detection makes it possible to plan effectively and assess the need for springtime treatment.

Following a possible springtime treatment Confirm effectiveness of springtime treatment.

During a honey flow* Detect a massive Varroa build-up and plan possible intermittent treatment between honey flows. (*Particularly on areas where there are large number of hives belonging to different beekeepers.)

Late July – August Choose the best-suited late-season treatment depending on the level of infestation.

September – October – December Ensure effectiveness of autumn treatment and assess the need for additional treatment in winter (is when brood is absent) or early next spring.

Alcohol washing of bees: (Varroa EasyCheck - £20)

Consists of washing bees (around 300) with alcohol (dish washing detergent diluted in water may also be used). Phoretic Varroa from bees on brood frames are detached, and counted. Care must be taken to avoid including the queen in the sample. Find her and protect her. Objective: Determine the percentage the percentage of phoretic infestation (# Varroa/100 bees) by dividing by the number of bees in the sample. Using a graduated measurement (1/2 cup) makes it possible to avoid precisely counting the number of bees each time.

Monitoring of natural mortality of Varroa by the use of sticky boards:

Counting the number of Varroa mites that fall onto a greased piece of cardboard, or plastic, which is referred to as a sticky board. A screen or mesh floor should be placed above the sticky board to prevent the bees from touching the board. Objective: This method consists of establishing an average rate of Varroa per 24 hour day. Thus, 12 Varroa observed over 3 days = 4 Varroa/day.

De-capping of drone and/or worker broods:

Involves de-capping 200 or more male brood cells and then removing the brood for counting.

Objective: While this method is precise, it is also destructive to the colony and very time consuming. Also, it is important that the sample be exact in order to be representative complete. Lee (2010) and Martin (1998) recommend extrapolation to determine the colony's population, together with counting of phoretic Varroa.

<http://www.nationalbeeunit.com/public/BeeDiseases/varroaCalculator.cfm?>

Time of monitoring	Estimated alert thresholds. Thresholds dependent on multiple factors; must be adapted to each operation.		
	Sticky boards (strong hives - 30.000 bees)	Washing with alcohol	Checking of capped drone brood
Early spring	≥ 1 Varroa mite per day on average	≥ 1% of Varroa on average	4% of cells infested
Between 2 honey flows	2 Varroa mites per day	3%	5%
Late July – early August	> 10 Varroa mites per day	> 3%	
Late August – September in the absence of summertime treatment	> 4 Varroa mites per day*	1 Varroa mite for 200 bees*	
End of season during broodless period	> 0,5 Varroa mites per day*		

Chemical Treatments

Chemical treatments - these are veterinary medicines... and thus have a defined set of treatment instructions. It is wise to follow these instructions as resistance to the particular chemicals may be speeded up by using the wrong dose or honey may be contaminated if the advised timing is altered. Beekeepers should never use a non-registered chemical to control mites.

Treat all hives at the same time.

Record keeping requirements

As bees are considered to be food-producing species, beekeepers must [keep records](#) of all medicines given to their bees. This includes the name of the product, the batch number, the date you bought it, how much you bought and who from.

You must then record the date you administered the medicine to the bees, how much of the medicine you administered, the hive identifier and the withdrawal period.

When disposing of unused medicine you must record the date of disposal, how much of the medicine you disposed of and where it was disposed.

These records must be kept for 5 years after the medicine is given to the bees, even if you no longer have the bees in your possession.

MAQs Strips (£55 for 10 packs, £5.50 per hive)

Active ingredient: Formic acid. Formic acid is a natural component of honey and is found in the venom of ants

How it works: Kills varroa where they breed, i.e. in the hive and in the capped brood

Effectiveness: Reduces varroa population by 90% and also kills tracheal mites

Application: Temperature needs to be above 10C but less than 29C, treatment takes 1 week

When: Typically used from April – August, when have honey supers on

Other benefits: It evaporates completely, leaves no residue in the comb

Side effects: Randy at [Scientific Beekeeping](#) reported few side effects as compared with previous formic acid treatments. The MAQs website says “background colony health issues, such as queen frailty, may be exposed”

Advantages: can be used with open mesh floors and without closing hive up (as required with Apiguard)

Disadvantages: one year shelf life; don't use if above 29C

61 to 98% effective under temperature limitations effectiveness decreases.

[Apiguard \(£27.80, £5.56 per hive\)](#)

Active ingredient: Thymol. Thymol is a naturally occurring substance derived from the plant thyme.

How it works: Kills varroa in the hive (but not in the capped brood)

Effectiveness: Reduces varroa population by 93% and also kills tracheal mites

Application: Temperature needs to be above 15C, treatment takes 4 week, requires 2 treatments. Cannot be used with honey supers you want to extract

Timing: Typically applied from mid-August (in UK), can also be applied in spring

Side effects: can sometimes make the queen stop egg laying for a short period; brood may be removed by the workers.

Disadvantages: Because you need to remove any honey supers you want to extract and you cannot feed at the same time, I struggled to feed and use Apiguard at the same time (a colony starved last year). Hence, why I am considering MAQs strips

74 to 95% (more effective with warmer temperatures)

[Apivar \(£31 for 5 hives, £6.20 per hive\)](#)

The active ingredient in Apivar is amitraz, an acaricide developed by Boots in the 1960's. Varroa are exposed to a sub lethal dose which results in them losing their grip upon the adult bee. Amitraz also leads to a constant state of excitation and paralysis leading to death via starvation. It can be used in any season when supers are not on the hive but has a slow mechanism of action needing 6 to 10 weeks depending on brood nest size. However, in contrast to MAQs and Apiguard there are no temperature constraints. It is also worth noting that a delay of 2 weeks is recommended before adding supers back onto the hive. Up to 95% effective.

[Api Bioxal \(£13 for 10 hives, £1.30 per hive\)](#)

ApiBioxal is an oxalic acid based treatment. Dissolve 35g in 500 ml of light syrup (1:1) then apply using a syringe at a rate of 5ml per seam of bees. If treating in the Summer, stop the queen laying for 25 days prior to treatment.

[Oxybee \(£37 – enough for 20 to 30 hives ~£1.85 - £1.23 per hive\)](#)

Oxybee comes with sachets of powder containing glycerol and essential oils as well as a bottle of oxalic acid. The glycerol increases the adherence of oxalic acid to the bees which improves dissemination throughout the colony. The powder and oxalic acid are mixed together and then applied with a trickle 2 bottle or syringe between the frames occupied by bees. Depending on the strength of the hive and the number of seams of bees in the brood body the litre of Oxybee can treat between 20 and 30 hives. Oxybee can be used once per colony

Unlike other oxalic acid treatments that have to be used immediately after mixing up the solution, one major advantage of Oxybee is that it can be stored for 24 months in the original packaging and 12 months in the fridge once the solution has been made up. There is no withdrawal period which means there is no mandatory waiting time between applying Oxybee and using honey for consumption.

Apilife Var (£3 per pack, 2 per hive - £6 per treatment)

Combination of Thymol + camphor, menthol and eucalyptol oil. Treatment at temperatures above of 30°C lead to increased stress and mortality of adult bees and brood. For maximum efficacy use the product in late summer after the honey harvest, when the amount of bee brood present is diminishing. Insufficient efficacy can be expected if the average outside temperature is lower than 15°C. Average temps for Leeds in September are 12°C and with a four-week treatment time, if using this treatment method, the earlier the better, once honey is removed. Winter bees are being born mid September they are still get viruses from the varroa which can reduce their lifespan – typically wanting them to live until March/April.

70 to 90% effectiveness

Oxalic Acid Vapour Treatment (£35 for vaporiser, plus oxalic acid, £22.50 Safety Kit)

A gas powered version (think chefs blowtorch with an adapter) is available along with a battery operated vaporiser which requires a 12v battery, such as a car battery to provide the power to heat the oxalic acid crystals e.g. Api-Bioxal. You will also need a piece of foam for the entrance.

Place 2.3g of the product in the shaped pan at the end of the shaft (one level scoop full). Insert into the hive entrance so it is approximately 2/3 of the way in to the hive. Seal the entrance around the Vaporiser shaft with the foam.

Vaporising the product will take approximately 3 minutes. Remove foam and vaporiser, replace foam and leave hive sealed for 15 minutes. Wear suitable protective clothing, goggles and face mask (at least type FFP2)

82 to 99% when brood not present

BioTechnical Controls

Open Mesh Floor

An open mesh floor is a key line of defence in the fight against varroa as once the varroa lose their grip upon the bee and fall through the floor, they cannot return to the hive. It has proved to be an effective weapon in the fight against varroa. 10% effective

BeeGym (£14.99)

The bee gym is essentially a cat scratching post for bees, it has wires and flippers which dislodge varroa (and indeed other parasites) when the bees rub their backs or abdomens against it.

<https://www.youtube.com/watch?v=EeHZMlh7c8o>

Icing Sugar (100g - 10p per hive, plus old sieve. Sugar dusting grid £12.50, Sugar dusting measure and brush £7.20)

Thorne's sell a complete Icing sugar kit, but a quick raid of the kitchen cupboards should provide an appropriate sieve. The Thorne's kit comes with a measure for your icing sugar. However, there are much higher figures quoted within the literature (100g per box) – which is a considerable amount of icing sugar! The icing sugar acts by getting between the mites feet and preventing them from

gripping on effectively. Whilst you would have thought such a vast amount of powder would effect the bees' tracheae, evidence seems to suggest this is not the case.

The treatment can be repeated as the beekeeper sees fit, but it is likely to have greatest effect when mite load upon the bees is greatest – e.g. during broodless periods.

[Drone Brood Sacrifice \(Free\)](#)

As outlined earlier, varroa prefer drone brood as the extended developmental period of 24 days allows an additional varroa mite to reach maturity and thus the varroa will actually seek out drone pheromones within the hive by hitching lifts on passing bees. The beekeeper can use this to their advantage by placing half an empty frame (or one half-filled with brood foundation). This results in a much larger concentration of drone brood within the hive than is observed in a traditional national hive setup where drone brood tends to be around the edge or beneath frames. The beekeeper can then cut out this section of drone comb, once capped and discard, at the same time removing a large proportion of varroa.

[Brood Interruption / Queen Isolation \(Free\)](#)

Effective but requires good beekeeping skills for season-long management (commercial beekeepers who split their colonies tend to retain the newer colonies better than non-split ones); may use brood interruption to create time with no capped brood cells & use treatment that is effective when there is no brood (oxalic acid); potential lower honey harvest or population growth due to delay in brood production.

[Brood frame trap \(£64 for Hoffman\)](#)

A brood frame trap enables all the brood to be concentrated on particular frames, which can subsequently be removed along with a large proportion of varroa. The problem with this method is the queen laying rate is vastly reduced (typically 2000 eggs per day, reduced to a frame per week) during the process and this will have a subsequent effect on colony size.

1. Confine the queen on an empty comb and place in the trap.
2. After 7 days, remove the frame and substitute another frame with the queen trapped again.
3. After 18 days, both frames will be full of sealed brood and, hopefully, full of varroa mites trapped with the only brood available to them.
4. Remove both frames and destroy.

[Requeening \('Free' if you breed your own queens, £25 plus otherwise\)](#)

Varroa Sensitive Hygiene is an important behavioural trait within *Apis Mellifera*, by which nest cleaning bees remove infected larvae between 15 and 18 days old (after capping) There is an article in this month's LBKA newsletter on this.