Animal & Plant Health Agency

National Bee Unit

Estimating *Varroa* mite populations

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If *Varroa* population levels are not regularly monitored, then infestation may go unnoticed until it becomes severe. Monitoring for *Varroa* should be performed at least four times each season: early spring, after the spring honey flow, at the time of honey harvest and late autumn. This fact sheet outlines three methods that can be used.

Natural mite drop

Varroa mites fall into the bottom of the hive when they die. An open mesh floor with a monitoring tray can be used to count the natural death rate of *Varroa* as they fall onto the floor. This 'daily drop' rate is then used to calculate an approximate number of mites in the colony. This method relies on mite drop as a proxy for the true *Varroa* population level in the hive, so it is not a particularly accurate method for determining mite numbers. However, it is a quick and easy way to get an indication if there are few or many mites in the hive.

1. Using an open mesh floor, coat your monitoring tray with vegetable oil or petroleum jelly, or apply a sticky board, so that any living mites that fall down cannot return to the colony, and the dead mites don't get blown away when the tray is pulled out.
2. Leave the tray in the colony for 7 days during the summer; or longer during the winter. Due to variability in the daily mite mortality, 7 days is the minimum monitoring period.
3. Count the total number of mites collected and divide this figure by the number of days that the monitoring tray was left in. The gives the daily mite drop.
4. Multiply the daily mite drop by one of the following (this accounts for the amount of sealed brood likely in the hive and therefore how many mites are on the adult bees):
    - November to February: Multiply by 400
    - May to August: Multiply by 30
    - March, April, September and October: Multiply by 100

The maximum threshold of mites per colony before serious harm occurs is 1000 — treatment should be applied before reaching this level.

NB: This method is unreliable where a colony is broodless or collapsing from varroosis[1].

Figure 1: The debris that falls into the floor can be examined for *Varroa* mites

Drone brood uncapping

Varroa mites have a preference for infesting drone brood over worker brood because drones have a longer developmental time, which increases the reproductive success of the mite. This method is accurate, but only if enough drone brood are sampled. The optimal amount of drone brood to extract for an accurate estimate is three hundred[2].

1. Select an area of sealed drone brood at an advanced stage of development, i.e. purple eyed stage.
2. Insert an uncapping fork under the cappings and lift out the pupae. Twisting the fork during uncapping may ease the removal of the cappings.
3. Any mites that are present will be clearly visible on the pupae. Count the number of mites, and the number of pupae sampled.
4. If there are more than 5 mites per 100 drone brood, then treatment is urgently needed. An acceptable level of infestation is less that 3 mites per 100 drone brood.

Figure 2: Drone brood uncapping is an accurate way to determine the mite numbers in a hive.

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[1] Branco, M.R., Kidd, N.A.C. and Pickard, R. (2006) A comparative evaluation of sampling methods for *Varroa destructor* (Acari: Varroidae) population estimation. *Apidologie*, 37. DOI: doi.org.10.1051/apido.2006010.

[2] Wilkinson, D., Smith, G. C., Hutton, S. and York, Y. (2002). Modeling the efficiency of sampling and trapping *Varroa destructor* in the drone brood of honey bees (*Apis mellifera*). *American Bee Journal*, 142(3), 209-212.

Alcohol-wash

The alcohol-wash method is used to count the number of mites infesting adult worker bees. This method can also be performed by substituting the alcohol with powdered sugar to perform the non-lethal 'sugar-roll' method, where bees are shaken for 3 minutes in the powdered sugar. The results are comparable, and both are fairly reliable methods for determining mite populations in the hive[1].

1. Collect a brood frame from the colony, ensuring that the queen isn't on it; a brood frame should contain a higher proportion of nurse bees than other frames. Knock the bees off the frame and into a bowl.
2. Scoop half a cup (approx. 300 to 400) of the bees from the bowl and into a sampling container that contains alcohol, such as 70% ethanol. Ensure there is enough alcohol to cover the bees.
3. Seal the container with a lid and shake vigorously. You can leave the container to stand for up to 24 hours, so that the mites can detach from the bees into the alcohol.
4. Shake again before pouring the bees through a mesh with a pore size of approximately 2 mm, and into a large bowl or tray. Rinse the bees with water to dislodge any remaining mites.
5. Count the number of mites and the number of bees. If there are more than 5 mites per 100 worker bees (5%), then the infestation is serious and the colony should be treated urgently[3]. A acceptable level of infestation is 3% of less.

To learn more about how to treat *Varroa*, please view our advisory leaflet entitled '[Managing *Varroa*]', which can be found at: www.nationalbeeunit.com/resources-for-beekeepers/leaflets-guides-and-videos/advisory-leaflets2/

[3] Gregorc, A. and Sampson, B. (2019). Diagnosis of Varroa Mite (*Varroa destructor*) and sustainable control in honey bee (*Apis mellifera*) colonies—A review. *Diversity*, 11(12). DOI: doi.org.10.3390/d11120243.

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