Animal & Plant Health Agency

National Bee Unit

Queen trapping

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Queen trapping is a technique used to induce a brood break in a colony for the purpose of controlling the *Varroa* mite population. The queen is trapped on a series of frames that are used as bait frames to attract and trap *Varroa* mites. The capped brood frames are then destroyed, thus resulting in a decrease in the mite load in a colony. This fact sheet describes how to perform queen trapping.

The principles behind queen trapping

Varroa mites reproduce inside honey bee brood cells. Trapping the queen in a cage can prevent her from laying, which induces a brood break in a colony and reduces the mite population in the colony by slowing their reproductive rate. However, mites can survive on adult bees for many weeks until bee brood is present in the colony again and the mites can resume reproduction. However, if the queen is restricted to laying on a single frame at a time, availability of honey bee brood is tightly controlled. These frames can be used as bait frames to attract the mites into the brood cells where they are capped over and can then be removed from the colony culling the *Varroa* mites. The use of bait frames in this version of the queen trapping method ensures the maximum efficacy of using queen trapping to reduce the mite numbers in the colony.

How to perform queen trapping

Before getting started, you will need the following materials:

- A queen frame cage (ensure it has a mesh size that allows workers to pass through but not the queen; approx. 4.3 mm) *Beware that some frame cages (queen isolation or introduction cages) do not let workers pass through the mesh to care for the brood and 'unload' their Varroa mites.*
- Three frames of drawn-out comb (make a small hole in the wax to allow the queen to pass from one side of the comb to the other if there is no bee space available between the frame and the cage); older combs work well for this
- Rubber bands to hold the cage tightly closed
- A marker pen or drawing pins to label the frames
- A small queen cage to hold the queen during colony manipulations

DAY ONE

1. Find the queen and place her on a frame of drawn-out comb that has space for laying. Place this frame inside the frame cage, and gently close it, ensuring the queen is not at the edges where she may come to harm when the cage is being closed. Wrap rubber bands tightly round the lugs of the cage containing the frame to make sure it stays tightly closed and the queen cannot escape.
2. Find two frames that can be removed from the colony such as partly drawn-out frames or a frame of pollen to create space to accommodate the frame cage with the queen. The frame cage will take up more space than one normal frame. This is why two frames need to be removed, although removing one frame and a dummy board if it's being used may provide enough space.
3. Reposition the frames so that there is a space in the centre of the brood nest. The caged frame with the queen (labelled 'A' in Figure 1) should be put in here — ensure there is enough space in the brood box for the frame cage to fit.

DAY NINE

1. Return to the colony and carefully remove the cage from around the frame. Find the queen on the frame and place her in a queen cage for safekeeping.
2. The frame (A) that was in the cage should be labelled in some manner, for example by pushing a drawing pin into the top frame or labelling it with a marker pen. It is then placed back into the centre of the brood nest. This frame is labelled 'A' in Figure 1.
3. Place another frame of drawn-out comb (B) into the frame cage and gently transfer the queen onto it. Close the cage carefully and place it next to the brood frame (A) that has just been returned to the colony.
4. Examine the other brood frames for queen cells and destroy any that are present.

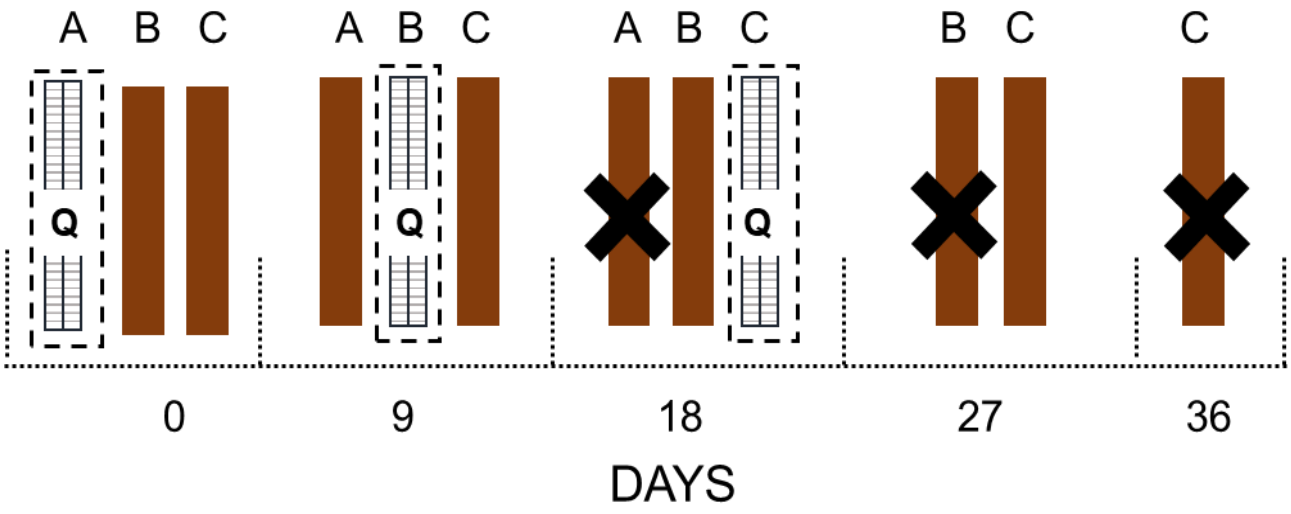

Figure 1: A simplified schematic of the movement of frames that the queen has been trapped on during the queen trapping procedure. 'A', 'B' and 'C' indicate arbitrary labels assigned to the frames for this example

DAY EIGHTEEN

1. Return to the colony and remove the labelled brood frame (A in Figure 1); shaking off any bees on it. This capped frame will contain *Varroa* mites and should be destroyed by freezing or burning.
2. Remove the cage from around the caged frame (B) with the queen as before, placing the queen in a queen cage safely out of the way until step 4.
3. Label the frame that has been removed from the cage in a similar way to the previous one. In the example in Figure 1, this frame is marked ‘B’.
4. Place another empty drawn out brood frame (C) back into the frame cage and transfer the queen onto it, closing it carefully. Place the cage next to the brood frame (B) that was just returned to the colony.
5. It is not necessary to check the colony for queen cells any more because there are no longer any eggs or young larvae on frames other than the frame trapping cage.

DAY TWENTY-SEVEN

1. Return to the colony and remove the labelled brood frame (B in Figure 1); shaking off any bees on it. This capped over frame will contain *Varroa* mites and should be destroyed.
2. Remove the cage from around the caged frame (C) as before, you can now place the queen back into the colony. There is no longer any need for the frame cage, so it can be taken away for cleaning
3. Label the frame that has been removed from the cage in a similar way to the previous two. In Figure 1, this frame is marked ‘C’.

DAY THIRTY-SIX

Return to the colony and remove the labelled brood frame (C in Figure 1). Be careful that the queen is not on it and shake the bees off it. This capped over frame will contain *Varroa* mites and should be destroyed.

When to perform queen trapping

Local conditions and year on year climatic variability will mean that the optimum time to perform queen trapping varies. It should be carried out after the eggs that develop into bees that forage the main crop have been laid, but before those that will take the colony into winter. Depending on how good the spring weather is, and how far south you live, this may mean that the procedure can be performed in April. However, in many cases, queen trapping will be appropriate during May and June; perhaps the beginning of July.

Potential problems using the method

The nine-day period between visits is important. It may be increased to ten days if necessary for one period but should not exceed 19 days in total for two consecutive periods. This is because worker brood may begin to hatch on day 20, along with captured

mites and their progeny. If for practical reasons you wish to trap for seven-day periods, then four comb cycles should be used to maintain efficacy.

If you experience problems getting the queen to lay, especially if the cage is new, the cage can be placed into a colony before use for a few days so that it 'smells' of bees and will feel less alien to the bees. The type of drawn-out comb used may also affect whether the queen is inclined to lay. Try using older, used brood frames, they may be more attractive for the queen.

Combination with other methods of control

A brood break offers a good opportunity to eradicate the majority of mites in the colony if it is combined with an oxalic acid trickle. Oxalic acid based medication is not suitable when there is brood in the colony because it is lethal to open brood and cannot penetrate the wax cappings to kill mites in capped brood cells. However, oxalic acid based medications have an efficacy of over 90% against mites living on the adult bees[1] and as there is nowhere else for them to go in a broodless colony this combination can result in the removal of the vast majority of mites from the colony. Trickling oxalic acid based medication is cheap, easy and fast and has no harmful effects on the bees *when applied correctly.* Be aware that the oxalic acid used must be in the format of an authorised bee medicine; application of unauthorised products to honey bees is illegal. For more information on how to apply oxalic acid to colonies, please read our advisory leaflet on Managing *Varroa*.

Figure 2: Trickling oxalic acid into the frame spaces kills the mites living on adult bees

Is queen trapping harmful to colonies?

It may seem intuitive that inducing a brood break through queen trapping should hinder the development of a colony. However, a large study testing brood interruption techniques for *Varroa* control across 10 different European countries, found that the queen caging results in a strong reduction in mite infestation of colonies, and yet colonies compensate in terms

[1] Büchler, R., Uzunov, A., Kovačić, M., Prešern, J., Pietropaoli, M., Hatjina, F., ... and Nanetti, A. (2020). Summer brood interruption as integrated management strategy for effective Varroa control in Europe. Journal of Apicultural Research, 59. DOI: doi.org/10.1080/00218839.2020.1793278

of number of adult bees within two months of treatment[1]. This is because bees age according to work load and whilst the queen is trapped the nurse bees that would normally feed and care for brood are in a rest phase with less brood than normal to care for. When the queen is released back into the colony to lay freely there is a large work force of worker bees available to raise brood as fast as the queen can lay eggs. The colony effectively bounces back along with a dramatic reduction in *Varroa* damage.

Queen trapping methods are highly effective at reducing *Varroa* populations and are well worth the effort for those who wish to manage *Varroa* whilst avoiding the use of medications. In this scenario it may be best to buy enough comb trapping cages to treat a whole apiary at once.

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