When IPM Programmes Go Wrong

By Jason Learner, National Bee Unit

Concluding this series on varroa management, Jason Learner reviews some of the common IPM programmes and asks: "what can go wrong?"

A mother mite with three offspring seen after drone trapping. Photo courtesy of Wendy Johnston, Northern Ireland.

The entrance to a colony suffering from Varroa-mediated collapse. Photo courtesy of Dr James Tew.

So we come to the final article in the series. Previously, in article 1 we looked at the now extensive list of registered varroa treatments and how to use them properly. Then in article 2 we looked at how both registered and unregistered treatments have been used incorrectly in colonies and led to damaging the colony rather than helping it. In the third article we looked at how an integrated pest management (IPM) programme could be used to reduce mite populations, outlining some of the biotechnical methods which beekeepers could use to help them achieve different levels of control. Finally, we look at a few of the common IPM techniques and ask: What could go wrong?

Drone comb removal; letting drones hatch

When you use drone brood to trap and kill varroa, it can be an effective supplement to chemical treatments, offering up to 50–60% efficacy. However, if you forget to remove frames of drone brood, you will end up doing the opposite of what you set out to achieve; increasing mite populations, rather than reducing them. Believe it or not, this happens and beekeepers, for one reason or another, forget to remove drone brood comb which was placed in the colony to trap varroa. To understand why this is a problem, we must look at the biology of the mite. When a female varroa mite enters a worker cell, she will lay her first egg approximately seventy hours after the cell is capped. The first egg is unfertilised and therefore develops into a male. The three to four subsequent eggs that are laid at approximately thirty-hour intervals are fertilised and will develop into female offspring. The latter eggs laid by the reproductive female mite do not reach maturity because the developmental time of the female bee pupa is too short to allow the mites to fully develop. The drone bees' developmental stage is about two to three days longer than that of workers, which makes them more rewarding in terms of mite reproduction because more young mites reach maturity. This results in, on average, two to three viable female offspring in drone cells compared to the one or two viable female offspring in worker cells, and means that mites will preferentially seek out drone brood.

Therefore, if you wish to use drone foundation in a colony with the intention of cutting out the sealed and mite-infested comb, that is great, but make sure you keep a record of your timings. I have heard of cases where inspectors have found colonies showing signs of parasitic mite syndrome, associated with high mite levels. Upon inspection of the hive, they found either whole frames of drone comb or drone comb on the bottom of super frames which had hatched. When asking why the beekeeper had not removed the drone comb the reply was: "*I forgot to do so*" and subsequently several cycles of brood emerged. I understand that we all lead busy lives, but this should not happen if you inspect your colonies weekly. A simple solution is to cut the comb out as soon as all the cells are capped.

Potential knock-on effects of drone comb retention and high mite levels

A second, important issue could arise as a result of a colony dying of high mite levels: transport of mites into adjacent colonies. Remaining bees in a dying colony can drift into neighbouring hives carrying with them phoretic mites, which will increase mite populations in those colonies. This could lead to mite invasion pressure and in a commercial enterprise it can be devastating to see, as your colonies die in a domino-like fashion. I have not seen this happen, but have heard about such instances from our European colleagues.

As a final note on drone trapping, I would say that we need to be careful not to remove all of the drone brood from our colonies as a means of varroa control, otherwise the virgin queen bees going out on mating flights will have a lonely couple of mate-finding trips. Remember bees are polyandrous which means that the queens need to mate with more than one drone, roughly around twelve to fifteen, in order to be effectively inseminated.

The artificial swarming technique

This can seem a daunting technique for a beginner beekeeper, but it is 'doable' with a bit of planning. If you are not sure how to do it, ask if your local association has someone willing to help you. In order to carry it out, you will need a strong colony that is nearly ready to swarm. When you carry out this technique, bear in mind that you have taken a lot of resources away from the 'new colony' where the original queen has been placed on foundation. Therefore, if the weather is wet and the bees are not getting out to forage you will need to feed them so that the colony does not starve. This applies, generally, when the weather is wet for long periods, say two weeks. Beekeepers seem to leave colonies alone when it rains to the point that they do not check whether the colony has any food, only to return upset that the colony has died of starvation. A few of these cases have even been found after an artificial swarm has been carried out. You will not disturb a colony if all you do is to lift the lid and crown board up and tip syrup into a feeder. This is far better than coming back to a dead colony which has starved. A strong colony which has just been split in this way will require at least three gallons of strong syrup; not one litre as some beekeepers have done. If you are using a small rapid feeder which only holds 2.25 litres, this will need topping up every other day and, in prolonged bad weather, possibly up to eight times.

Not having a plan and not treating

No doubt some of you will have been reading these articles and thinking that none of it applies to you because you no longer treat your colonies for varroa. In my experience, it can sometimes take up to three years for symptoms of varroosis to appear in your colony; it may not be in the first year, but it will eventually catch up with your colonies and either kill them or damage and hamper their development. These colonies will be unlikely to fill a double brood box wall-to-wall with brood or produce 60–90 kg of honey each season. I have said it before and I will say it again, just because you cannot see varroa, it does not mean that the mites are not there. Remember to monitor your colonies over a period of at least a week in the spring, in summer after the main crop and in winter, then carry out a treatment if the mite threshold is likely to exceed 1,000 mites. You can use the varroa calculator on BeeBase to help provide a rough estimate. We have already seen from the 2017 season that mite levels can become damaging before the standard August treatment which most beekeepers adopt and this has resulted in some 'sick' colonies showing signs of parasitic mite syndrome as early as late June.

So now, as this series draws to a close, I hope that some of you have found it useful, or if not, at least interesting to read. Unfortunately, varroa remains one of the most formidable pests of apiculture and even twenty-five years on, it still causes problems for our colonies, both directly and indirectly. Hopefully, by highlighting some of the ways in which varroa management has gone wrong for some beekeepers, you will be able to learn from others' mistakes. If you have any questions, do not be afraid to ask your local association, your Seasonal Bee Inspector or you can email me directly at Jason.learner@apha.gsi.gov.uk.

Further reading

Beetsma J, Boot WJ, Calis J. Invasion behaviour of *Varroa jacobsoni* Oud.: from bees into brood cells. *Apidol* 1999; 30: 125–140.

Ifantidis MD. Ontogenesis of the mite *Varroa jacobsoni* in worker and drone honeybee brood cells. *J Apic Res* 1983; 22: 200–6.

Schulz AE. Reproduction and population dynamics of the parasitic mite *Varroa jacobsoni* Oud. and its dependence on the brood cycle of its host *Apis mellifera* L. *Apidol* 1984; 15: 401–20.

"Drone brood trapping to remove varroa can offer up to 50–60% efficacy, but you must remember to remove the frames or you will increase mite numbers."