Drifted

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More than generally during our travel to the Arbeitstagung it was already feeling like summer when we (Johan Calis, Willem Boot & Tjeerd Blacquière) drove to Marburg on March 25, with maples and wild cherry trees blossoming along the way. And knowing of our bees at home being already very active we felt a little drifted from the place where we should be – even though we did not yet know of the mysterious heavy decline of colony losses going on in the Netherlands (9 % winter loss). Drifted, but not losing way because of the nice and well-presented research contributions from Germany and some other places, helping us to stay up to date.

Some remarkable things: just alike here (and elsewhere) a lot of attention was given (and thus research carried out) to low (sub-lethal) dosages of insecticides, and to possible interactions of these with diseases of bees and with other environmental factors. But again alike here: not yet much clarity can be given about the nature as well as the severity of the (possible) interactions. A lot of research is just at its beginning. Therefor we did already report about several 'facts' in the Beekeepers journal Bijenhouden (2014 Nr 3, p 29). Most of the presentations was given by young scientists and most were of high quality.

Drifting

Many factors may influence flying and navigating of bees, and through that on the dwindling (not returning home) of bees, but also on the accuracy of finding their own hive. Neonicotinoids might reduce the accuracy, but the same holds for a Nosema infestation, the carrying of varroa mites, strong winds, displacement of hives (by the beekeeper) or changes of visual beacons around the hives. The use of a pollen trap at the entrance of a hive reduces the accuracy. Or should we better consider this as a case of higher accuracy?

Nadège Forfert investigated whether varroa infested colonies would result in an increase of 'drifting foragers', as compared to colonies with a lower infestation. First she looked at the number of bees that in an apiary took the wrong hive entrance: no fewer than 32%! Most of these errors were to closely neighbouring hives, and possibly such foragers might make the right choice again in a next flight. She also showed that infested colonies did not drift more than not (or low-) infested colonies. Would this have been the case it could also have been a mechanism initiated by the parasite to improve its horizontal transmission. Or of course also possibly on behalf of the secondary parasites, the viruses accompanying varroa. Surprisingly during a varroa treatment there was less drifting; do foragers have a sensitive 'nose' for (formic) acid? Nadège did recognize drifters using genetic markers: based on tandem repeats in the 'nonsense' DNA the origin of each forager could unmistakably be identified by comparison with the known tandem repeat profile of the queens.

Varroa drifts too

In Germany there is concern about re-infestation of colonies with mites after the formic acid treatment in (late) summer. These mites would be originating from colonies of other beekeepers which had not yet treated, or from not so well treated hives. A recent paper from Frey & Rosenkranz (2014) compared the mite fall on the bottom board and the incoming (drifting) mites on two locations: one in an area with high colony densities, and one in an area with low colony densities. The experiment started in the end of July, after they had killed all mites in the colonies using acaricides. In order to estimate how many mites were introduced into the colonies from that moment, half of the colonies were equipped with strips with the acaricides flumethrin and coumaphos, aiming to retrieve any mite entering the hive quickly from the sticky bottom board. In colonies without strips the mites were free to develop and reproduce.

During the three months experiment about 5-15 mites entered the hives weekly in the area with low colony density, but 40 per week in the dense colony area; in the end of August (declining brood area in the colonies) it even went up to 60/week. Accumulated over the whole period: high density, 462 (± 74) mites per colony; low density, 126 (± 16) mites per colony. The strips proved to be effective, as no or hardly any alive mite could be found on bees or in the brood of the treated colonies. In the colonies without strips the infestation showed to increase from about 1% in July to 4% at low colony density, but up to 18% in the area with high density. In the capped brood cells the infestation also increased (up to

50%; note that in October the brood nest is small, resulting always in relatively high infestation levels). Total infestation level per colony in October was 340 mites per colony at low, and 2028 at high density. (So: if you don't like to treat your colonies, at least move them to a 'high colony density area': you will lose many mites by sharing them with your colleagues. Probably not possible then anymore to call them your Bee-Friends).

In the next spring the high density colonies had strongly declined during winter, at least the ones that had no acaricide strip. So even after a well performed varroa treatment with formic acid in the end of summer, re-infestation during autumn can still cause a worse overwintering and spring development.

What can be done?

Especially to catch mites invading the colonies after summer treatment and before in-wintering, Bayer has worked for many years on the Varroa-gate, a gate that allows bees to go in and out freely, but which kills mites on bees passing through. The idea was that with only the use of an acaricide at the entrance of the hive, the build-up of residues in bee wax could be strongly reduced as compared to the use of strips with acaricide inside the hive between the combs. This also helps to retard possible build-up of resistance by the mite against the acaricide.

Stephan Berg showed during the Tagung results from four large field studies with a prototype of the varroa-gate, three in Germany and one in France. It was found that, when the Varroagate was used as intended after the formic acid treatment in July –August, the final mite population during the oxalic acid treatment in December was 1-3 mites per colony in total. In order to keep residue levels as low as possible Bayer prefers to consider the Varroagate as a means to avoid re-invasion by mites. Nevertheless: it could as well be a complement to the normal varroa control in cases that the formic acid treatment did not perform so well (through adverse weather conditions for instance).

"Nicht immer hat die böse Nachbar Schuld"

That you should not always blame the nasty neighbour was concluded by Pia Aumeier, who did a comparable experiment as Frey & Rosenkranz. She found a much lower invasion rate of mites in her colonies (~2,5%), maybe because she had many more nice neighbours than Frey & Rosenkranz. According to Pia especially 'own' mites re-invade, from own colonies in which the formic acid treatment had not worked out too well.

Reference

Frey E & Rosenkranz P 2014 Autumn invasion rates of *Varroa destructor* (Mesostigmata: Varroidae) into honey bee (Hymenoptera: Apidae) colonies and the resulting increase in mite populations. J. Econ. Entomol. 107(2): 508-515. DOI: http://dx.doi.org/10.1603/EC13381