Towards resilient bees

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Bees@wur organized an international workshop on Resilient Honey bees in November 2015. Twenty-two national and international researchers and representatives of initiatives got together to discuss the question how to work towards more resilient bees?

The resilience, or self-reliance, of bees is important for beekeeping. Organisms that cause diseases and pests build-up resistance against the compounds that we use to prevent damage. In addition, treatment costs a lot of time and money. It would be much more durable when bees themselves can suppress pests and diseases. Healthy bees are essential for the pollination of many of our food crops.

23 and November 24 2015 Bees@wur organized an international workshop on resilient bees. At this workshop, 22 national and international researchers and representatives of initiatives met to discuss the steps to take towards more resilient bees and the related conditions to get there. Based on the discussions at this workshop we drew up a joint research agenda in recent months past.

Although the workshop was resilient bees across the whole subject, there was consensus on the parasite *Varroa destructor* being the main pest to tackle first. Many diseases are transmitted by varroa and are expected to reduce automatically with increased varroa resistance. Moreover, different (behavioural) traits against varroa may or will also work effectively against other diseases.

Workshop

Currently, there exist two main methods to increase the (hereditary) resistance of bees against varroa mites. One method selects on the specific resistance traits using breeding programs. The other method selects for colony survival and natural adaptation(s) to local infestation pressure or even the overall local conditions. This second method of selection can also cause tolerance in addition to natural resistance to improving resilience. Some initiatives fit clearly into one of these two methods, other use aspects of both. These two methods are not mutually exclusive – as long as mating stations remain separate - and may even reinforce each other. For example, in naturally selected populations the most important resistance traits can be identified for further use in breeding programs. Alternatively, key traits for beekeeping that are lost through natural selection can be reintroduced by classical breeding.

Both methods identified the main points of action. For the natural selection approach, concepts to start up new potential resilient populations need to be developed, refined and tested for implementation into beekeeping practice. Infrastructures need to be put in place. Involvement of groups of adaptive beekeepers is essential in order to create ‘isolated’ or focus areas for mating and to let beekeeping practice co-evolve with the ‘new colony phenotype’.

For the breeding program approach, existing breeding structures need to be refined and enforced and additional new breeding structures need to be set up. Tailored breeding and selection tools need to be developed and be made available to beekeepers. There is a continuous need for new technologies, but also for new drugs to bridge the gap between

current practices and future resilient bees. Involvement of beekeepers is essential in order to map high potential breeding material in those beekeepers' stocks and to determine the 'wish-list' of the beekeepers' required bee traits.

However, considering the interactions with the environment of the bee makes it essential to include the potential impacts of interactive stressors. Efforts should be made to prevent or reduce unnecessary exposure of bees to stressors as much as possible (stressors from agriculture and beekeeping). We should also take into account possible effects of beekeeper actions on the resilience of the bees. Technical handlings may disturb processes important for the suppression of a pest or pathogen by the natural mechanisms of the bees of bee colonies.

For the long term, it is important that besides working on resistance to Varroa mites we continue to look around and take proactive action against new threats such as the small hive beetle and other invasive species.

For more information about resilient bees and for the full agenda, see our webpage on resilient bees (change page to English on top right)

Photos by Norman Carreck