What's the state of play with bee mortality?

Two of these honey bees have a varroa mite on their backs. Control of this parasite has improved dramatically in recent years.

It looks as though the period of alarmingly high winter mortality in honeybees is over. And a long-term study by Wageningen and Leiden suggests there is no clear cause of other bee deaths. Seven questions about bees, varroa mites and neonicotinoids.

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1 WHY WERE SO MANY BEES DYING?

It has always been the case that some bee colonies don't survive the winter. According to bee researcher Bram Cornelissen, average winter mortality was about three per cent until 1983. That was the year that the infamous varroa mite made its appearance. This insect parasitizes bees and can cause a whole colony to collapse. From the start of this century winter mortality assumed alarming proportions, not only in the Netherlands but worldwide. In the winter of 2009-2010 around 29 per cent of the colonies did not survive into spring. The use of insecticides – and in particular those called neonicotinoids – in agriculture was identified as a possible cause. The Dutch government woke up to the problem in 2011 after the current affairs programme Zembla aired a controversial programme on what it dubbed the 'murder of the bees'. The ministry of Agriculture, Nature and Food Quality commissioned Naturalis to conduct a four-year study (2014-2018) on the causes of the bee deaths. A number of WUR researchers contributed to this, and the report was submitted to the Dutch parliament last summer.

2 WHAT HAS THE STUDY CONTRIBUTED TO OUR KNOWLEDGE?

The most important finding is that winter mortality is not as bad as we thought. The high levels of colony collapse of the first decade in this century have stopped. The last time mortality was higher than 20 per cent was in the winter of 2001-2002. Since then the figure has just about halved. Last winter only nine per cent of the colonies did not survive and most beekeepers did not lose any hives during the winter. Another important point is that there is no smoking gun: no single cause of mortality has been found. Various factors play a role: parasites such as the varroa mite, chemical pesticides, fragmented landscapes. What does increase bee colonies' chances of surviving the winter, is good control of the varroa mite.

3 AND WHAT ABOUT NEONICOTINOIDS?

Residues of chemical pesticides were found in about 30 per cent of the bee colonies in the study, and in 12 per cent these were neonicotinoids, but there is no correlation with winter mortality. And anyway, in 2013 the use of the three most important 'neonics' – imidacloprid, clothianidin and thiamethoxam – was banned on crops that bees feed on, and a total ban was introduced in 2018. While the study reveals no noticeable effects of neonics, this does not mean that they have no effect, says Bram Cornelissen, one of the Wageningen bee researchers who worked on the study. 'There are enough studies in both lab and field that do show that neonicotinoids affect bees. But no studies demonstrate a correlation with winter mortality. His colleague Tjeerd Blacquière, also a bee expert, was not involved in the study and is more outspoken. 'The role of neonicotinoids is always exaggerated. In all the years that the debate has been going on, many beekeepers' colonies have not died. I've never had a colony collapse during the winter. It's a question of careful beekeeping.'

'The role of neonicotinoids is always exaggerated - it's a question of careful beekeeping'

4 SO HOW COME WINTER MORTALITY HAS HALVED SINCE 2012?

There's no clear answer. Experts in Wageningen attribute it to beekeepers' improved understanding, which has resulted in more effective control of the varroa mite. 'Varroa is the most important factor affecting bees' health,' says Cornelissen. 'Beekeepers used to kill varroa by placing a strip with a chemical on it in the beehive. Since 2005 they've been using other substances such as oxalic acid and formic acid, which you apply in the form of drops or a spray: more labour intensive but a less noxious form of pesticide. In 2010 we published a booklet on effective varroa mite control. We think that changing from straightforward chemical control to a more natural method has had a significant effect on the reduction in winter mortality. But remember, we are talking about honeybees, says Blacquière. 'Wild bees are a different story; it's much more difficult to pinpoint the causes of mortality than it is with honeybees.'

5 SO IS THE END OF WINTER MORTALITY IN SIGHT?

No. Mortality levels remain higher than they were before the advent of the varroa mite. It would therefore be good for honeybees to acquire resistance against the parasite. At WUR they've been working on breeding a varroa-resistant bee since 2008. Blacquière: 'We started by separating 75 randomly chosen bee colonies so that the queens only mated with the drones from this group. After one last varroa treatment at the start, we stopped treatments, so that only colonies that were most resilient to the mites survived. Natural selection on the basis of resistance to varroa. Now we're 11 generations further and our bee population is pretty resistant.'

6 IS WAGENINGEN BREEDING A SUPERBEE?

No, WUR is certainly not developing a superbee to put on the market, says Blacquière. His aim is to demonstrate that all beekeepers, or beekeeper collectives, can breed their own resistant bees through natural selection. 'The varroa mite is with us to stay. Our approach is to show that the honeybee has enough genetic potential to be able to deal with the parasite itself. We are developing a protocol that gives instructions on how to do this.'

7 WILL THIS HELP TO FURTHER REDUCE WINTER MORTALITY?

Time will tell. 'A return to pre-varroa mite levels is no longer feasible, I suspect,' says Blacquière. 'If there are no mites in the autumn, winter mortality is around 3.7 per cent. The contamination level in our colonies is between 5 and 10 mites per 100 bees. We don't yet know how much winter mortality that causes.'