A bee pest on the increase: the small hive beetle with its distinctive club-shaped antennae lives in bee hives. It originated in Africa, then spread through North America and has since also been reported in Europe.

THE SMALL HIVE BEETLE

Invasive pest threatens bee colonies

The small hive beetle is a species that is endemic to Sub-Saharan Africa but is currently threatening bee colonies in many regions of the world. What's more, bees living outside its original distribution area are more susceptible to this threat. How can scientists and beekeepers stop this still relatively unknown pest?

Once the small hive beetle (Aethina tumida) infests a colony, beekeepers may have no other choice but to burn their hives. In the EU, this is the procedure stipulated by the law on epizootic diseases to stem any further spread of the pest. However, as the beetles pupate in the soil outside the beehives, some of them may survive the burning of the hives.

Drastic measures often needed to tackle infestation with the persistent pest

Veterinary officials and beekeepers therefore proceed according to a defined plan. To prevent the next generation of beetles from spreading further, they position new hives at the same location after destroying the infested ones. This lures hatching beetles out of the nearby soil in their search for a host hive. The beekeepers must then inspect their colonies at least every fortnight. If they again show signs of infestation with beetles, these hives must likewise be burned. "This systematic approach is designed to help us prevent the small hive beetle from proliferating in Europe," explains Dr. Klemens Krieger, a bee expert at Bayer.

The small hive beetle was introduced to the United States from Sub-Saharan Africa in 1996. Four years later it had also reached Australia and can now be found almost all over that continent. "Many beekeepers in the United States and Australia contributed to the spread of the beetle by using their bee colonies for large-scale commercial pollination and honey production and transporting them around the country," explains Peter Trodtfeld, a beekeeper and bee expert at Bayer.

Comb inspection: the small hive beetle is aptly named. It breeds preferably in the hives of honey bees.

"Systematic measures were initially successful in bringing the pest under control in Portugal in 2004."

Peter Trodtfeld,
beekeeper and bee expert at Bayer

Small hive beetle continuing its global march of conquest in Europe

To date, only individual outbreaks of this pest have been reported in Europe, in Portugal and Italy. "Strict regulation and systematic measures were apparently successful in bringing the invasive pest under control in Portugal in 2004," says Trodtfeld. However, European beekeepers have been increasingly concerned since researchers from the University of Reggio Calabria detected the pest in a 2014 study in southern Italy. "Burning the hives is the only really effective way of stopping the spread," says Krieger. "But it's very likely that the beetle will soon establish itself

Photos: Gaby Gerster/Bayer AG (1), Michael Rennertz/Bayer AG (1), Alexander Wild (2), Dieter Eck (1), Shutterstock (1), private (1)

throughout Europe as well." Bee experts are now trying to tackle the pest in a race against time. However, many of them believe that the battle in southern Italy has already been lost and that the beetle has already established itself there.

Invasive pest leaves a trail of destruction in the hive causing the honey to ferment

Beekeepers in countries confronted with the pest were surprised by the devastation that the beetle causes in such a short time. "Unlike the honey bee's biggest and best-known enemy, the Varroa destructor mite, the small hive beetle does not directly attack bees," says Trodtfeld. "Nevertheless, it harms the entire colony, moving into the hive and destroying the resources that the bees need to survive." The brood nest of honey bees offers adult beetles ideal conditions to reproduce. Their larvae feed on the stored honey and pollen and destroy the combs. They tunnel through the combs, undermining them and leaving behind slimy defecation products. The larvae contaminate the honey, causing it to ferment, spoil and then ooze out of the combs, making it useless to both the bees and the beekeepers.

At present beekeepers in only a few countries have access to a limited number of insecticides to control the small hive beetle. None of them are registered in Europe. Coumaphos, for example, can be used to combat the small hive beetle in certain countries, such as the United States. Bayer is seeking to obtain approval for it in Europe as well. "The problem is that at present it is not clear from a regulatory point of view whether these products should be considered as veterinary drug products or pest control agents," explains Krieger. Bayer is currently working on modifying the formulation of existing products to comply with the current regulatory requirements for agents targeting the small hive beetle in other countries beyond the USA. The development of new insecticides would take too much time and would also be cost-intensive.

Beekeepers fight tirelessly to help their bees

In the absence of synthetic treatment options, beekeepers are forced to manually remove the beetles from their hives or lure them into traps. Left to themselves, a heavy beetle infestation can completely destroy a bee colony within a week. Bees protect themselves against the invasion by fleeing the hive, leaving the honey and their brood behind. The beetles are then able to reproduce undisturbed for some time, and the next generation then searches for new host colonies. "In the event of heavy infestation, beekeepers should therefore destroy infested colonies and their hives at an early stage. That will prevent the beetle from spreading to other hives," says Trodtfeld.

Bayer is engaging in various research collaborations and working on information materials to help beekeepers better protect their bees against this devastating pest in the future. It is a race against time. But unlike their counterparts in the United States and Australia, who were completely unprepared for the pest, European beekeepers still have a chance to gear up for the onslaught.

The biology of the small hive beetle

The small hive beetle is a member of the family of sap beetles (Nitidulidae), which comprises some 2,500 species worldwide. Some of these insects are pests of fruit, stored food or crops. Other species, including the small hive beetle, live in the nests of bees or wasps.

Threat for the honey bee: the greatest devastation in the hive is caused by the beetle larvae (photo left), which feed on the stored honey and pollen and the combs. In the long term they can completely destroy the comb material. Dr. Klemens Krieger is concerned that the beetle will continue to spread through Europe (right).

Interview

"An alien pest is spreading"

research *talked to Professor Peter Neumann, who teaches at the Institute of Bee Health at Bern University in Switzerland. His bee research covers various aspects, from the behavior of bees and their evolution through to bee pests. Beekeeping associations have been asking him whether the small hive beetle will now conquer Europe as well.*

Peter Neumann

What is the situation like in Europe?

The small hive beetle is now permanently established in Calabria. In 2015, one year after the first sighting of the beetle in southern Italy, there was still the hope that it had been eradicated. But then in the two following years, 2016 and 2017, more sightings were reported to the Italian authorities. In other words, the small hive beetle is here to stay in southern Italy.

What does that mean for beekeepers?

Many beekeepers are concerned. The small hive beetle is a serious threat to bee colonies, but nothing like the Varroa mite for the time being. I am trying to put their concerns into perspective: what they should do now is learn how to deal with the pest and adjust their beekeeping accordingly. It makes sense to take a combination of measures: good hygiene in the apiary and the honey centrifuge room, timely centrifugation of the honeycombs after the harvest, targeted traps for the beetles in the colonies, making sure that the bees always have access to all parts of the hive yet not leaving them too much space.

How quickly can the pest continue to spread?

That is difficult to predict. The main problem is not that the pest spreads naturally but rather that it is spread by man, for example due to the transport of bees and used beekeeping equipment. Bee products like untreated wax can also contain the pest and enter completely new regions as trade products – including far beyond the borders of Italy. If we cannot establish an effective control system for migratory beekeeping now, the beetle will be found all over Europe in just a few years' time. We have clear evidence from the United States and Australian that migratory beekeeping can very quickly spread the beetle. As such, there should definitely not be any migration of bee hives from and into the affected regions. Furthermore, beekeepers should be more alert in general and check their colonies and equipment carefully for beetles and their larvae and eggs.