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## Bee decline linked to falling biodiversity

By Richard Black

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Before and after: entire colonies of bees have collapsed in the US

**The decline of honeybees seen in many countries may be caused by reduced plant diversity, research suggests.**

Bees fed pollen from a range of plants showed signs of having a healthier immune system than those eating pollen from a single type, scientists found.

Writing in the journal *Biology Letters*, the French team says that bees need a fully functional immune system in order to sterilise food for the colony.

Other research has shown that bees and wild flowers are declining in step.

Two years ago, scientists in the UK and The Netherlands reported that the diversity of bees and other insects was falling alongside the diversity of plants they fed on and pollinated.

Now, Cedric Alaux and colleagues from the French National Institute for Agricultural Research (INRA) in Avignon have traced a possible link between the diversity of bee diets and the strength of their immune systems.

"We found that bees fed with a mix of five different pollens had higher levels of glucose

oxidase compared to bees fed with pollen from one single type of flower, even if that single flower had a higher protein content," he told BBC News.

**“ You've now got large areas of monoculture; and that's been a fairly major change in what pollinating insects can forage for ”**

David Aston

British Beekeepers' Association

Bees make glucose oxidase (GOX) to preserve honey and food for larvae against infestation by microbes - which protects the hive against disease.

"So that would mean they have better antiseptic protection compared to other bees, and so would be more resistant to pathogen invasion," said Dr Alaux.

Bees fed the five-pollen diet also produced more fat than those eating only a single variety - again possibly indicating a more robust immune system, as the insects make anti-microbial chemicals in their fat bodies.

Other new research, from the University of Reading, suggests that bee numbers are falling twice as fast in the UK as in the rest of Europe.

### **Forage fall**

With the commercial value of bees' pollination estimated at £200m per year in the UK and \$14bn in the US, governments have recently started investing resources in finding out what is behind the decline.

In various countries it has been blamed on diseases such as Israeli Acute Paralysis Virus (IAPV), infestation with varroa mite, pesticide use, loss of genetic diversity among commercial bee populations, and the changing climate.



Varroa mite infestation could be made worse by lower bee immunity

The most spectacular losses have been seen in the US where entire colonies have been wiped out, leading to the term colony collapse disorder.

However, the exact cause has remained elusive.

A possible conclusion of the new research is that the insects need to eat a variety of proteins in order to synthesise their various chemical defences; without their varied diet, they are more open to disease.

David Aston, who chairs the British Beekeepers' Association technical committee, described the finding as "very interesting" - particularly as the diversity of food available to UK bees has declined.

"If you think about the amount of habitat destruction, the loss of biodiversity, that sort of thing, and the expansion of crops like oilseed rape, you've now got large areas of monoculture; and that's been a fairly major change in what pollinating insects can forage for."

As a consequence, he said, bees often do better in urban areas than in the countryside, because city parks and gardens contain a higher diversity of plant life.

### **Diverse message**

While cautioning that laboratory research alone cannot prove the case, Dr Alaux said the finding tied in well with what is happening in the US.

There, collapse has been seen in hives that are transported around the country to pollinate commercially important crops.



### **Biodiversity near 'point of no return'**

"They move them for example to [a plantation of] almond trees, and there's just one pollen," he said.

"So it might be possible that the immune system is weakened... compared to wild bees that are much more diverse in what they eat."

In the US, the problem may have been compounded by loss of genetic diversity among the bees themselves.

In the UK, where farmers are already rewarded financially for implementing wildlife-friendly measures, Dr Aston thinks there is some scope for turning the trend and giving some diversity back to the foraging bees.

"I'd like to see much greater awareness among land managers such as farmers about managing hedgerows in a more sympathetic way - hedgerows are a resource that's much neglected," he said.

"That makes landscapes much more attractive as well, so it's a win-win situation."

The French government has just announced a project to sow nectar-bearing flowers by roadsides in an attempt to stem honeybee decline.

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