



# BEE RESEARCH ON AN UNPRECEDENTED SCALE

**A glimpse behind the scenes of the Mecklenburg-Vorpommern study: One of the largest oil seed rape field research studies on the impacts of the neonicotinoid, clothianidin, on bees in Europe.**

Honey bee colony losses in recent years, particularly in Europe and North America, have raised public concern in many countries around the world. Understandably: bees and other pollinators provide a critical service to agricultural and natural ecosystems. It's in everyone's interests to ensure a robust and healthy bee population.

While much scientific opinion now points to a combination of factors affecting bee health – and some evidence suggests that honey bee colony numbers are on the rebound in Europe – the EU took the decision in 2013 to place restrictions on the use of several neonicotinoid pesticides, while their impact on bee health was further investigated. Bayer, manufacturers of some of these pesticides, has been supporting these further investigations by undertaking extensive research programmes.

Results from one of the largest field trials in Europe, the Mecklenburg-Vorpommern study, are now in and published. Dr Juergen Keppler, Bayer Crop Science's Group Leader Ecotoxicology, explains the significance of the study.

Dr Keppler, an agronomist by training, has been involved in bee research and risk assessment since joining Bayer more than 15 years ago. "You could say I follow the bees, and the bees follow me!" he says.

"And as an agronomist, I always try to keep the broader picture in mind. In large parts of Europe we have excellent soil and weather conditions to grow crops. So for me, it's about doing my bit to ensure we have the right balance: we have a responsibility



Dr Keppler

*"Bayer's role in this study was to share experiences from our own work concerning logistics – for example, how to ensure the sampling devices and samples for the test and reference sites are kept strictly separate. This is crucial, but when you're dealing with test substance concentrations at trace levels of parts per billion, it's very difficult to achieve."*

— Dr Juergen Keppler  
**Bayer Crop Science Group  
Leader Ecotoxicology**

to make best use of these favourable agronomic conditions and contribute to global food supply – of course in a sustainable way."

Neonicotinoid seed treatments have been successfully used in growing oilseed rape for more than a decade. These products help farmers

*Continued >*

grow an important crop, by protecting it from pests. And a healthy flowering crop serves beekeepers well during spring, providing a nectar source for their honey bees to feed on.

During the development of plant protection products, assessments carried out in the lab, under strict testing conditions are performed to characterize the risk potential. If risks can't be excluded on the laboratory scale – which is the case for certain neonicotinoids and bees – higher tier effect and exposure studies under more realistic use conditions have to be performed to demonstrate that products and uses can be registered. These studies showed that clothianidin residues in nectar and pollen of oilseed rape have no adverse effects on honeybee colony health.

Dr Keppler explains: “All regulatory lab and field studies have to meet high quality standards. Our own labs and those of contract research organisations performing regulatory studies are certified to the “Good Laboratory Practice” (GLP) standard, which we see as our ‘license to test’. This is a very high standard, which requires a high level of staff qualification and strict processes be followed for data collection and documentation, as well as regular calibration of lab equipment such as pipettes and balances. Adherence to these high standards is regularly audited in detailed inspections by the competent authorities and pre-requisite for a successful re-certification.”

But for an issue this important, Bayer went even further, and set about organising a field trial on an unprecedented scale in Europe – of course again under GLP conditions.

“Undertaking this study presented a lot of challenges. First of all we needed to find an organisation external to Bayer to conduct the study. So the research was conducted by a Contract Research Organisation, who specialise in field studies. It also involved several renowned bee experts for the different bee pollinator species tested -wild bees, bumblebees, and honey



1500 cocoons of solitary bees were released per test location.

bees - independent from both the research organisation and Bayer. Bayer's role in this study was basically to share experiences from our own work concerning logistics – for example, how to ensure the sampling devices and samples for the test and reference sites are kept strictly separate. This is crucial to prevent cross-contamination, but when you're dealing with test substance concentrations at trace levels of parts per billion, it's very difficult to achieve”.

“Another aspect of the study was to find the farmers. When you're talking about hundreds of hectares, this is no small feat. It had to be the right landscape, with few other flowering crops around the oilseed. And the farmer had to be prepared to create a control area where the product – which had been the reliable and well established standard for protecting the crop from pests – was not used. When you're talking about an area of 2 x 65 square kilometers, this presented a particular challenge for us to overcome.”

Dr Keppler's trip to the fields during the project brought home the level of effort involved: “I visited the study during the nectar and pollen sampling phase and was impressed by the commitment of the team and scrutiny applied. The full team were staying

*Continued >*



From left: Honey Bee (*Apis mellifera*); Red Mason Bee (*Osmia bicornis*); Buff-tailed Bumble Bee (*Bombus terrestris*); One of the test fields.

there on a camping site living in bungalows, for several weeks or even months. To ensure a complete separation between test and reference sites during residue sampling, dedicated teams working in test and reference sites were formed who used different cars and even different colours of clothing.

“The researchers found some new things that improve our understanding of the different bee species which were tested in this study. 1500 cocoons of solitary bees were released per test location, which resulted in several thousand offspring the year after and allowed really robust conclusions. There is less technical experience with solitary bees, so a personal surprise and fascination was how these bees also use other flowers as food sources in a landscape which was really dominated by flowering oil seed rape. This is why it’s really important to understand behaviour in the field.”

The results from the large-scale monitoring confirmed and supported the previous findings from the lab and field trials: detailed analysis of the pollen and nectar samples from bees foraging in clothianidin-treated oilseed rape fields were exposed to levels of clothianidin at a level of one part per billion and thus well below any effect threshold. In all, the study demonstrated no adverse effect on honey bee colony development, bumble bee populations or the reproduction of solitary bees.

Dr Keppler concludes: “There are many publications about potential effects of neonicotinoids on bees – the vast majority of studies are performed in the lab under partly unrealistic concentrations. This large-scale monitoring enabled us to confirm previous conclusions and demonstrate the safety of clothianidin seed treatments in oilseed rape for bee pollinators under realistic conditions.”