

## **Soil Association Bee Briefing**

### **The evidence that neonicotinoids are implicated in the decline in honey bee populations, and why they should be banned in the UK:**

#### **Setting the scene**

Over the last two years there has been a massive, worldwide drop in bee numbers. In the UK beekeepers report a one in three loss of bee colonies has occurred. In 2007, Lord Rooker, then a DEFRA Minister, said "If nothing is done about it, the UK honey bee population could be wiped out in 10 years". However, this is a worldwide phenomenon, and appears that we are heading towards a global disappearance of honey bees.

This has serious consequences for worldwide food security and will have huge economic impacts. Bees are the 'canary in the coal mine' – their deaths are a warning to us all that the health of the planet is under threat. This is because bees are our most important pollinators and play a vital role in the food chain – it is estimated that one third of human food supplies (so 1 in 3 mouthfuls) depend on bee pollination.

#### **Why are bee populations declining?**

This is the million-dollar question to which there is not yet a definitive answer. The Co-op has just donated £150,000 for their 'plan bee', a 10 point plan to save the bees. The Co-op has also banned the use on their farms of some pesticides hazardous to bees, including neonicotinoids. There is also a huge amount of worldwide research being done into the causes of bee colony declines.

A major suspect for this is a new group of insecticides called neonicotinoids, which were first used in agriculture in the mid 1990's – exactly the time when mass bee disappearances started occurring. The evidence against these chemicals is strong, which is why they have been withdrawn in several European countries (France, Germany, Italy and Slovenia). However the UK government has not yet followed suit.

#### **Why are bees so susceptible to pesticides?**

Through mapping of the bee genome we know that bees have a much-reduced capacity to detoxify chemicals, when compared to other insects, relying instead on the behaviour of other bees in the hive (nurse bees) to clean them off on arrival back to the hive. In addition there is another very efficient safety net strategy in place, whereby on the first day of foraging in a new area, scout bees are sent out first to taste the nectar and pollens, and any that are adversely affected will be expelled from the hive immediately on their return. So they are acting as 'testers' before large numbers of the colony go out to feed in a new area. These two behavioural strategies seem to be in place to make up for the fact that bees have a lesser detoxifying capacity in their bodies compared to some other insects. But this does make honey bees particularly susceptible to sub-lethal exposure to pesticides. Honey bees are also found to have a higher number of the neurological receptors that are targeted by Neonicotinoids, than other insects.

Honey bees live in colonies of about 50,000 bees per hive, of which about 10,000 are foragers. These need to coordinate their quest for nectar – so when they return to the hive they dance on the comb in a very special way (the 'waggle dance') that communicates to the others the flight direction according to the sun, and the distance,

to the source of the nectar. Honey bees also exhibit other complex behaviours such as the building of the honeycomb – a perfect hexagonal cell. All these skills are based on both innate and learned behaviour patterns and rely on the integrity of a nervous system where each synapse is crucial.

So the disruption to the neurological signalling of honey bees by Neonicotinoids means that they become disorientated. The chemicals impair their communication, homing and foraging ability, flight activity, olfactory discrimination (smell is also vital to bees communication systems), and learning, and a weakened immune system.

Honey bees do not live as individuals; they act as a colony. Therefore looking at what amounts to lethal doses of pesticide in individual bees, as is the case in most safety pesticide trials, does not give a picture of how neurological disruption will affect honey bees.

## **Countries that have taken action against neonicotinoids to protect their honey bees:**

### **France**

Widespread hive collapse was first seen in France in July 1994, a few days after the sunflowers came into bloom. This coincided with the use of a brand new insecticide used to treat the sunflower seeds. This new insecticide was 'Gaucho' manufactured by Bayer – and the chief ingredient is the Neonicotinoid 'Imidacloprid' (IMD). It was being used on half of France's sunflower seeds by 1997.

In 1999 honey production in France fell to 50,000 tons - down from 110,000 tons in 1996. The National Union of French Beekeepers (UNAF) reported a third of the country's honey bee colonies had disappeared. They were desperate and lobbied the French agriculture ministry.

In 1997, after much lobbying by UNAF, the Commission des Toxiques put up 6 million francs for research into how IMD was affecting bees, but did not suspend the IMD at this point.

1998 saw intense IMD research in France; and the results of this research, carried out at Bologne University and the Institute National Recherche Agricole (INRA) told a different story from the pesticide manufacturers.

The French researchers (led by Dr Colin at INRA) looked at doses of IMD down to <1 ppb (parts per billion) and found that as little as 6ppb could impair the foraging behaviour of the bees – and their feeding behaviour. They have video evidence of this – comparing organic and IMD affected colonies. This was of course completely at odds with the manufacturer, Bayer's, figure of IMD being safe at levels 50- 100ppb.

However despite all this compelling evidence the Commission des Toxiques still did not suspend IMD use and opted to continue trials.

The beekeepers (UNAF) and allied organisations took direct action and protested on the streets in Paris in December 1998. They appealed to the Minister of Agriculture Marc Galvany, who could overrule the Commission des Toxiques. On Jan 22<sup>nd</sup> 1999 the

Minister acted on the scientific evidence and directed IMD be suspended from use on sunflowers until research proved it safe (this suspension was upheld in 2000). This was the first time the principle of precaution had been used in France in a decision to remove a pesticide from the market.

In addition the beekeeping organisation UNAF has stated that the safety tests required by the EU directive 91/414/EEC have not been carried out on Gaucho. When the risk coefficient (Hazard Quotient or HQ) of a product rises above 50 it is compulsory under EU law to carry out a number of tests on bee larvae. For Gaucho, used on sweet corn seed, the HQs are 18,900 and 11,283 for oral and dermal exposure respectively. Bayer argued that the HQ value is irrelevant where seed dressings are concerned as the seeds are not consumed. However, the chemicals are detected in the nectar and pollen consumed by bees.

In different judgements (the last one in 2006) France's Council of State declared that the conditions of authorization for Gaucho had not been fulfilled, compelling the Minister to suspend the use of Gaucho until the EU completes its review of IMD. The ban on Gaucho in France seems to have worked. By 2006/07 bee deaths had fallen to less than 10%.

Imidacloprid has been banned as a sunflower seed dressing since 1999 and in 2003 was also banned as a sweet corn, oilseed rape. Bayer's application for approval of Clothianidin was also rejected by French authorities. This ban is still in place.

In France over 90 billion bees died over the last 10 years, reducing honey production by up to 60%

### **Germany**

Banned in May 2008 – after a huge problem where sticking agent was not added, so IMD was airborne.

Germany banned Neonicotinoids for seed treatment in May 2008, due to negative effects on bee colonies. Beekeepers in the Baden-Württemberg region suffered a severe decline, losing two thirds of their bee colonies, linked to the use of Clothianidin. "It's a real bee emergency," said Manfred Hederer, President of the German Professional Beekeepers' Association. Tests on dead bees showed that 99% of those examined had a build-up of Clothianidin.

Bayer says the pesticide entered the environment because farmers failed to apply an adhesive agent that affixes the pesticide to the seeds. Without the fixative agent, Bayer says, the pesticide drifted into the environment from sown rapeseed and sweet corn and then killed the honeybees.

### **Italy & Slovenia**

Last year (2008) the Italian and Slovenian governments also withdrew the use of several Neonicotinoid pesticides that are blamed for the deaths of millions of honeybees. The Ministero del Lavoro della Salute e delle Politiche Sociali in Italy issued an immediate suspension of the seed treatment products Clothianidin, Imidacloprid, Fipronil and Thiamethoxam used on rapeseed oil, sunflowers and sweet corn seeds. The Italian Government will start a monitoring program to investigate further the reasons for recent bee deaths.

