Bees and the EU Pesticides Ban

The recent move by the European Union to protect ailing honeybee populations by imposing a two-year suspension of a number of neonictionoid pesticide uses has been celebrated and derided in equal measure. In the absence of unequivocal empirical evidence linking the mass bee decline to neonicotinoid use, the key point of contention is whether, during the past decade, neonicotinoids are the primary contributor, just one in a complex mix of factors, or totally uninvolved in widespread colony collapse disorder.

Neonicotinoids are a class of systemic insecticides that act on the central nervous system of insects[1]. Available since the 1990s and generally much less toxic to humans than other classes of insecticides such as carbamates and organophosphates, neonicotinoids are now used on approximately 100 million acres of crops.

In a vote of the Standing Committee on the Food Chain and Animal Health in April this year France, Germany, Poland plus twelve other members supported the suspension, eight including Britain and Italy opposed it and four abstained. A clear majority was not reached, so the European Commission, which has the final legislative say in such situations, made the decision to implement the temporary restrictions, set to become effective at the end of 2013.

The Commission has implemented regulation (EU) 485/2013 in response to European Food Safety Authority (EFSA) reviews on bees and the active substances clothianidin, imidacloprid and thiamethoxan. The conclusions[2,3,4] of these reviews were published in January 2013 and found that, in each case, the active substance poses unacceptable risks to bees, primarily from dust associated with seed treatments. The published conclusions also identify risks to bees from residues in pollen, nectar and guttation fluid; and highlight a large number of data gaps.

Although high levels of risk were identified, the risk assessments draw on data from a small number of exposure studies and EFSA notes that high levels of exposure would be limited to a narrow strip of vegetation at the field edge. Supporters of neonicotinoids argue that the risk assessments are based on insufficient data to be truly representative of realistic agricultural conditions and that, effectively, the Commission decision is an application of the precautionary principle. That the Commission draws attention to the data gaps in their decision only re-enforces this view. The precautionary principle has been part of European law for a number of years[5] but this decision still comes as a surprise. When data gaps for other approved products have been identified in the recent past it has been accepted practice to provide industry a period of grace to generate new data, allowing continued sales, before a final decision is taken.

However, bees are essential participants in agricultural and natural ecosystems so few could argue against active steps towards their protection. Out of the 100 crop species providing around 90% of food globally, 71 are pollinated by bees. But with the current gaps between laboratory and field research, it has been difficult for researchers in the field to demonstrate a clear link between neonicotinoid use and impact on bee populations. Although there are a large number of reports[1,6] that implicate neonicotinoids in colony collapse through sub-lethal effects, including adverse impacts on foraging behaviour and efficiency, a 2012 EFSA opinion[6] found that many of the published observations are based on exposure rates well in excess of realistic environmental concentrations and, therefore, those findings do not indicate a practical risk. There is evidence of interactions between sub-lethal neonicotinoid exposure to bees and infection by the bee gut parasite *Nosema* spp[7,8,9]. although EFSA points out that it is difficult to extrapolate these findings to field conditions[6]. It is clear that bee populations have been declining and suspicion of neonicotinoids remains high[1] and it is against that background that the 2013 EFSA reviews were conducted.

Agrochemical industry giants such as Bayer CropScience and Syngenta, along with many farmers and agrobusiness lobbyists, argue hard economics alongside science. The Humboldt Forum for Food and Agriculture has estimated that without neonicotiniods, maize and cereals cut yields will fall by 20% and cost the EU economy £3.7bn. In UK terms the estimated cost of the ban will be £360 million with crops like oilseed rape and winter wheat being damaged.

The argument continues that suspension of these products will lead to growing dependence on a small group of insecticides, principally within the pyrethroid class, as uses of many of the older alternatives such as carbamates and organophosphates have been banned or severely restricted due to safety concerns. US information suggests that pyrethroids may present a greater danger to bees than neonicotinoids[10], whilst over reliance on a single chemical class also brings dangers of increasing pest resistance to insecticides.

This pro-neonicotinoid lobby maintain that lack of nutrition, climate, parasites, disease, genetics and bee management practice all play a part in the bee decline. US research indicates that a parasite known as the varroa mite is the "single most detrimental pest of honey bees"[10]. Neonicotinoid supporters point out that in Australia, where varroa mite is not a problem, bee populations have thrived despite widespread neonicotinoid use.

Supporters of the suspension point out, however, that introduction of neonicotinoids brought little if any improvements to European cereal yields, argue that neonicotinoid use in seed dressings undermines the principles of integrated pest management and predict that a broad range of non-target arthropods are at risk from use of these products[1].

Time will tell if the two-year suspension is indeed a "historic milestone on the road to recovery for these crucial pollinators", as Friends of the Earth put it, or whether the Bayer CropScience view that "what is really sad about the suspension is that we will see more spraying of insecticides, more difficulty cultivating crops yet not a single bee will be saved" proves to be closer to the truth. Certainly the political, economic, environmental and scientific ramifications mean that the lobbying, research and debate which accompanied the suspension will not cease in the foreseeable future. Amongst all the argument and politics there is a clear need for rigorous, appropriate and well-focused research to be done in order to draw reliable conclusions that can inform policy.

- **Rob Carlton and Luke Fabian**

Refs:

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6 Anon. 2012. Scientific Opinion on the science behind the development of a risk assessment of Plant Protection Products on bees (Apis mellifera, Bombus spp. and solitary bees). EFSA Journal, **10**: 2668.

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New Members Elected 22 March 2013

Miss Sam Amy, Ecologist at Centre for Ecology & Hydrology, Wallingford with special interests in biological control, food systems, pesticide application and agri-environment schemes & agricultural biodiversity

Mr Mario Balzan, PhD Student at Institute for Life Sciences, Scuola Superiore Sant'Anna, PISA with special interests in biological control, cropping and the environment and applied entomolgy

Mr Jon Birchall, Farm Management Consultant, Bloxham with special interests in cropping and the environment, food systems, pesticide application and plant physiology & crop improvement

Mrs Roxanna Bonyadi Pour, PhD Student at Life Sciences Student at University of Warwick studying resource use efficiency of legumes, in particular Megicago and how they balance lateral root and nodule development according to their nitrogen status with special interests in applied mycology and bacteriology, biological control, cropping and the environment, food systems and plant physiology & crop improvement

Dr James Cockram, Research Scientist at NIAB, Cambridge with special interests in cropping and the environment and plant physiology & crop improvement

Dr Edna Curley-O'Flynn, Postdoctoral researcher in crop science dep. Studying the quality of milling wheat in Ireland, with special interests in biological control, cropping and the environment, food systems, pesticide application, soil science and nutrient cycling

Dr Carole Desbois-Vimont, Seed Technology R&D Manager at Clause a Vegetable Seed Company, France with special interests in applied mycology and bacteriology and pesticide application and plant physiology & crop improvement

Ms Claire Fremann, Research Scientist, Cereals Plant Breeding Company KWS-UK, Royston with special interests in applied mycology and bacteriology, biological control, cropping and the environment, food systems, nematology, pesticide application, plant physiology & crop improvement and virology

Dr Oorbessy Gaju, Research Fellow working on pre-breeding project investing some physiological traits in wheat which enhance nitrogen use efficiency and biomass production, with special interests in cropping & the environment and plant physiology & crop inmprovement