Pollinators research informs UK and European pesticides policy debate

Research into the effects of pesticides on pollinators, with funding from the Insect Pollinators Initiative and BBSRC, is informing UK and European political debate on pesticide use.

Researchers studying the effects of pesticides on pollinators presented the results of their work to the Environmental Audit Committee’s Pollinators and Pesticides inquiry at the House of Commons in November 2012, and again in June 2014. The report subsequently produced by this committee, and the European Food Safety Authority’s (EFSA) “Scientific Opinion on the science behind the development of a risk assessment of Plant Protection Products on bees” both cited the findings of these research projects, among others.

“They asked me specifically about this work and the wider impacts of it, and what we thought were the significance of our findings,” says Nigel Raine, one of the lead researchers on the Insect Pollinators Initiative-funded project investigating the effects of pesticides on bees, and now Professor of Pollinator Conservation at the University of Guelph in Ontario, Canada.

The European Commission drew heavily on these reports as part of its decision-making process that led to the two-year moratorium on pesticide use effective from December 2013.

The evidence was provided by Raine, Dr Christopher Connolly – a reader at the University of Dundee who led the Insect Pollinators Initiative-funded research into the effects of pesticides on bees – and Professor Dave Goulson, who has received funding from BBSRC to study the effects of agricultural practices and landscape on bee populations and is now Professor of Biology at the University of Sussex. These on-going interactions, and other consultations, allow EFSA to base its on-going discussions and recommendations regarding pesticide use on up-to-date scientific evidence.

“This means UK scientists are in the frame to directly have a more immediate impact on policy regarding pesticide use in the future,” says Connolly. “We are now part of the process and scientific opinion will be heard as evidence emerges.”

“There is on-going work on this subject,” says Raine, “and clearly we need to consider more evidence in the future and keep policy-makers aware of it. For example, we recently published the first evidence that neonicotinoid exposure not only affects the behaviour of bees, but also the pollination services they provide to crops.”

Assessing the impact

Connolly and Raine were two of the lead scientists on a research project assessing the impacts of sub-lethal exposure to pesticides on bees, which received £1.5M in funding from the Insect Pollinators Initiative. Connolly and his team studied the effects of pesticides on bees at a molecular level, and found that organophosphate and a neonicotinoid pesticide called imidacloprid, disrupt honeybees’ nervous system when applied at levels bees would encounter in the field. As predicted, these deficits were shown to affect bee learning and memory. In bumblebees, Connolly’s team found that imidacloprid in

IMPACT SUMMARY

Researchers funded by the Insect Pollinators Initiative and BBSRC provided evidence for UK and European political debates on the effects of certain pesticides on pollinators.

The findings were cited in reports from the UK House of Commons Environmental Audit Committee and the European Food Safety Authority. Both reports contributed to the European Commission discussions that led to a two-year moratorium on certain neonicotinoid pesticides.

The researchers also presented their results, which describe the effects of neonicotinoids on bees and their colonies, to the US Congress and to the US Environmental Protection Agency to help them decide whether to implement a similar ban to that introduced in Europe.

The researchers contributed to the work of the Pest Management Regulatory Agency (PMRA) in Canada, as well as the Ontario Ministry of Agriculture, Food and Rural Affairs.

The research was supported by a £1.5M grant through the Insect Pollinators Initiative (funded by BBSRC, NERC, Defra, The Scottish Government and Wellcome Trust through the Living With environmental Change Programme) and through £1M BBSRC responsive mode grants.

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nectar and pollen took days to accumulate in the bees’ brains, where it disrupted energy production in neurons. They also found that exposure to imidacloprid reduced the performance of entire colonies12.

Raine and his team studied the effects of neonicotinoid imidaclopid and pyrethroid insecticides on bumblebee colonies and found that both reduced rates of colony growth, with colonies exposed to the two types of insecticide in combination suffering the largest reductions in numbers and highest rates of failure13. Chronic, low-level exposure to neonicotinoids (both imidaclopid and another, thiamethoxam) affects learning, memory14 and foraging behaviour15 in bumblebees. In addition to these impacts on normal behaviour, sublethal exposure to neonicotinoids can affect the pollination services bumblebees provide to economically important crops like apples16.

UK research, international influence

Dave Goulson17, now Professor of Biology at the University of Sussex18, has received four three-year responsive mode grants from BBSRC, totalling approximately £1M, to study the effects of agricultural practices and landscape on bee populations. Based on this research, he published one of the first papers revealing the effects of the neonicotinoid imidacloprid on bumblebee colonies19.

“Research Council funding has played a major role in generating knowledge of how pesticides affect pollinators,” says Goulson. “The UK has been one of the bigger players contributing evidence on this issue. A lot of the key research has been carried out here.”

Interest in the findings of the UK research has extended beyond Europe to North America. Goulson was invited to Washington, DC in March 2014 to speak to the US Congress regarding a congressional bill proposing restrictions on neonicotinoid use.

Raine has been contacted by the US Environment Protection Agency (EPA), which is in the process of assessing the effects of neonicotinoids on pollinators with a view to making a decision about whether a ban similar to that in Europe should be implemented in North America. The EPA has corresponded extensively with Raine and his team, who are providing raw experimental data to help the EPA carry out a thorough assessment on which to base their policy decision.

Raine is also in contact with the Pest Management Regulatory Agency (PMRA) in Canada, which has a similar interest in the effects of pesticide use. Since moving to Canada in May 2014, Raine has been acting as a strategic advisor to the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) on the potential impacts of neonicotinoids and other issues relating to pollinator health.

“Our 2012 Nature paper on combined pesticide exposure in bees has acted as a real catalyst,” says Raine. “Since it was published I’ve had a lot of discussions with policymakers and NGOs, all interested in the results of our ongoing research.”

REFERENCES

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8 Dave Goulson, University of Sussex: http://www.sussex.ac.uk/profiles/126217.
9 At the time of this research, Dave Goulson was at the University of Stirling.
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