Scottish Wildlife Trust

Briefing
Neonicotinoids

What are neonicotinoids?

Neonicotinoids are a group of systemic insecticides[1] which attack the nervous system of invertebrates, and are routinely used by farmers to help protect crops such as oilseed rape (OSR) from sap sucking insects such as aphids and other insect herbivores.

How neonicotinoids work

There are a variety of active compounds (e.g. imidacloprid, thiacloprid, thiamethoxam and clothianidin) which are all nicotine-based. They work by binding to important neurotransmitter receptors in insects which causes their paralysis and death. This neural pathway is more abundant in insects than mammals and birds.

Sub-lethal dosage

Neonicotinoids are used as a 'seed dressing'[2] which is taken up by all of the plant tissue and is therefore found in pollen and nectar too. Therefore **all** pollinators and insects feeding on nectar such as honey bees, bumblebees, hoverflies, butterflies and moths are exposed to a small (sub-lethal),[3] prolonged dose of the toxin when the crop blooms.

Effects on honey bees, bumblebees and other pollinators

Increasingly, research shows that neonicotinoids have a detrimental effect at sub-lethal doses on honey bees and bumblebees because they affect their behaviour which can impact on their performance as workers and potentially affect the colony.[4,5,6]

Henry et al[4] work concluded that: *exposure of [honey bee] foragers to non-lethal but commonly encountered doses of thiamethoxam can affect forager survival, with potential contributions to collapse risk*.

Stirling University research group[5] found bumblebee colonies produced significantly less new queens when fed imidacloprid compared with control colonies. They concluded that: *there is an urgent need to develop alternatives to the widespread use of neonicotinoid pesticides on flowering crops wherever possible*.

Gill et al[6] found bumblebees exposed to imidacloprid had a decreased pollen foraging efficiency leading to increased colony demand for food. They concluded: *our findings have clear implications for the conservation of insect pollinators in areas of agricultural intensification, particularly social bees with their complex social organization and dependence on a critical threshold of workers performing efficiently to ensure colony success*.

The effect on other insect pollinators such as solitary bees, hoverflies, butterflies and moths is unknown.

The pesticide industry continues to maintain that their products are safe to use for non-target species. They conduct their own research which is examined by the Advisory Committee on Pesticides (see below) but is not easily available for the public or other scientists to scrutinise.

Pesticide regulation

The active ingredients are regulated by the European Commission (EC); application and use is regulated by Member States. Regulation of pesticides in the UK is undertaken by the Chemicals Regulation Directorate (CRD).

The Advisory Committee on Pesticides (ACP), is the main route for the Scottish Government (through SASA)[7] to input to the decision making process. ACP is an independent scientific advisory committee which provides advice to Ministers, particularly on questions relating to the approval of pesticides in the UK, but also on other related matters to do with the control of pests more broadly.

Scottish Government's position

Although the Scottish Government (SG) could adopt the precautionary principle and place a moratorium on the use

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[1] This means that they are taken up by the plant into the sap, pollen and nectar
[2] i.e. they coat the seed rather than sprayed on the crop
[3] Between 1-10 parts per billion of the chemical
[4] Mickaël Henry et al (2012) *A Common Pesticide Decreases Foraging Success and Survival in Honey bees.* Science Vol 336 :348-350
[5] Gill et al (2012) Combined pesticide exposure severely affects individual- and colony-level traits in bees. Nature Volume:491, Pages:105–108
[6] Penelope R. Whitehorn et al (2012) *Neonicotinoid Pesticide Reduces Bumblebee Colony Growth and Queen Production.* Science Vol 336: 351 - 352
[7] Science and Advise for Scottish Agriculture

of neonicotinoids in Scotland, presently they are going along with Defra and they have stated to us in a letter, *inter alia*, that: *The Scottish Government's position is based on scientific advice from a range of sources. SG scientists are monitoring the work of the UK committee (i.e. ACP) and will consider their report when it appears. SG scientists will continue to look at all relevant studies and publications including ongoing research evidence due in December and January*.

Opinion of European Food Safety Authority (EFSA)

The EFSA, at the request of the European Commission, has assessed the risks associated with clothianidin, imidacloprid and thiamethoxam as seed treatment with regard to: their acute and chronic effects on bee colony survival and development; their effects on bee larvae and bee behaviour; and the risks posed by sub-lethal doses. Their press release on 16 January 2013 stated*: EFSA scientists have identified a number of risks posed to bees by three neonicotinoid insecticides.* They advise that with regard to bee exposure from pollen and nectar: ***Only uses on crops not attractive to honey bees were considered acceptable****.*

Westminster's Environmental Audit Committee (EAC)[8]

Westminster's EAC is currently examining the effect of neonicotinoids on pollinators. They have taken evidence from leading scientists, pesticide industry, NGOs, and the UK Government. Their report is due for publication shortly.

Responding to the findings of the EFSA, Chair of the Committee, Joanne Walley MP, stated *inter alia*: *I welcome [the EFSA's move], but given that there is no new data here, it is extremely worrying that these pesticides were authorised for use in the European Union in the first place. Our inquiry had already identified risks to bees that were not picked up in the EU assessment process for one of Europe's most widely used pesticides, despite field trial data showing it could linger in the environment at dangerous levels. This raises important questions about the whole European pesticides assessment regime, which the Environmental Audit Committee will now be looking into. Defra and the UK Advisory Committee on Pesticides have previously stressed their confidence in the safety of these products so they must now examine EFSA's risk assessment carefully before deciding whether UK farmers can continue to use these chemicals on crops, such as oilseed rape."*

Defra's recent research

Defra is carrying out research to 'fill gaps in what is known,' including questions raised about the relevance of the recent studies to field conditions. The new research to explore further the impacts of neonicotinoids on bumblebees in field conditions and to understand what levels of pesticide residues and disease in honey bees are normal will be completed early in 2013. We believe that the findings will be discussed by ACP on 29 January 2013.

The unknowns

- impacts on soil dwelling invertebrates – imidacloprid has been shown to accumulate in soils[9]
- impacts on aquatic invertebrates - neonicotinoids are highly soluble and through run off could make their way into watercourses
- contamination of field margins – neonicotinoids have been found in field margin dandelions[10]
- effects on other wild pollinators - honey bees account for only c 30% of crop pollination - the rest is done by bumblebees and other wild pollinators
- effects on agricultural ecosystems

The Scottish Wildlife Trust's position

There is a growing body of evidence that shows that neonicotinoids have a detrimental effect at sub-lethal doses on insect pollinators. For this reason, the Scottish Wildlife Trust believes that the Scottish Government should adopt the precautionary principle and place a moratorium on their use on all outdoor crops in Scotland until there is convincing scientific evidence that pollinator populations, and by extension ecosystem health, are not significantly impacted upon by use of neonicotinoids.

What the Scottish Government can do

- In light of the EFSA's report, adopt the precautionary principle and place a moratorium on the use of neonicotinoids on outdoor crops in Scotland
- Speak independently to the scientific experts who have conducted the research in Scotland and those behind the findings of the EFSA
- Expose the lack of independence of the safety testing carried out by the industry

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[8] http://www.parliament.uk/business/committees/committees-a-z/commons-select/environmental-audit-committee/inquiries/parliament-2010/insects-and-insecticides/

[9] See: http://www.publications.parliament.uk/pa/cm201213/cmselect/cmenvaud/c668-iv/c66801.htm Questions from Q289 onwards

[10] Krupke CH, Hunt GJ, Eitzer BD, Andino G, Given K (2012) Multiple Routes of Pesticide Exposure for Honey bees Living Near Agricultural Fields. PLoS ONE 7(1): e29268. doi:10.1371/journal.pone.0029268