



Submission to the APVMA

Review of Neonicotinoid use

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My name is Jenni McLeod and I am founder and operator of the Bee Collective. I am a peri-urban beekeeper living on the South Arm Peninsula in Tasmania. I have beehives in my backyard as well as hives in backyards throughout the community. In addition to beekeeping, I run community projects to raise awareness about the importance of bees and pollinators and what people can do to promote pollinator friendly environments. I understand the scope of this review includes a reconsidered focus on the potential for unacceptable environmental risk in areas including:

- non-target invertebrates, including pollinators;
- birds; and,
- small animals.

Neonicotinoid-target Vs non target species

Neonicotinoids are a class of insecticides that target the nervous systems of insects—they are both less expensive to make and less toxic to humans than other products, making them an appealing option for agriculture applications. However, new research has shown they are far more toxic to insects, including those not targeted by agricultural practices than prior industrial insecticides (1).

There are eight different neonicotinoids and related compounds, falling into three categories:

- N-nitroguanidines: imidacloprid, thiamethoxam, clothianidin and dinotefuran
- Nitromethylenes: nithiazine, nitenpyram
- N-cyanoamidines: acetamiprid and thiacloprid

A key issue with neonicotinoids for all species (target and non-target) is its ability to pervade the entire plant structure, infecting the sap, nectar and pollen of a plant. For example, the Safety Data Sheet (SDS) for imidacloprid, sold commercially in Australia as 'Confidor' states – this material is toxic to invertebrates and bees, highlighting acute eco-toxicity to LD50 (*Coturnix japonica* (Japanese quail) 31 mg/kg The value mentioned relates to the active ingredient imidacloprid. LD50 (*Colinus virginianus* (Bobwhite quail) 152 mg/kg The value mentioned relates to the active ingredient imidacloprid. *Apis mellifera* (bees) The value mentioned relates to the active ingredient imidacloprid. Toxic to bees. (2)

Further research on SDS's for other neonicotinoid products also being reconsidered as part of this review, draw similar conclusions, that is they are highly toxic to invertebrates, birds and aquatic life (3). This was highlighted in Australia when dead parrots in Western Victoria were found with levels of imidacloprid in their system (4)



Impact on Honeybees

Two research papers released in 2015 for the scientific journal Nature, demonstrated that bees preferentially eat sugar-water spiked with field-realistic levels of neonicotinoid pesticides, even though they can't taste it. The bees seem to prefer it because of its nicotine-like effect on the brain cells (5). This supported earlier research demonstrating chronic exposure of honeybees to field-realistic levels of neonicotinoids can impair learning and memory, making their pesticide habit a dangerous one (6). Honeybees then bring the contaminated honey and pollen back to the hive with 3 out of 4 hives surveyed across the globe in 2017, containing neonicotinoids (7).

The second paper published in the same issue of Nature journal, reported wild bees that foraged in fields of crops grown from neonic-coated seeds had reduced nesting and failed to build brood cells for new larvae. The results of this field study are in agreement with earlier reports from laboratory studies that found chronic exposure to one of the most widely used neonicotinoid pesticides (imidacloprid) was associated with reduced brood production, reduced colony growth, and an 85% reduction in the production of bumblebee queens (8).

A further study highlights that one of the problems with neonicotinoids is they are consistently used prophylactically, killing indiscriminately (9). Agribusiness relies on the services of pollinators – all pollinators including bees – and yet neonicotinoids continue to be used prophylactically – creating a break point between the fundamental services pollinators provide and industry. Backyard and Commercial Beekeepers in Australia are impacted by the choices of farmers to use approved insecticides that are toxic to bees (10).

Additional research undertaken in 2015 demonstrated that Queen Bees exposed to neonicotinoids had a 60% survival rate as compared to 80% of the control group (11). As noted in the scope document for this review managed and wild honeybees are not (yet) in decline in Australia.

Environmental Impact

Neonicotinoids live beyond their initial target species (insects) and continue a long soil life and are water-soluble, which means they travel from the soil to the water table when it rains (12). As mentioned earlier this has an impact on non-target species, such as aquatic animals, birds and fish, as well as honeybees, other pollinating insects and small mammals that drink from puddles, rivers and waterways inadvertently contaminated with neonicotinoids (13). Further the SDS for 'Confidor' clearly states the product is 'not rapidly biodegradable' (14).

Further research has uncovered several rivers in the UK are heavily polluted with neonicotinoids (15) many of these polluted waterways were located near greenhouses (16). Attempting to mitigate neonicotinoid use by restricting it to greenhouses only, may in fact increase its environmental impact downstream.

In 2013, a Dutch study revealed that water contaminated with imidacloprid (a neonicotinoid), had 50% less invertebrate species than uncontaminated water. The study further found that the cumulative effects of neonicotinoids imply that even the lowest concentrations have toxic effects if sustained over a long period, which is especially relevant for species with a long-life span or a long aquatic stage (16).



Acute Insecticide Toxicity Loading (AITL)

A recent study in the US using honeybees as an indicator species, has concluded that Acute Insecticide Toxicity Loading (AITL) on agricultural land in the US has had a significant impact on pollinators because of an increase in pesticide toxicity loading over the past 26 years, which potentially threatens the health of honey bees and other pollinators and may contribute to declines in beneficial insect populations as well as insectivorous birds and other insect consumers.

Conclusion 6 of the study clearly states;

6. The introduction and increased use of the neonicotinoids in the late 1990s appears to be an example, in hindsight, of a regrettable substitution that might have been avoided had proper predictive analytical tools been available and applied prior to the approval of the registration of these pesticide products (17).

International response

USA

President Trump reversed a 2014 decision to ban neonicotinoid use in Wildlife refuges stating that 'decisions on neonicotinoid usage on farms in wildlife refuges will be made on a case by case basis'. In 2019 the Environmental Protection Agency revoked approval for a dozen pesticides containing clothianidin and thiamethoxam as part of a legal settlement.

Canada

Montreal banned neonicotinoid use in 2015.

Ontario reduced the use of neonicotinoid coated seeds by 20% in 2015.

British Columbia started phasing out neonicotinoid use in 2016.

European Union

The EU voted in 2018 to ban neonicotinoids which began as a phase out process in 2013. Member nations, including Italy, France and Germany have put in place bans and restricted uses of neonicotinoids. (18)

Conclusion

Research studies are consistently showing the links between neonicotinoid use, its impact on honeybees, pollinators and other non-target species. The link between neonicotinoid use and contamination of waterways is especially intensified where neonicotinoid use is restricted to greenhouse use only. Research also demonstrates AITL over the 26 year period the product has been in use, raising questions about the initial approval for neonicotinoids against the information we now have at hand. Target and non-target species are all impacted by this chemical. Agri-business is affected when mass bee kills occur, having an economic impact on Beekeepers and farmers who rely on pollination services. In reviewing this product, the APVMA needs to consider neonicotinoid use today, the effect on non-target species of a 'not rapidly biodegradable' poison, especially on pollinators and the downstream environmental and economic impact on Agri-business.

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