# Green Scene: Neonicotinoids – a Growing Concern

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Over the past year, there have been a number of reports regarding the potential for a relatively new group of pesticides, called the neonicotinoids, to have deleterious impacts on honey bees and other pollinators. More recent research indicates the impacts of these pesticides are more widespread and sometimes result in the death of birds. Neonicotinoids, abbreviated as "neonics", were first developed about 20 years ago. In the past decade, their use has increased substantially; they have now become the most widely-used insecticides in the world. The most commonly-used neonicotinoids are imidacloprid, acetamiprid, thiacloprid, clothianidin and thiamethoxam. Other neonics include dinotefuran, nitenpyram and nithiazine. If you use any type of insecticide in your home or garden you may want to check the labels for these ingredients. Imidacloprid was first registered for use in Canada in 1995; neonicotinoids are now approved for a wide variety of food crops.

**In local areas where cosmetic pesticides are prohibited, exposure of bees and other pollinators to neonicotinoids should be negligible. *Bruce Brandhorst photo*.**

All new pesticides are required to undergo mandatory testing to demonstrate that impacts on non-target species are minimal. Each country has its own set of regulations and a process that must be followed. Shockingly, it now appears the evaluation processes for neonicotinoids have been lax. In some cases, the tests performed were inadequate; in other cases, it appears the warnings of scientists were ignored. In retrospect, it is appalling that neonicotinoids have been approved in so many developed countries despite early scientific evidence which suggested problems. Recent research is now providing convincing proof of the harm caused by them.

Neonicotinoids are water-soluble chemicals which can persist in soil for 3 or more years. It is estimated about 90% of the insecticide applied ends up in the soil. Neonicotinoids are readily absorbed by plants. Because of the persistence of these insecticides in the environment, the potential for contamination of agricultural fields and the waterways which drain them is huge. Neonicotinoids are quite toxic for aquatic insects. In California, 89% of the streams tested in 2012 had detectable concentrations of imidacloprid; 19% of these streams exceeded EPA guidelines.

The most common use of neonics is for treating seeds prior to planting but they are also used as sprays to treat, e.g., fruit trees. Initial studies of the first neonicotinoid, imidacloprid, showed some evidence of bird and mammalian toxicity. There may have been a tendency to overlook such problems because the toxicity of imidacloprid was less than many of the older pesticides it replaced (such as the organophosphates and carbamates). However, it appears adequate field studies were not undertaken and there was too heavy a reliance on limited laboratory studies. It is quite possible there was a tendency for the agricultural industry to overlook the initial findings and for decision-makers in government to ignore them.

Because neonicotinoids are designed to kill insects, it is, perhaps not surprising there could be impacts on bees. What may have not been realized was that treated seeds in neonicotinoid-soaked soil could grow into a plant with potentially harmful amounts of insecticides in its pollen and nectar. In 2012 in Ontario, bee deaths were attributed to the use of clothianidin when corn fields were planted with treated seeds. Exposure to sublethal doses of neonicotinoids has been shown to inhibit the ability of bees to navigate and forage. Thus, there is speculation these pesticides are contributing to collapse of bee colonies. Impacts such as these would not be revealed in typical laboratory tests. In a field study conducted in 2012, exposure of bumblebees to relatively low concentrations of imidacloprid resulted in decreased nest growth and an 85% drop in queen production. Production of queens is especially critical for bumblebees since it is only the queens that overwinter and establish new colonies in the spring.

Many species of birds commonly forage for seeds in recently-planted fields. Research has shown that larger birds would have to eat only five imidacloprid-treated corn seeds or 6 beet seeds to receive a dose that would kill 50% of them. A study recently completed in Holland has shown a decrease in the populations of several species of birds that prey mainly on insects. On average, bird populations decreased by 3.5% annually in areas where concentrations of imidacloprid in surface waters exceeded 20 nanograms per liter (such concentrations were reached or exceeded in many agricultural areas). In this study, the authors did not distinguish between direct toxic impacts on birds or simply the loss of insect prey due to pesticide use. There is also speculation that widespread use of neonicotinoids is contributing to the decline of grassland birds throughout North America.

Once pesticides are widely applied, it typically doesn't take too long before target insects begin to develop resistance. Thus, it should not have come as a surprise when, after only 3 years of use, the Colorado potato beetle showed a 100 fold increase in resistance to imidacloprid. Such resistance often results in spiraling applications of even higher concentrations of the pesticide in futile efforts to control the target insect pest. Given the now undeniably deleterious impacts on pollinators and wildlife in general, the continued use of neonicotinoids is posing unacceptable environmental risks.

Ideally, the use of neonicotinoids should be withdrawn until methods can be developed for their application which do not pose risks to non-target species.  n Europe, some uses of neonicotinoids have now been suspended. In Canada, the government has taken no action but is, apparently, studying the problem. For people who wish to read more on this troubling topic, I recommend a report published by the American Bird Conservancy which is available at
http://www.abcbirds.org/abcprograms/policy/toxins/Neonic_FINAL.pdf.