

# Science for Environment Policy

## Neonicotinoid and fipronil insecticides harm birds and fish and reduce their food supply

**Neonicotinoid and fipronil insecticides** have a range of impacts on birds, mammals and fish, a new review of scientific literature has found. A house sparrow would need to eat just one and a half beet seeds treated with a common neonicotinoid to receive a lethal dose, for instance. The insecticides may also have equally important effects on vertebrate wildlife, such as reducing insect prey and hence food supply.

**Neonicotinoids and fipronil** are important insecticides, designed to affect a broad range of insect pests by disrupting the functioning of the central nervous system. Both are systemic chemicals, absorbed by plants, commonly after seed treatment or soil application.

However, laboratory research has found that they can also have direct toxic effects on non-target species, such as birds and mammals, resulting in reduced growth and reproduction, or even death. They can also have indirect effects on these animals in the wild, for example, by reducing the amount of insect prey available, which in turn may affect their growth, breeding success and survival.

The researchers reviewed 150 studies on the direct and indirect effects of fipronil and the neonicotinoids imidacloprid and clothianidin, on vertebrate species, i.e. mammals, birds, fish, amphibians and reptiles.

The researchers classified the effects of the insecticides on different vertebrates using the [US Environmental Protection Agency's](#) ecotoxicity classification system. All three insecticides were directly toxic to vertebrates, the results showed. Imidacloprid, for example, was moderately to highly toxic to many birds. Clothianidin was moderately to practically non-toxic to rats, mice and birds and practically non-toxic to fish. Fipronil was highly toxic to game birds and fish.

Furthermore, all three insecticides had sub-lethal effects, impairing growth, development and reproduction of mammals, birds, fish and amphibians. Other sub-lethal impacts found included damage to genetic material and cells and abnormal behaviour.

Some species of bird may be particularly at risk from eating seeds treated with imidacloprid or clothianidin. One study revealed that grey partridges (*Perdix perdix*) would only need to eat six beet seeds coated with 0.9 mg of imidacloprid to die. House sparrows (*Passer domesticus*) would only have to eat one and a half seeds. Moreover, house sparrows would experience sub-lethal effects after eating only a quarter of a treated seed.

Levels of imidacloprid and clothianidin likely to be found in freshwater are not high enough to kill fish and amphibians, the researchers found. However, sub-lethal effects could still occur, including damage to DNA and the immune system.

A small number of studies reviewed also show the indirect effects of imidacloprid or fipronil on mammals, birds, fish and reptiles. For example, in one study, fipronil and imidacloprid affected the growth and development of the fish medaka (*Oryzias latipes*) in rice fields, most likely by reducing populations of insects that the fish feed on.

In another study, fipronil used to kill locusts in Madagascar also killed harvester termites, a non-target species. This significantly reduced prey for lizards and led to their population decline. The authors of this study call for greater consideration of systemic insecticides' effects on birds, mammals and fish.



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