chemicalWATCH Factsheet

DIFLUBENZURON

The chlorinated diphyenyl compound, Diflubenzuron, better known by its trade name Dimilin™, is an insect growth regulator. Diflubenzuron can be found as a soluble concentrate, flowable concentrate, wettable powder, or pellet (U.S. EPA 1997). All wettable powder diflubenzuron products are classified as a Restricted Use Pesticide, meaning for certified applicator use only, by EPA due to its severe toxicity to aquatic organisms and other hazards to wildlife (University of MD 2000).

Mode of Action

Diflubenzuron works by preventing the formation of chitin, a molecule necessary to the formation of an insect's cuticle or outer shell. Insects that absorb a dose of diflubenzuron cannot form their protective outer shell and die during molting. It is particularly effective against insect larva, but also acts as an ovicide, killing insect eggs (U.S. EPA 1997).

Toxicity

According to industry tests, diflubenzuron does not pose a high risk of acute toxicity to mammals. The oral LD_{50} (dose needed to kill 50% of the animals tested) is greater than 4.64 g/kg in rats and mice and the dermal LD_{50} is 4.64 g/kg in rabbits. However, EPA has given it a toxicity class III rating (out of a scale of I to IV, I being the highest toxicity class) with the signal word CAUTION, because it does cause skin and eye irritation.

Methemoglobinemia and sulphemoglobinemia, indicating an impairment of the oxygen carrying capacity of the blood, were seen in many studies (acute, sub-acute, sub chronic, and chronic). Moderate amounts of diflubenzuron fed to day-old ducks for 90 days showed decreased testosterone levels after 42 days (EXTOXNET 2001). Also, 2.5 parts per million of diflubenzuron in a diet fed to growing chickens was shown to depress testosterone levels.

Diflubenzuron has not been found to be mutagenic in short-term tests. However, when halogenated compounds (molecules containing either chlorine, bromine, fluorine or iodine) like diflubenzuron are tested in short-term tests, results of ten correlate poorly with carcinogenicity in animal assays.

Environmental Effects

The major environmental hazard posed by diflubenzuron is its non-selective toxicity to insects, including beneficials like the parasitic wasp. Diflubenzuron is also highly toxic to both aquatic invertebrates and crustaceans because they are both chitin producers. The LC_{50} (concentration needed to kill 50% of the test population) for the common water-flea is 1.5 ppb (parts per billion) and blue crab reproduction is impaired at even lower concentrations with an LC_{50} of only 0.5ppb.

Environmental Fate

Diflubenzuron's fate in water depends on the pH of the water. It degrades most rapidly in alkaline water (half life is 1 day) and more slowly in acidic water (half life is 16+ days). The half-life in soil is between four days and four months, depending on the particle size. However, on leaf surfaces, diflubenzuron is very stable. One study reports that even thirty to sixty days after treatment, 90% of the intact pesticide could be detected on leaves (Willcox and Coffey 1978). Plus, a small of amount of diflubenzuron in soil will break down into 4-chloroaniline (PCA), which rapidly binds to the soil (ETN 1996).

Data Gaps

In 1997, a Reregistration Eligibility Document was created for diflubenzuron. Data regarding the ecological effects, acute toxicity and occupational and residential exposures are needed for this pesticide (U.S. EPA 1997).

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Diflubenzuron *chemicalWATCH* Factsheet Bibliography

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