United States
Environmental Protection
Agency

Office of Pesticides and Toxic Substances
Office of Pesticide Programs (TS-766C)
Washington, DC 20460

EPA

Pesticide Fact Sheet

Name of Chemical: DIFLUBENZURON
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1. Description of Chemical

Generic name: N-[[(4-chlorophenyl)amino]carbonyl]-2,6-difluorobenzamide

Common Name: diflubenzuron
Trade Names: Dimilin, Micromite, Vigilante
EPA Shaughnessy Code: 108201
Chemical Abstracts Service (CAS) Number: 35367-38-5
Year of Initial Registration: 1976
Pesticide Type: Benzamide chitin inhibitor
U.S. and Foreign Producers: Duphar B.V., Amsterdam, Holland

2. Use Patterns and Formulations

Application sites:

Agricultural crops:
- cotton (boll weevils ; cotton leaf perforator)
- soybeans (velvetbean caterpillar; green cloverworm)

Forests:
- woodland trees and shrubs including Christmas trees (gypsy moth; Douglas fir tussock mouth; forest tent caterpillar; Nantucket pine tipmoth)

Ornamentals:
- commercial nursery (gypsy moth)

Pasture:
- flood irrigated areas in California only (floodwater mosquitoes)

Greenhouse:
- mushrooms (mushroom flies)

Type of Formulation: 25% Wettable Powder

3. Science Findings

Summary Science Statement:

Diflubenzuron has demonstrated a low acute toxicity to mammals through the oral, dermal, and inhalation routes. The Agency has determined that diflubenzuron is not an oncogen, a teratogen, a mutagen, or a neurotoxin.

The allowable daily intake (ADI) of diflubenzuron is 0.02 mg/kg/day. This is based on a no observable effect level of 40 ppm (2 mg/kg/day) on changes in the blood of rats. The tolerances established add up to 2.9% of the ADI.

Diflubenzuron disrupts the normal molting of insects and other invertebrates by interfering with the deposition of chitin preventing proper formation of the new exoskeleton and shedding of the old one.

Chemical Characteristics:

Physical state: solid
Color: white
Odor: none
Boiling point: N/A
Melting point: 210 to 230 °C
Flammability: N/A
Solubility in water: at 20 to 25 °C 0.2 mg/l. There are no unusual handling characteristics.

Toxicology Characteristics:

Acute Oral, Rat: > 4640 mg/kg
Toxicity Category IV

Acute Dermal, Rabbit: > 4000 mg/kg
Toxicity Category III

Acute Inhalation, Rat: > 2.88 mg/L
Toxicity Category III

The Major Routes of Exposure in Order of Toxicological Significance:

Chronic Toxicology Results:

Rat Chronic Feeding: NOEL = 40 ppm (2 mg/kg) bwt/day for met- and sulphemoglobin formation.

Rat Oncogenicity: Not oncogenic to male and female rats under the conditions of the study; highest dose tested 10,000 ppm (500 mg/kg bwt/day).

Mouse Oncogenicity: Not oncogenic to male and female mice under the conditions of the study; highest dose tested was 10,000 ppm (500 mg/kg bwt/day).

Rat Teratology: Not fetotoxic or teratogenic to rats at levels up to 4 mg/kg bwt/day, the highest dose tested.

Rabbit Teratology: Not fetotoxic or teratogenic to rabbits at levels up to 4 mg/kg bwt/day, the highest dose tested.

Three-Generation Rat Study: No adverse effects on reproductive performance at 160 ppm (8 mg/kg/day), the highest dose tested.

Gene Mutation: At rates up to 1000 ug/plate there was no evidence of changes in spontaneous revertant frequency or any mutagenic effect.

Sheep 13-Week Feeding Study: No treatment-related effects were observed on food consumption, body weight gain, hematological parameters or urinalysis at 10,000 mg diflubenzuron/kg in the diet.

Dog 13-Week Feeding Study: No histopathological changes were reported attributable to feeding diflubenzuron at rates up to 160 ppm in the diet.

Physiological and Biochemical Behavioral Characteristics:

A. Translocation:

The available plant metabolism data show that diflubenzuron, when foliarly applied in doses approximating those registered or proposed for use on citrus, soybeans, and cotton will undergo very little, if any, translocation from treated areas. Additional metabolism data are needed to support the established mushroom tolerance.

B. Mechanism of Pesticidal Action:

Diflubenzuron interferes with arthropod chitin formation, thus disrupting the development of a new cuticle in preparation for molting of the exoskeleton. Exposed insect larvae continue to feed and otherwise develop normally until growth makes it necessary to shed the old cuticle. The old exoskeleton is shed, after which the growing insect swells by taking air into the respiratory system, expanding the body, and stretching the formed, elastic new cuticle before it hardens. Insects exposed to diflubenzuron die while trying to molt since the new cuticle is not properly formed.

C. Metabolism and Persistence in Plants and Animals:

The metabolism of diflubenzuron in plants has been adequately described for higher plants following foliar treatments. No residues were found in the milk, fat, kidney, liver, or meat of cattle fed at 25ppm of the total diet. In an exaggerated rate study, residues were found in milk, liver, and kidneys from cattle fed diflubenzuron at 250ppm of the diet. Metabolites found included p-chlorophenylurea, p-chloroaniline, and 4-chloroacetanilide.

Environmental Characteristics:

Due to rapid binding with soil particles and organic matter and breakdown by soil biota, ground water contamination problems are unlikely. In aerobic soil, radiolabeled diflubenzuron with a particle size of approximatly 2 microns had a half-life of less than 2 weeks at 20 °C.

Ecological Characteristics:

Avian Oral Acute Toxicity:
> 5000 mg/kg - Bobwhite quail and mallard duck

Avian Dietary Toxicity:
> 20,000 ppm - Bobwhite quail and mallard duck

Fish Acute Toxicity:

> 25 ppm - Yellow perch
> 50 ppm - Brook trout
> 100 ppm - Rainbow trout, channel catfish and bluegill sunfish
> 500 ppm - Fathead minnow

Freshwater Invertebrate Acute Toxicity:

560 ppb - Chironomus sp
16 ppb - Daphnia magna
30 ppb - Gammarus pseudolimnaeus

Estuarine/Marine Organism Acute Toxicity:

2.06 ppb - Mysid shrimp
0.64 ppm - Grass shrimp
> 130.00 ppm - Oyster larvae
255.00 ppm - Mummichug

> 1000.00 ppm - Uca pugilator, Carcinus maenus, Anodonta sp. and Mercenaria mercenaria

Honeybee Acute Toxicity:

> 114.8 micrograms per bee. (rel. non-toxic)

Based on these studies, diflubenzuron is of low toxicity to birds, finfish, and honeybees. However, based on current studies, it is extremely toxic to aquatic invertebrates. Therefore, additional studies are required to complete a hazard assessment for aquatic invertebrates.

Tolerance Assessment:

Sufficient data are available to determine that the established tolerances for residues of diflubenzuron (DFB) in or on the following commodities are adequate: cottonseed, pasture grass, soybeans, soybean hulls, soybean soapstock, milk, eggs, and the meat, fat, and meat byproducts of cattle, goats, hogs, horses, sheep, and poultry. However, additional data are required for complete elucidation of the nature of the residue in mushrooms to support the established tolerance in mushrooms.

The Theoretical Maximum Residue Concentrate (TMRC) for diflubenzuron is 0.0352 mg/day based on a 1.5 kg diet. The ADI is 0.011 mg/kg/day. based on a 1.5 kg/day diet. The tolerances established add up to 2.9% of the ADI.

4. Summary of Regulatory Position and Rationale

The Agency has determined that it should continue to allow the registration of diflubenzuron. However, because of gaps in the data base, additional data are required as specified in the registration standard whitch was published on September 10, 1985 and is available from the National Technical Information Service in Springfield Virginia. Additional tolerances and label changes will be considered as applications are submitted.

Because of toxicity to crab, shrimp, and other aquatic invertebrate animals, diflubenzuron is classified as a restricted pesticide for use on forests and field crops. Cautionary statements are required on the label warning of hazards to aquatic invertebrates.

The only geographic limitation for use of products containing diflubenzuron is for control of mosquitoes in temporarily flooded areas of pastures in Central California. The primary concern with these mosquitoes breeding in wastewater from irrigation projects is their potential for carrying diseases affecting humans.

5. Summary of Major Data Gaps

Toxicology:

None.

Environmental Safety: (Data due in 1987)

Avian Reproduction Studies
Freshwater Invertebrate Acute LC_{50}
Estuarine/Marine Organism Acute EC_{50}
Freshwater Invertebrate Life-Cycle
Estuarine Invertebrate Life-Cycle.

Residue Chemistry: (Data due in 1987)

Metabolism in mushrooms
Metabolism in cattle, poultry, and swine

6. Contact person at EPA:

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