

E X T O X N E T

Extension Toxicology Network

A Pesticide Information Project of Cooperative Extension Offices of Cornell University, Michigan State University, Oregon State University, and University of California at Davis. Major support and funding was provided by the USDA/Extension Service/National Agricultural Pesticide Impact Assessment Program.

Pesticide
Information
Profile

Pendimethalin

Publication Date: 9/93

TRADE OR OTHER NAMES

Some trade names include AC 92553, Accotab, Go-Go-San, Herbadox, Penoxalin, Prowl, Sipaxol, Stomp and Way-Up.

REGULATORY STATUS

Products containing pendimethalin must bear the signal word "Caution" or "Warning" depending on the formulation.

INTRODUCTION

Pendimethalin is a selective herbicide used to control most annual grasses and certain broadleaf weeds in field corn, potatoes, rice, cotton, soybeans, tobacco, peanuts and sunflowers. It is used both preemergence, that is before weed seeds have sprouted, and early postemergence. Incorporated into the soil by cultivation or irrigation is recommended within 7 days following application. Pendimethalin is available as emulsifiable concentrate, wettable powder or dispersible granule formulations ([1](#), [6](#)).

TOXICOLOGICAL EFFECTS

ACUTE TOXICITY

Pendimethalin is slightly toxic if ingested, inhaled or absorbed through the skin. The most probable occasion for human exposure is to applicators during mixing, loading, spraying and flagging ([5](#)). Pendimethalin is a mild skin irritant ([6](#)). When applied to the eyes of rabbits, pendimethalin caused irritation of the cornea which cleared within 7 days. Inhalation of dusts or fumes may be mildly to moderately irritating to the linings of the mouth, nose, throat and lungs ([2](#)).

The amount of a chemical that is lethal to one-half (50%) of experimental animals fed the material is referred to as its acute oral lethal dose fifty, or LD50. The oral LD50 for technical pendimethalin in rats is greater than 5000 mg/kg (6). The dermal LD50 for technical pendimethalin in rabbits is greater than 2000 mg/kg.

The lethal concentration fifty, or LC50, is that concentration of a chemical in air or water that kills half of the experimental animals exposed to it for a set time period. The inhalation 4-hour LC50 for technical pendimethalin in rats is 320 mg/l and for Prowl 4EC is 3.5 mg/l (6, 2).

CHRONIC TOXICITY

Increases in alkaline phosphatase level and liver weight were produced in dogs fed 50 and 200 mg/kg for 2 years. No effects were observed at 12.5 mg/kg/day (2, 4). In a 90 day feeding study of rats, the NOEL was 500 ppm (40 mg/kg/day) (4).

Reproductive Effects

Slightly fewer offspring with decreased weight gain from weaning to maturity were observed in a 3-generation reproductive study of rats tested at levels up to 250 mg/kg. No effects were observed at 30 mg/kg (40 mg/kg) (2, 4).

Teratogenic Effects

No birth defects and no toxic effects on fetuses occurred when pregnant rats were given 500 mg/kg, the highest dose tested. The NOEL and the highest dose tested in a teratology study with rabbits was 60 mg/kg (4).

Mutagenic Effects

EPA reports that several mutagenicity studies, including tests on live animals and mammalian and bacterial cell cultures, have all shown that pendimethalin is not mutagenic (4).

Carcinogenic Effects

EPA is currently reviewing the carcinogenicity data for pendimethalin.

Organ Toxicity

Increases in alkaline phosphatase level and liver weight were produced in dogs fed 50 and 200 mg/kg for 2 years (2, 4).

Fate in Humans and Animals

By 24 hours after the administration of 37 mg/kg of radio-labeled pendimethalin to rats, 90.3% of the dose was recovered in the feces and urine. After 96 hours, 95.8% of the dose was recovered in the urine (20.9%) and feces (74.9%). When a lower dose was administered (7.3 mg/kg), 99.8% was recovered in the urine (21.8%) and feces (78.0%) after 12 hours. After 96 hours, residues were less than 0.3 ppm in all body tissues except fat, which had 0.9 ppm. This study indicates that ingested pendimethalin is largely unabsorbed by the bloodstream and excreted through the feces. Pendimethalin which does become absorbed into the bloodstream from the gastrointestinal tract is rapidly metabolized in the kidneys and liver and is then excreted in the urine (7).

ECOLOGICAL EFFECTS

Effects on Birds

When used according to label instructions, pendimethalin is not toxic to birds (6). The 8-day dietary LD50 for pendimethalin in bobwhite quail is greater than 3,149 ppm, and for mallard ducks is greater than 4,640 ppm (5).

Effects on Aquatic Organisms

Pendimethalin is highly toxic to fish and aquatic invertebrates. Runoff from treated areas may be hazardous to aquatic organisms in neighboring bodies of water. Pendimethalin should be kept out of lakes, streams and ponds. Do not contaminate open waters during cleaning of equipment or disposal of wastes (1, 5). The 96-hour LC50 for pendimethalin in bluegill sunfish is 0.199 ppm, and for rainbow trout is 0.138 ppm. The 48-hour LC50 in *Daphnia magna*, a small freshwater crustacean, is 0.28 (5).

Effects on Other Animals (Nontarget species)

When used according to label instructions, pendimethalin is not toxic to bees or mammals (6).

ENVIRONMENTAL FATE

Breakdown of Chemical in Soil and Groundwater

Pendimethalin adsorbs strongly to soil organic matter and clay and does not leach through the soil to contaminate groundwater (3, 6, 5).

Pendimethalin is not subject to microbial degradation. Slight losses of pendimethalin can result from photodecomposition and volatilization. When used according to label instructions, no carry over to subsequent crops is expected (6). Its soil half-life is 90 days (3).

Breakdown of Chemical in Water

Pendimethalin is stable to hydrolysis, but is degraded by light in aquatic systems. Pendimethalin may be removed from water by its strong tendency to bind to sediment and organic matter. It is rapidly degraded in sediment.

Breakdown of Chemical in Vegetation

Pendimethalin's herbicidal effects are related to inhibition of cell division and cell elongation. It is absorbed by plant roots and shoots. Pendimethalin is not absorbed by the leaves of grasses. Only very small amounts are taken up by plants from the soil. Once absorbed into plant tissues, translocation is limited and pendimethalin breaks down via oxidation. Residues on crops at harvest are usually below detectable levels (0.05 ppm) (6).

PHYSICAL PROPERTIES AND GUIDELINES

Pendimethalin is an orange-yellow crystalline solid with a faint nutty or fruit-like odor (3, 6). Products containing pendimethalin range from slightly to highly flammable. They should not be stored, used or handled near heat or open flames (6). It is slowly decomposed by light (2). It is stable under normal temperatures and pressures, but it may pose a slight fire hazard if exposed to heat or flame. It poses a fire and explosion hazard in the presence of strong oxidizers. Thermal decomposition of pendimethalin will release toxic oxides of nitrogen and carbon (2).

Occupational Exposure Limits:

No occupational exposure limits have been established for pendimethalin by OSHA, NIOSH or ACGIH (3).

Physical Properties:

CAS#: 40487-42-1
Specific gravity: 1.17 g/ml at 25 degrees C (6)
H2O solubility: 0.275 ppm at 25 degrees C (1); 300 ppb at 20 degrees C (2)
Solubility in other solvents: soluble in most organic solvents such as acetone (161.0 g/100 ml at 25 degrees C) and xylene (1, 6). Soluble in corn oil, heptane, benzene, toluene,

chloroform, dichloromethane.
Moderately soluble in isopropanol.
Slightly soluble in petroleum ether and petrol (2).

Melting point: Melting starts at 47-53 degrees C, and samples are completely melted at 56-58 degrees C (6).

Boiling point: 330 degrees C (626 degrees F) (6)

Flashpoint: 92 degrees F (1)

Vapor pressure: negligible; 3.0 x 10 to the minus 5 mm Hg at 25 degrees C (6)

Koc: 24,300 g/ml (3)

Chemical Class/Use: dinitroaniline herbicide

PADI: 0.125 mg/kg/day (4)

MPI: 7.5 mg/day for a 60 kg person (4)

BASIC MANUFACTURER

American Cyanamid Co.
One Cyanamid Plaza
Wayne, NJ 07470

Review by Basic Manufacturer:

Comments solicited: November, 1992
Comments received: December, 1992

REFERENCES

1. Meister, R.T. (ed.). 1992. Farm Chemicals Handbook '92. Meister Publishing Company, Willoughby, OH.
2. Occupational Health Services, Inc. 1991 (Feb. 21). MSDS for Pendimethalin. OHS Inc., Secaucus, NJ.
3. U.S. Department of Agriculture, Soil Conservation Service. 1990 (Nov.). SCS/ARS/CES Pesticide Properties Database: Version 2.0 (Summary). USDA - Soil Conservation Service, Syracuse, NY.
4. US Environmental Protection Agency. 1987 (Dec. 16). Pesticide Tolerance for pendimethalin. Federal Register 52(241): 47734-5.
5. _____. 1985 (March 31). Chemical Fact Sheet For: Pendimethalin (Fact Sheet No. 50). Office of Pesticide Programs, US EPA, Washington, DC.
6. WSSA Herbicide Handbook Committee. 1989. Herbicide Handbook of the Weed Science Society of America, 6th Ed. WSSA, Champaign, IL.

7. Zulalian, J. 1990. Study of the absorption, excretion, metabolism, and residues in tissues of rats treated with carbon-14-labeled pendimethalin, Prowl herbicide. *J. Agric. Food Chem.* 38: 1743-54.