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: Fenoxaprop-ethyl
Reason for Issuance: New Chemical Registration
Date Issued: 2/88
Fact Sheet Number: 157

1. DESCRIPTION OF CHEMICAL

Generic Name:	(+) ethyl 2-[4-[6-chloro-2-benzoxazolyl]oxy]phenoxy]propanoate
Common Name:	Fenoxaprop-ethyl
Trade Names:	Whip, Acclaim
EPA Shaughnessy Code:	128701
Chemical Abstracts Service (CAS) Number:	66441-23-4
Year of Initial Registration:	1987
Pesticide Type:	Herbicide
Chemical Family:	Structurally related to diphenyl ethers
Producer:	American Hoechst Corporation

2. USE PATTERNS AND FORMULATIONS

Application sites: Used for post-emergent control of annual and perennial grasses on terrestrial and aquatic food crops (rice and soybeans) and on terrestrial nonfood and domestic outdoor use sites (turfgrass, including sod farms, rights-of-way, and commercial and residential turf).

Types of formulations: 93% active ingredient technical grade. End use products containing 12.50% active ingredient formulated as emulsifiable concentrates.

Usual carrier: Water. Non-phytotoxic crop oil may also be used with the agricultural use formulation.

Types and methods of application: Fenoxaprop-ethyl is applied to turfgrass by pressurized hydraulic sprayers (30-60 PSI) and hand held pump sprayers. It may also be applied as a spot treatment. Both ground and aerial application are permitted for the use on soybeans and rice.

Application rates: Application rates for soybeans range from .8 to 1.2 pints per acre (.10 to .15 pounds active ingredient) depending on the target weed species. For rice, application rates vary from 1.2 to 1.6 pints per acre (.15 to .20 pounds active ingredient) depending on the target weed species and stage of growth. Application rates for turfgrass range from 15 to 45 fluid ounces per acre and from .15 to 1.02 fluid ounces per 1,000 square feet depending on the type of turf and stage of weed growth.

3. SCIENCE FINDINGS

Summary Science Statement: Fenoxyprop-ethyl induces developmental toxicity (birth defects) in rabbits based on studies which showed that dietary administration of the compound caused an increased incidence of rib anomalies and diaphragmatic hernias at 200 mg/kg, the highest dose tested. Margins of safety (MOS) calculated based on a no-observed-effect-level of 50 mg/kg in the rabbit study are 740,000 and 260,000 for one serving daily of rice and soybean oil, respectively. Even assuming that four servings of each could be consumed every day, the MOS's would be 180,000 for rice and 66,000 for soybean oil. MOS values for mixer/loaders are 1,250,000, for inhalation exposure, and 1000, for dermal exposure. For applicators, the MOS for inhalation exposure is 250,000; the MOS for dermal exposure is 2500. In addition, the label requires that mixer/loaders wear protective clothing, including impermeable gloves, and long-sleeved shirts and pants. Applicators must also wear long-sleeved shirts and pants. The teratogenic risk to consumers of foods treated with fenoxaprop-ethyl and to users of the herbicide are therefore quite low.

Fenoxaprop-ethyl did not induce an oncogenic response in long-term rat and mouse studies. The chemical did not significantly impair reproductive ability in a two-generation reproductive effects study in rats. Four mutagenicity studies with fenoxaprop-ethyl were negative.

In both short and long term animal studies, fenoxaprop-ethyl induced toxicologically significant increases and decreases in lipid enzymes (blood cholesterol). The Agency has calculated MOS values for these effects based on the highest dose tested, 6 mg/kg, in a mouse oncogenicity study, the mouse being the most sensitive species. The dietary MOS values are, for rice, 35,000, and for soybean oil, 31,000. For applicators, MOS values are 30,000 for inhalation exposure and 300 for dermal exposure. For mixers/loaders, the MOS for inhalation exposure is 150,000 and 120 for dermal exposure. The dermal exposure MOS's were calculated based on exposure estimations which assumed that 100% of the chemical would be absorbed through the skin. However, as indicated above, mixer/loaders/applicators are required to wear protective clothing, and therefore exposure will be reduced.

Fenoxaprop-ethyl is not acutely toxic to humans or avian species. The pesticide is toxic to fish and aquatic invertebrates Environmental fate studies show that fenoxaprop-ethyl does not persist significantly in the environment, that it is relatively immobile and therefore should not pose a risk of leaching to groundwater.

Chemical Characteristics:

Physical state:	brown crystalline solid
Molecular formula:	$C_{18}H_{16}ClNO_5$
Molecular weight:	361.8 g/M
Solubility:	0.9 mg/l (pH 7 at 25°C) in water, low solubility
Melting point:	85-87°C
Vapor pressure:	0.187 x 10^{-7} mbar at 20°C (non volatile)

Toxicological characteristics:

Acute oral toxicity (rat):	2357 mg/kg (relatively nontoxic)
Acute dermal toxicity (rat):	Greater than 2000 mg/kg (moderately toxic)
Acute dermal toxicity (rabbit):	Greater than 2000 mg/kg (moderately toxic)
Dermal sensitization:	Non-sensitizing

Chronic effects:

2-generation Reproduction (rat):	NOEL = 5 ppm (0.25 mg/kg) based on reduced blood lipi in parents and reduced body weight in offspring
Developmental Toxicity:	Rabbit -- NOEL = 12.5 mg/kg, for maternal toxicity, based on decreased food consumption and weight gain; NOEL = 50 mg/kg for developmental effects, based on increased incidence of rib anomalies and diaphragmatic hernia; teratogenic Rat -- NOEL = 32 mg/kg for maternal toxicity based on reduced body weight gain; NOEL = 32 mg/kg for developmental (fetotoxic) effects -- delayed ossification and slightly impaired growth; NOEL = 100 mg/kg for teratogenic effect:
Chronic Feeding/ Oncogenicity:	Rat -- not oncogenic at doses up to and including 180 ppom (9 mg/kg); systemic toxicity NOEL = 30 ppm (1.5 mg/kg) based on decreased serum cholesterol Mouse -- not oncogenic at doses up to and including 40 ppm (6 mg/kg); dosing not adequate to achieve a maximum tolerated dose (MTD) -- Adequate MOS values based on ratio of highest dose tested/ maximum daily dietary intake. Dog -- NOEL = 15 ppm (0.37 mg/kg) based on reduced body weight
Mutagenicity:	Negative -- chromosomal aberration, Ames test, Unscheduled DNA Synthesis, and mouse micronucleus

Physiological and biochemical behavior characteristics:

Mode of Activity: Fenoxaprop-ethyl is a systemic herbicide which is rapidly absorbed and translocated throughout leaf and stem tissue. Although the precise mode of activity is unknown, fenoxaprop-ethyl is thought to kill weeds by disrupting lipid metabolism. Effects are seen as general yellowing of the weed followed by death in approximately two to three weeks.

Translocation characteristics: Fenoxaprop-ethyl is highly systemic and rapidly metabolized and therefore there is little potential for the presence of residues in the edible parts of crops treated with the herbicide.

Environmental characteristics: Fenoxaprop-ethyl is stable to hydrolysis at 20°C in pH5 and pH7 solutions, but rapidly hydrolyzes in pH9 solutions. Extensive environmental fate studies show that the chemical does not persist significantly in any medium. Residues in irrigated and rotational crops will not be detectable when label restrictions on using water from rice fields to irrigate grops and on planting rotational crops are strictly followed. Fenoxaprop-ethyl was slightly mobile in two loamy sand soils, two silt loam soils and an aquatic sediment (clay). Therefore, there is little potential that fenoxaprop-ethyl would leach to ground water.

Ecological characteristics:

Avian Reproduction:	Bobwhite -- 30 ppm Mallard duck -- 180 ppm (NOEL's for reproductive effects; does not impair avian reproduction)
Avian Oral toxicity:	Bobwhite quail -- >2510 mg/kg
Avian dietary toxicity:	Mallard duck -- >5620 mg/kg Bobwhite quail -- >5620 mg/kg
Freshwater fish:	Bluegill -- 310 ppb Pumpkinseed sunfish -- 360 ppb Brown trout -- 480 ppb
Aquatic invertebrates:	Daphnia Magna -- 3.18 ppm

These data indicate that fenoxaprop-ethyl is essentially non-toxic to avian species and that it does not impair avian reproduction; and that fenoxaprop-ethyl is acutely toxic to fish and aquatic invertebrates. The label prohibits use in St. Francis and Cross Counties in Arkansas to avoid impact on the endangered fat pocketbook mussel, Potamilus capax. No other endangered species issues have been identified for the rice and soybean uses.

4. TOLERANCE ASSESSMENT

Tolerances have been established for the combined residues of fenoxaprop-ethyl and its metabolites on the following raw agricultural commodities (40 CFR 180.):

Commodities	Tolerance (ppm)
Rice grain	0.05
Soybeans	0.05

There are no international tolerances/residue limits for fenoxaprop-ethyl.

There are sufficient residue chemistry data available to support these tolerances, including plant and animal metabolism, storage stability (for both the parent compound and its metabolites), field residue studies, and analytical methods. Cattle and poultry feeding studies were not submitted. However, under the proposed conditions of use, measurable residues are not expected to be found in the raw agricultural commodities or fractions. These data are therefore not now necessary.

The Acceptable Daily Intake (ADI) and the Maximum Permissible Intake (MPI) are two ways of expressing the amount of a substance that the Agency believes, on the basis of the results of data from animal studies and the application of "safety" or "uncertainty" factors, may safely be ingested by humans without risk of adverse health effects. The ADI is expressed in terms of milligrams (mg) of the substances per kilogram (kg) of body weight per day (mg/kg/day). The MPI, a related figure, is obtained by assuming a human body weight of 60 kg, and is expressed in terms of mg of substance per day (mg/day).

The Agency has calculated an ADI for fenoxaprop-ethyl of 0.0025 mg/kg/day, based on a NOEL of 0.25 mg/kg/day in the 2-generation rat reproduction study and a 100-fold safety factor. The MPI for a 60 kg person is 0.15 mg/day. These tolerances have a theoretical maximum residue contribution (TMRC) of 0.0011 mg/day in a 1.5 kg diet and would utilize .073 percent of the ADI.

5. CONTACT PERSON AT EPA

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