VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment

Virginia Department of Health

DIVISION OF HEALTH HAZARDS CONTROL

P.O. Box 2448, 1500 East Main Street, Room 124
Richmond, Virginia 23218 (804)786-1763

PRIME +®

GENERAL BACKGROUND

Prime+® is a formulation of a plant growth regulator containing Flumetralin as the active ingredient, and also a solvent system composed of ethylbenzene, xylene, trimethylbenzenes, and a surfactant. The chemical name for Flumetralin is 2-chloro-N-(2,6-dinitro-4-(trifluoromethyl)-phenyl)-N-ethyl-6-fluorobenzene-methanamine. The chemical formula for Flumetralin is $C_{16}H_{12}ClF_4N_3O_4$ and it has a molecular weight of 421.75. Ninety-six percent pure Flumetralin is an orange-yellow crystal which is odorless. Prime+@ is 15% Flumetralin and 85% solvent system. The formulation has an aromatic solvent odor and a specific gravity of 0.96 grams per milliliter (g/ml). Prime+® is a combustible liquid and has a flash point of 109°F.

PRODUCTION AND USES

Prime+® is produced by Ciba, Ltd. to control axillary bud (sucker) growth after the floral portion of tobacco plants have been topped. Prime+® is absorbed by the tobacco plant within a few hours after application and provides residual sucker control through the growing season.

ENVIRONMENTAL FATE

Results of laboratory absorption and leaching studies with a variety of soils indicate that Flumetralin binds strongly to soil and exhibits little or no tendency to leach to groundwater. Experiments were preformed with sand, sandy loam, silt loam, and clay loam soils representative of tobacco growing areas. Photodegradation of Flumetralin on soil surfaces proceeds rapidly, and laboratory experiments indicate a half-life of 74 hours. Limited field data suggest that Flumetralin readily disperses in typical agricultural soils.

Laboratory experiments have shown Flumetralin to be stable in aqueous buffered solutions of pH 5, 7, and 9, and under acidic conditions of pH 1, at room temperature for a period of 30 days. However, degradation under basic conditions was observed. A half-life of 19.6 days was recorded for solutions at pH 13 maintained at room temperature. Photolytic degradation in aqueous solution is quite rapid. A half-life of approximately one-hour was observed for exposure to natural sunlight. Photolysis products are numerous and include benzimidazoles and dealkylated products.

HEALTH EFFECTS

Humans

No cases of acute poisoning or effects of overexposure in humans have been reported. Based on the acute oral LD_{50} (the dose of a chemical which has been calculated to cause death in 50% of a defined experimental animal population) in rats, ingestion of six ounces or more of Prime+® may be fatal to an adult human. Prime+® is corrosive, moderately irritating to the eyes and mildly irritating to the skin. Repeated contact with the skin may cause sensitization (allergic) reactions in sensitive individuals. Prolonged inhalation may cause headache, dizziness, breathing difficulty, or nausea.

Prime+® contains an aromatic petroleum solvent composed of ethylbenzene, xylene, trimethylbenzenes, and a surfactant. Inhalation of solvent vapors at high concentrations can cause central nervous system depression, respiratory tract irritation, asphyxiation, cardiac stress, and coma. Exposure to extremely high levels of xylene may cause kidney or liver damage. A surfactant present in Prime+® is reported to cause corneal damage. None of the solvent components have been shown to be carcinogenic in humans or in experimental animals.

Animals

Oral administration of Prime+® in rats produced an LD_{50} of 4,400 milligrams per kilogram of body weight (mg/kg) and the following toxic signs: salivation, activity decrease, ptosis, emaciation, prolapse of anus, rigid muscle tone, piloerection, lacrimation, body tremors, lethargy, cyanosis, sensitivity to touch, polyuria, diarrhea, chromodacryorrhea, ataxia, and dilated pupils. The Prime+® dermal LD_{50} in rabbits is reported to be 2,010 mg/kg. The Prime+® inhalation LC_{50} (a calculated concentration of a chemical to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population) in rats is >2.5 milligrams per liter (mg/L) of air at 4 hours.

In acute studies in rats, ingestion of Flumetralin indicated an oral LD_{50} of >5,000 mg/kg. In a 96-hour dietary study, the bobwhite quail and mallard duck indicated a Flumetralin LC_{50} of >5,000 parts per million (ppm). Flumetralin is acutely toxic to fish with estimated theoretical 96-hour LC_{50} values less than 100 parts per billion (ppb). Channel catfish did not show any toxic responses at the maximum attainable water concentrations.

In two lifetime feeding studies with rodents (one with rats and one with mice), Flumetralin was not found to be oncogenic or carcinogenic at tested doses of 0, 30, 300, 1,000 and 1,500 ppm. The systemic no observable effect level (NOEL) for these studies was 300 ppm. Flumetralin did not affect reproduction capabilities in rats over two generations, was not fetotoxic or teratogenic in rats or rabbits, and showed no genotoxic potential in mutagenicity studies up to 200 mg/kg, the maximum tolerated dose (MTD).

STANDARDS

Currently, there are no occupational or drinking water standards or guidelines for Flumetralin.

REFERENCES

Ciba-Geigy Toxicology Data on Prime+® Agricultural Division, Greensboro, NC 27419. 1982, 1991, 1993, and 1995.

Plant Growth Regulator Handbook. Plant Growth Regulator Society of American (Third Edition). 1990.

Farm Chemicals Handbook. 1994. Meister Publishing Company. Willoughby, Ohio. Vol. 80,. Pg. C 291.

PREPARED BY: Peter C. Sherertz, Ph.D., Toxicologist
June 15, 1995