

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

MCPA

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TRADE OR OTHER NAMES

Trade names for some of the products containing MCPA are Agritox, Agroxone, Chiptox, Rhonox, and Weed-Rhap. This herbicide may be used in formulations with many other types of pesticides including 2,4-D, dicamba, MCPB, bromoxynil, mecoprop and bentazone.

INTRODUCTION

MCPA is a systemic phenoxy herbicide used to control annual and perennial weeds (including thistle and dock) in cereals, grasslands, trees and turf. As with some of the other phenoxy herbicides, MCPA is an acid, but it is often formulated as a salt such as diethanolamine salt. Unless otherwise indicated, this document will refer to the acid form. The herbicide works by concentrating in the actively growing regions of a plant (meristematic tissue) where it interferes with protein synthesis, cell division and ultimately the growth of the plant.

This compound is a Restricted Use Pesticide (RUP). Restricted Use Pesticides may be purchased and used only by certified applicators.

TOXICOLOGICAL EFFECTS

ACUTE TOXICITY

MCPA carries a DANGER signal word on the label even though the acute toxicity of the product indicates that it is only slightly toxic. This is due to its potential to cause severe eye irritation. Symptoms in humans from acute toxic exposure include slurred speech, twitching, jerking and spasms, drooling, low blood pressure, and unconsciousness.

The LD50 for MCPA in rats ranges from 700 mg/kg to 1,330 mg/kg and the LD50 of MCPA in the mouse ranges from 550 to 800 mg/kg. The dermal LD50 is 4,800 mg/kg in

male rabbits and 3,400 mg/kg in female rabbits. The estimated human lethal oral dose is from 250 to 450 mg/kg (6).

CHRONIC TOXICITY

Three ninety day studies of rats revealed chronic toxic effects at doses around 20 to 25 mg/kg/day. Growth retardation and increased kidney weight were the effects noted in all three studies. Another study of this type indicated that the lowest dose that caused chronic toxic effects in the rat was about 5 mg/kg/day. These levels are substantially below the LD50 values for the organism indicating that chronic toxicity can occur at low exposure levels.

Reproductive Effects

A two-generation rat study at doses of up to 15 mg/kg affected reproductive function. Even smaller amounts of the compound were toxic to the fetuses. Dogs receiving relatively small amounts of MCPA (8 and 16 mg/kg) for 13 weeks had various adverse sperm and testes changes (8).

Teratogenic Effects

Pregnant rats fed low to moderate doses of MCPA (20 to 125 mg/kg) on days 6 to 15 of gestation, had no birth defects in their offspring. However, when the ethyl ester form of MCPA was fed to pregnant rats at low to moderate levels (2 to 100 mg/kg) on days 8 to 15 of gestation, cleft palate, heart defect, and kidney anomalies were observed in the offspring (7). Mice fed 5 to 100 mg/kg of MCPA on days 6 to 15 showed significantly reduced fetal weight and delayed bone development at the highest dose.

The EPA, however, has stated that these studies are unacceptable under current guidelines and are requiring additional testing of the compound with regard to its potential to cause birth defects in two animal species. No conclusions can be drawn about human birth defect risk from the currently available information.

Mutagenic Effects

MCPA was only weakly mutagenic to bone marrow and ovarian cells of hamsters and negative results were reported for all other mutagenic tests (10). While another test has been requested by the EPA (a gene mutation study) it appears that the compound poses little mutagenic risk to humans.

Carcinogenic Effects

All of the available cancer evidence on MCPA indicates that the compound does not cause cancer (10).

Organ Toxicity

Farm worker exposure has resulted in reversible anemia, muscular weakness, stomach problems, and slight liver damage (6).

Fate in Humans and Animals

Rats eliminated nearly all of a single oral dose within 24 hours, mostly in their urine. In another rat study, three quarters of the dose was eliminated within two days. All was

gone by the eighth day. Humans excreted about half of a 5 mg dose in the urine within a few days. No residues were found after day five. Rats given intravenous MCPA had residues in tissues within 1.5 hours.

Cattle and sheep fed MCPA in low to moderate doses in the diet for two weeks had no residues from levels less than about 18 mg/kg. At moderate continuous ingestion there was greater than 0.05 ppm in whole- milk or cream. This level declined to non-detectable levels one or three days after the removal of MCPA from the diet.

The major metabolite of MCPA is 2-methyl-4-chlorophenol in the free and conjugated form which is formed in the liver (2).

ECOLOGICAL EFFECTS

MCPA is moderately toxic to wildfowl and has an LC50 for bobwhites, pheasants, and mallard. For example the acute avian LD50 of MCPA in bobwhite quail is 377 mg/kg. MCPA is only slightly toxic to freshwater fish with LC50 values around 90 mg/l for rainbow trout and for bluegill. MCPA is practically non-toxic to freshwater invertebrates, and estuarine and marine organisms. It is non-toxic to bees (9, 10).

ENVIRONMENTAL FATE

The organic content of soil determines in large part the persistence of MCPA. With less than 10% organic matter in soil, the compound is degraded in one day and, with greater than 10% levels in soil, it takes three to nine days to degrade. No MCPA was detected in forest soils at a depth of 3 to 15 cm 40 days after application. The half-life is five to six days in slightly acidic to slightly alkaline soils.

MCPA leaches in most soils, but its mobility increases as organic matter decreases (2). The compound has been found in well water in Missouri and is of concern to the EPA as a potential groundwater contaminant (9).

In sterilized water, it takes about three weeks for half of the compound to degrade due to the action of sunlight. In rice paddy water however, MCPA is almost totally degraded by aquatic microorganisms in under two weeks (2). MCPA is absorbed, translocated, and actively broken down by vegetation. Forest litter had 32 ppm 10 months after application. Levels in moss declined to 7% of the initial level within 40 days. The metabolite found in plants is 2-methyl-4-chlorophenol.

Exposure Guidelines:

NOEL (dog): 0.15 mg/kg/day, based on kidney effects, 1 year
DWEL: 0.05 mg/l
HA: 0.01 mg/l (lifetime)
RfD: 0.0005 mg/kg/day (EPA); 0.0015 mg/kg/day (WHO)
LEL: 0.75 mg/kg/day

Physical Properties:

CAS #: 94-74-6
Chemical name: (4-chloro-2-methylphenoxy) acetic acid

Chemical class/use: phenoxy herbicide
Solubility in water: for the amine salt, 866,000 mg/l; for the ester, 5 mg/l (estimate)
Solubility in other solvents: ether 77 g/100 g; ethanol 153 g/100 g; toluene 6.2 g/100 g
Melting Point: 118-119 degrees C
Vapor Pressure: 1.5×10^{-6} mm Hg
Partition Coefficient: 2.07 calculated (octanol/water)

BASIC MANUFACTURER

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Review by Basic Manufacturer:

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