

EXTOXNET

Extension Toxicology Network

Pesticide Information Profiles

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

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MCPA

Trade and Other Names: Trade or other names for MCPA or products containing it include: Agritox, Agroxone, Agrozone, Agsco MXL, Banlene, Blesal MC, Bordermaster, Cambilene, Cheyenne, Chimac Oxy, Chiptox, Class MCPA, Cornox Plus, Dakota, Ded-Weed, Empal, Envoy, Gordon's Amine, Kilsem, Legumex, Malerbane, Mayclene, MCP, Mephanac, Midox, Phenoxyline, Rhomene, Rhonox, Sanaphen-M, Shamrox, Selectyl, Tiller, U 46 M-Fluid, Vacate, Weed-Rhap, and Zhelan.

Regulatory Status: MCPA is a slightly toxic compound in EPA toxicity class III, and is a General Use Pesticide (GUP). Labels for products containing MCPA must carry the Signal Word DANGER due to its potential to cause severe eye irritation.

Chemical Class: phenoxy compound

Introduction: MCPA is a systemic postemergence phenoxy herbicide used to control annual and perennial weeds (including thistle and dock) in cereals, flax, rice, vines, peas, potatoes, grasslands, forestry applications, and on rights-of-way. This herbicide is very compatible with many other compounds and

may be used in formulation with many other products, including bentazone, bromoxynil, 2,4-D, dicamba, fenoxaprop, MCPB, mecoprop, thifensulfuron, and tribenuron.

NOTE: As with some of the other phenoxy herbicides, MCPA is an acid, but is often formulated as a salt (e.g. dimethylamine salt) or an ester (e.g. isooctyl ester). Unless otherwise indicated, this document will refer to the acid form.

Formulation: This herbicide is very compatible with many other compounds, and may be used in formulation with many other products, including bentazone, bromoxynil, 2,4-D, dicamba, fenoxaprop, MCPB, mecoprop, thifensulfuron, and tribenuron.

Toxicological Effects:

- **Acute toxicity:** MCPA acid is slightly toxic via ingestion, with reported oral LD50 values for the technical product in rats ranging from 700 mg/kg to 1160 mg/kg [5,6] and ranging in mice from 550 to 800 mg/kg [5,6]. It is slightly toxic via the dermal route as well, with reported dermal LD50 values ranging from greater than 1000 mg/kg in rats to greater than 4000 mg/kg in rabbits [5,6]. Symptoms in humans from very high acute exposure could include slurred speech, twitching, jerking and spasms, drooling, low blood pressure, and unconsciousness [1].
- **Chronic toxicity:** Dietary levels of approximately 50 mg/kg/day and 125 mg/kg/day over 7 months caused reduced feeding rates and retarded growth rates in rats [1]. White blood cell counts and ratios were not affected, but some reductions in red blood cell counts and hemoglobin did appear to be associated with exposure to MCPA at oral dose levels of approximately 20 mg/kg/day. In the same study, oral doses of approximately 5 mg/kg/day caused increased relative kidney weights, and oral doses of approximately 20 mg/kg/day caused increased relative liver weights [1]. Another study in rats showed no effects on kidney or liver weights over an unspecified period at oral doses of 60 mg/kg/day, but oral doses of 150 mg/kg/day did cause reversible increases in these weights over a course of 3 months [1]. Very high dermal doses of 500 mg/kg/day caused reduced body weight, and even higher dermal doses of 1000 and 2000 mg/kg/day resulted in increased mortality and observable changes in liver, kidney, spleen, and thymus tissue [1].
- **Reproductive effects:** A two-generation rat study at doses of up to 15 mg/kg/day 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 showed adverse sperm and testes changes [8]. It is unlikely that humans will experience these effects under normal exposure conditions.

- **Teratogenic effects:** Offspring of 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. However, when the ethyl ester form of MCPA was fed to pregnant rats (2 to 100 mg/kg/day 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/day of MCPA on days 6 to 15 showed significantly reduced fetal weight and delayed bone development at the highest dose [24]. Teratogenic effects in humans are unlikely at expected exposure levels.
- **Mutagenic effects:** MCPA is reportedly weakly mutagenic to bone marrow and ovarian cells of hamsters, but negative results were reported for other mutagenic tests [38]. It was negative in a bacterial test system (both with and without metabolic activation), negative in spot tests, and negative in host-mediated tests [1]. It produced no detectable increase in chromosomal aberrations in house flies [4]. Some irregularities occurred in gene transfer during cell division in brewers yeast, although at levels which caused massive cell death [1]. It appears that the compound poses little or no mutagenic risk.
- **Carcinogenic effects:** All of the available evidence on MCPA indicates that the compound does not cause cancer [1]. Forestry and agricultural workers occupationally exposed to MCPA in Sweden did not show increased cancer incidence [39].
- **Organ toxicity:** Target organs identified in animal studies include the liver, kidneys, spleen, and thymus. Farm worker exposure has resulted in reversible anemia, muscular weakness, digestive problems, and slight liver damage [1].
- **Fate in humans and animals:** MCPA is rapidly absorbed and eliminated from mammalian systems [1]. Rats eliminated nearly all of a single oral dose within 24 hours, mostly through urine with little or no metabolism [1,6]. In another rat study, three quarters of the dose was eliminated within 2 days. All was gone by the 8 days [1]. Humans excreted about half of a 5 mg dose in the urine within a few days. No residues were found after day 5 [1]. Cattle and sheep fed low to moderate doses of MCPA in the diet for 2 weeks showed no residues from levels less than about 18 mg/kg [1]. The major metabolite of MCPA is 2-methyl-4-chlorophenol in the free and conjugated form, which is formed in the liver [38].

Ecological Effects:

- **Effects on birds:** MCPA is moderately toxic to wildfowl; the LD50 of MCPA in bobwhite quail is 377 mg/kg [5,6].
- **Effects on aquatic organisms:** MCPA is only slightly toxic to freshwater fish, with reported LC50 values ranging from 117 [5] to 232 mg/L in rainbow trout [6]. MCPA is practically nontoxic to freshwater invertebrates, and estuarine and marine organisms.
- **Effects on other organisms:** It is nontoxic to bees, with a reported oral LD50 of 104 ug/bee [5,6].

Environmental Fate:

- **Breakdown in soil and groundwater:** MCPA and its formulations are rapidly degraded by soil microorganisms and it has low persistence, with a reported field half-life of 14 days to 1 month, depending on soil moisture and soil organic matter [21]. Decreased soil moisture and microbial activity, as well as increased soil organic matter, will prolong the field half-life for MCPA [12]. With less than 10% organic matter in soil, the compound is degraded in 1 day and, with greater than 10% levels in soil, it takes 3 to 9 days to degrade. The half-life is 5 to 6 days in slightly acidic to slightly alkaline soils [12]. MCPA readily leaches in most soils, but its mobility decreases with increasing organic matter [12]. MCPA and its formulations show little affinity for soil.
- **Breakdown in water:** It is relatively stable to light breakdown [5], but can be rapidly broken down by microorganisms. In sterilized water, it takes about 5 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 2 weeks [12].
- **Breakdown in vegetation:** MCPA is readily absorbed and translocated in most plants [5]. It 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 non-resistant plants [7]. It is actively broken down in plants, the major metabolite being 2-methyl-4-chlorophenol [5].

Physical Properties:

- **Appearance:** Pure MCPA occurs as colorless crystals [6].
- **Chemical Name:** (4-chloro-2-methylphenoxy)acetic acid [6]
- **CAS Number:** 94-74-6

- **Molecular Weight:** 200.62
- **Water Solubility:** 825 mg/L @ 25 C (acid) [5]
- **Solubility in Other Solvents:** v.s. in ether, ethanol, toluene, xylene; s. in methanol [6]
- **Melting Point:** 118-119 C [6]
- **Vapor Pressure:** 0.2 mPa @ 20 C [6]
- **Partition Coefficient:** Not Available
- **Adsorption Coefficient:** MPCA acid, 100; MCPA salts, 20 (estimated); MCPA ester, 1000 (estimated) [21]

Exposure Guidelines:

- **ADI:** Not Available
- **MCL:** Not Available
- **RfD:** 0.0005 mg/kg/day [31]
- **PEL:** Not Available
- **HA:** 0.01 mg/L (lifetime) [38]
- **TLV:** Not Available

Basic Manufacturer:

Gilmore, Inc.
5501 Murray Road
Memphis, TN 38119-3703

- **Phone:** 901-761-5870
- **Emergency:** Not Available

References:

References for the information in this PIP can be found in Reference List [Number 7](#)