carfentrazone-ethyl

Review Date: 02/10/2014
CAS #: 128639-02-1

Type	Contact aquatic herbicide
Controls	Carfentrazone-ethyl is highly toxic to aquatic plants and controls submersed, floating or emergent aquatic plants.
Mode of Action	Inhibits an enzyme which results in peroxide formation that degrades cell membranes and destroys cells.

Thurston County Review Summary:

Carfentrazone-ethyl as an active ingredient in aquatic herbicides is rated low in hazard and passes Thurston County's pesticide review criteria.

MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	20 - 30	1	Moderate - low
Soil Sorption (Kd=mL/g)	Value not found		
Organic Sorption (Koc=mL/g)	750	2	Moderate

Mobility Summary:

Carfentrazone-ethyl is slighlty soluble in water and is expected to adhere moderately to soil. The hazard for carfentrazone-ethyl to move off the site of a terrestrial application with rain or irrigation water is rated moderate. The rating for mobility hazard for aquatic applications is not applicable because mobility will be based on the flow of the water body it is applied to.

PERSISTENCE

Property	Value	Reference	Value Rating
Vapor Pressure (mm Hg)	0.00000012	1	High
Biotic or Aerobic Half-life (days)	<2	1	Low
Photolysis Half-life (days)	<8.3 (pH 5)	1	Low
Terrestrial Field Test Half-life (days)	2 to 5	1	Low
Hydrolysis Half-life (days)	<9 (pH 7) <4 (pH 9)	1	Low
Anaerobic Half-life (days)	<1 (soil)	1	Low
Aquatic Field Test Half-life (days)	<2	1	Low

Persistence Summary:

Carfentrazone-ethyl is rapidly degraded by hydrolysis, photolysis, as well as anaerobic and aerobic metabolism (Reference 1 and 2). The hazard for chemical persistence is low.

BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Value not found		
Bioconcentration Factor	34	1	Low
Octanol/Water Partition Coefficient	log Kow = 3.36	2	Moderate

Bioaccumulation Summary:

In a rat metabolism study, carfentrazone-ethyl was rapidly absorbed with up to 87% of the administered dose excreted within 24 hours (Reference 1). In a fish bioconcentration study, trout accumulated carfentrazone-ethyl in edible tissue but within one day half of the concentration was eliminated from their bodies when moved to clean water (depuration) and about 99% was eliminated after two weeks (Reference 1). This rapid elimination in mammals and fast depuration in fish indicates that carfentazone is not likely to bioaccumulate. The hazard for bioaccumulation is rated low.

ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

Test Subject	Value	Reference	Toxicity Rating
Mammalian (LD50)	>5,000 mg/kg	1	Low
Avian (LD50)	>2,250 mg/kg	1	Low
Honey bee or insect (LD50)	>200 ug/bee	1	Low
Annelida -worms (LC50)	>820 mg/kg	1	Moderate - low
Fish (LC50)	1.6 mg/L	1	Moderate
Crustacean (LC50)	>9.8 mg/L	1	Moderate
Mollusk (LC50)	2.3 mg/L	1	Moderate
Amphibian (LD50 or LC50)	Value not found		

Acute Toxicity Testing and Ecotoxicity Summary:

Single-dose toxicity testing indicates that carfentrazole-ethyl is low in toxicity to birds, honeybees, and terrestrial animals but moderately toxic to fish and other aquatic organisms (Reference 1).

Fish growth was reduced at carfentrazone-ethyl water concentrations of 242 ppb, but under full spectrum lights, fish growth was reduced at concentrations as low as 16 ppb (Reference 1). After evaluating the study performed with full spectrum lights, the EPA requested that the test be repeated due to problems with testing parameters (Reference 1). The test indicates that carfentrazone-ethyl is much more toxic in sunlight than it is without sunlight. Risk assessments for long-term exposures to fish exceeds the EPA's level of concern when a shallow water body is treated, although long-term exposures are unlikely due to the low application rates and rapid degradation of carfentrazone-ethyl (Reference 1). The risk of an adverse effect to fish and other aquatic organisms is rated low because of the rapid degradation of carfentrazone-ethyl and the limited exposure that is expected following an aquatic application.

ACUTE HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Risk Rating
Child swimming	Ingestion	0.5 mg/kg/day	0.0017 mg/kg/day	293	1	Low
Adult swimming	Ingestion	0.5 mg/kg/day	0.00052 mg/kg/day	957	1	Low
Adult consuming a diet with fish	Ingestion	0.5 mg/kg/day	<0.005 mg/kg/day	>100	1	Low
Combined exposures were not evaluated						

Acute Toxicity Risk Assessment Summary:

A risk assessment was calculated for a child or an adult swiimmer following an aquatic application of a carfentazone-ethyl herbicide at the maximum allowable rate. Skin exposures did not create toxicity in test animals so the risk assessment was calculated for oral ingestion only. A swimmer's potential exposure from ingestion of treated water over a 5-hour period is much lower than the calculated dose of concern and is rated low in hazard. The risk of eating fish from a water body after an aquatic application at maximum application rates is rated low in hazard.

CHRONIC HUMAN TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Not likely to be carcinogenic to humans	- -	2	Low
Mutagenicity	125 ug/ml	Chromosomal abberations	2	Low
Neurotoxicity - (NOAEL)	Value not provided	"Not neurotoxic"	1	Low
Endocrine Disruption	"No evidence of endocrine disruption"	- -	1	Low
Developmental Toxicity (NOAEL)	600 mg/kg/day	Skeletal abnormalities	2	Low
Reproductive Toxicity (NOAEL)	>387 mg/kg/day		1	Check risk
Chronic Toxicity (NOAEL)	50 mg/kg/day	Increase in porphyrin levels	2	Check risk

Chronic Toxicity Hazard Summary:

In reproductive toxicity testing maternal and offspring toxicity was observed at the same concentration, although reproductive toxicity was observed only at higher concentrations. Developmental toxicity was observed at doses much higher than doses that caused maternal toxicity (Reference 2). One of the mutagenicity tests indicated that carfentrazone-ethyl increased the incidence of chromosomal abberations without metabolic activation but that effect was not observed with metabolic activation (References 2 and 3). The EPA determined that carfentazone-ethyl was not mutagenic due to the negative results from all the other tests for mutagenic potential (Reference 3).

CHRONIC HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Risk Rating
Applicator exposures were not evaluated						
Post-application exposures were not evaluated						
Post-application exposures were not evaluated						
Combined exposures were not evaluated						

Chronic Toxicity Risk Assessment Summary:

Due to the rapid degradation of carfentrazone-ethyl in water, long-term exposures are not expected from aquatic herbicide applications.

Metabolites and Degradation Products:

Carfentrazone-ethyl degrades by hydrolysis to F8426- chloropropionic acid which is less toxic than carfentrazone-ethyl (Reference 1).

Comments:

Carfentrazone-ethyl is considered an eye irritant (EPA Toxicity Category III) but not a skin irritant (EPA Toxicity Category IV) or a skin sensitizer (Reference 1).

References

1. Washington State Department of Ecology. Environmental Impact Statement for Penoxsulam, Imazamox, Bispyribac-sodium, Flumioxazin, & Carfentrazone-ethyl. Addendum to the Final Supplemental Environmental Impact Statement for Freshwater Aquatic Plant Management. October 2011.
2. National Library of Medicine. TOXNET. Hazardous Substances Database. Carfentrazone-ethyl. Http://toxnet.nlm.nih.gov/ Created 8/27/2004, Updated 5/2/2005.
3. USEPA. Office of Prevention, Pesticides and Toxic Substances. Pesticide Fact Sheet: Carfentrazone-ethyl. September 30, 1998.