

pelargonic acid (nonanoic acid)

Review Date: 7/1/2009

Type	Terrestrial, contact, post-emergent herbicide.
Controls	Non-selective - but works best on herbaceous (non-woody) plants as well as moss and lichen.
Mode of Action	Desiccates (dries out) the vegetation that it contacts by destroying the waxy cuticle of the weed. It is also considered a plant growth regulator.

Thurston County Review Summary:

Herbicides with pelargonic acid as the only active ingredient pass the Thurston County review criteria. This active ingredient is considered low in hazard for toxicity and persistence, but moderate in mobility and bioaccumulation hazard. Pelargonic acid products should be used with caution because they have the potential to cause severe eye irritation and moderate skin irritation.

MOBILITY

Property	Value	Reference	Rating
Solubility (mg/L)	210	5	Moderate
Soil Sorption (Kd=mL/g)	Not found		
Organic Sorption (Koc=mL/g)	1700	5	Moderate

Mobility Summary:

Pelargonic acid is somewhat soluble in water and does not bind tightly to most soil types. When products with pelargonic acid are applied to vegetation the hazard for it to move off the site of application with rain or irrigation water is considered moderate.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	0.0016	1	Low
Biotic or Aerobic Half-life (days)	<20	5	Moderate
Abiotic Half-life (days)	1.6	6	Low
Terrestrial Field Test Half-life (days)	<1	6	Low
Hydrolysis Half-life (days)	Not expected	5	High
Anaerobic Half-life (days)	Not found		
Aquatic Field Test Half-life (days)	Not found		

Persistence Summary:

Pelargonic acid has a high vapor pressure, which increases the chance for it to evaporate, and is likely degrade to half of the applied concentration in less than one week. The EPA estimates that in soil it will degrade to half of the applied concentration in less than one day (References 5 and 6). The persistence hazard of pelargonic acid is rated as low.

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	230	5	Moderate
Octanol/Water Partition Coefficient	log Kow = 3.4	5	Moderate

Bioaccumulation Summary:

Pelargonic acid has a moderate affinity for organic matter (log Kow = 3.4) indicating that it can bind to the fats and oil in fish and animal tissue. Bioaccumulation is considered moderate in hazard.

ACUTE TOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	3,200 mg/kg	3	Low
Avian (LD50)	Not found		
Honey bee or insect (LD50)	25 ug/bee	10	Low
Annelida -worms (LC50)	Not found		
Fish (LC50)	68 mg/L	7	Moderate
Crustacean (LC50)	64 mg/L	7	Moderate
Mollusk (LC50)	Not found		
Amphibian (LD50 or LC50)	32 mg/L	7	Moderate

Acute Toxicity Summary:

Pelargonic acid on the skin can cause skin reactions, erythema, pigmentation, and contact dermatitis. However, short-term exposures to pelargonic acid from herbicidal uses is considered low in hazard for toxicity because it is considered practically non-toxic by ingestion or through absorption from skin contact (Reference 4). Single dose toxicity testing indicates that it is low in toxicity to mammals and insects, and moderate in toxicity to amphibians, fish, and other aquatic organisms.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Exposures to applicators were not evaluated						
Exposures to treated food was not evaluated						
Exposures to treated vegetation was not evaluated						
Combined exposures were not evaluated						

Acute Toxicity Risk Assessment Summary

Toxicity testing of pelargonic acid indicates that it is essentially non-toxic via the oral and dermal routes (Reference 4). The EPA concluded that there is reasonable certainty that there will be no harm to the general population, including infants and children, from all exposures to pelargonic acid from herbicidal use (Reference 2).

The risk of toxicity from single-day exposures to pelargonic acid, used for weed control, is rated as low in hazard.

CHRONIC TOXICITY

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	"no systemic toxicity"	--	2	Low
Mutagenicity	Negative	--	3	Low
Neurotoxicity - (NOAEL)	Not found			
Endocrine Disruption	>2,000 mg/kg/day	"no systemic toxicity noted"	2	Check risk
Developmental Toxicity (NOAEL)	<1,500	Cleft palate	2	Check risk
Reproductive Toxicity (NOAEL)	>2,000 mg/kg/day	"no systemic toxicity noted"	2	Check risk
Chronic Toxicity (NOAEL)	>2,000 mg/kg/day	"no systemic toxicity noted"	2	Check risk

Chronic Toxicity Summary:

Based on the following considerations, EPA concludes that pelargonic acid is unlikely to pose a risk under all reasonable exposure scenarios:

1. Fatty acids such as pelargonic acid are processed by known metabolic pathways within the body and contribute to normal physiological function.
2. Pelargonic acid is naturally present at levels up to 224 parts per billion (ppb) in apples, 385 ppm in the skin of grapes, and 143 ppm in grape pulp. It is present in a number of other foods as well. An average serving of grapes containing 385 ppm of pelargonic acid in the grape skins would result in exposure to pelargonic acid to an average consumer of 164 [mu]g/kg/day.
3. Pelargonic acid is exempt from a tolerance when used as a herbicide on all plant food commodities provided that allocations are not made directly to the food commodity except when used as a harvest aid or desiccant to any root or tuber vegetable, bulb, or cotton.
4. Dietary toxicity testing evidenced adverse reactions only at doses that were at or above limit doses. Dermal toxicity testing showed no significant systemic reaction.
5. The estimated exposures to pelargonic acid and other fatty acids from direct or indirect addition to food as well as sanitizer uses are well below the doses administered in animal studies that are required to elicit an adverse effect. Accordingly, EPA concludes that there is a reasonable certainty of no harm to the general population, including infants and children, from aggregate exposure to pelargonic acid (Reference 2).

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Exposures to treated vegetation was not evaluated						
Combined exposures were not evaluated						
Drinking water exposures were not evaluated						
Dietary exposures were not evaluated						

Chronic Toxicity Risk Assessment Summary:

The EPA concluded that there is reasonable certainty that there will be no harm to the general population, including infants and children, from all exposures to pelargonic acid from herbicidal use (Reference 2).

The risk of toxicity from long-term exposures to pelargonic acid, used for weed control, is considered low in hazard.

Degradation Products:

Nonanoic acid is metabolized by the liver to produce ketone bodies. Metabolism occurs via beta-oxidation, and chemical chain elongation or tissue storage of the acid. Metabolism of the terminal propionic acid residue results in increased glucose and glycogen synthesis (Reference 9).

Comments:

Severe eye irritant, moderate skin irritant, but not considered a skin sensitizer. (Reference 1).

References

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