

diquat dibromide

Review Date: 5/26/2009

Type	Terrestrial non-selective contact herbicide.
Controls	Non-selective herbicide that kills most broadleaf and grassy weeds (since it is not a systemic herbicide it will not circulate through the plant to kill roots).
Mode of Action	Works as a defoliant and desiccant by producing a superoxide anion that destroys plant cells.

Thurston County Review Summary:

Diquat dibromide has a single dose mortality concentration (LD50) for cows of 30-56 mg/kg, which is considered too highly toxic to mammals by Thurston County's review criteria. Also, the exposures to this chemical by a child entering an area treated for weed control is also considered too high in hazard for toxicity. Therefore, herbicides containing diquat dibromide as an active ingredient fail Thurston County's review criteria due to the toxicity hazard they present at expected environmental concentrations.

MOBILITY

Property	Value	Reference	Rating
Solubility (mg/L)	700,000	3	High
Soil Sorption (Kd=mL/g)	Not found		
Organic Sorption (Koc=mL/g)	3,000-500,000	5	Low

Mobility Summary:

Even though this chemical is very water soluble, it adheres to soil and sediment so strongly that it is considered low in hazard for mobility.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	<0.00000001	7	High
Biotic or Aerobic Half-life (days)	31-50	5	Moderate
Abiotic Half-life (days)	Stable	3	High
Terrestrial Field Test Half-life (days)	>365	6	High
Hydrolysis Half-life (days)	Stable	6	High
Anaerobic Half-life (days)	>270	5	High
Aquatic Field Test Half-life (days)	<2	6	Low

Persistence Summary:

In every environment diquat dibromide is very persistent. But, due to the nature of the chemical, it will become bound to soil and sediment so tightly that it won't be broken down by microorganisms. The persistence hazard of diquat dibromide is rated as high.

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	Not found		
Octanol/Water Partition Coefficient	0.000025	5	Low

Bioaccumulation Summary:

Diquat dibromide has a very low octanol / water partition coefficient so it is more likely to mix with water than accumulate in fat and tissue. The hazard for bioaccumulation is considered low.

ACUTE TOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	30-56 mg/kg	2	High
Avian (LD50)	31-60.1 ppm a.e.	5	Moderate
Honey bee or insect (LD50)	100 ug/bee	5	Low
Annelida -worms (LC50)	Not found		
Fish (LC50)	12.3 mg/L	2	Moderate
Crustacean (LC50)	0.048 mg/L	5	High
Mollusk (LC50)	0.34 mg/L	5	High
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Summary:

Diquat dibromide has a lethal-dose concentration (LD50) to cows of 30-56 mg/kg, which is considered too highly toxic to mammals by Thurston County's review criteria. Diquat dibromide is also considered highly toxic to aquatic organisms (oysters and crustaceans), moderately toxic to fish and birds, and low in toxicity to bees.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Adult mixing and	0.01 mg/kg/day	0.003 mg/kg/day	3.3	Skin (dermal)	3	Moderate
Child playing for 2 hours in treated turf	0.01 mg/kg/day	0.007 mg/kg/day	1.45	Ingestion (hand-to-mouth)	3	High
Child playing for 2 hours in treated turf	0.01 mg/kg/day	0.0078 mg/kg/day	1.3	Skin absorption (dermal)	3	High
Child playing for 2 hours in treated turf	0.01 mg/kg/day	0.0148 mg/kg/day	None	Ingestion + Skin absorption	3	High

Acute Toxicity Risk Assessment Summary

The potential exposures to an adult mixing, loading, and applying 5 gallons of diquat dibromide herbicides by backpack sprayer, low pressure handwand, or by aerosol can; are rated moderate in hazard. The potential exposure to a child playing for 2 hours in treated turf grass on the same day it was sprayed but after it is dry is considered high in hazard.

CHRONIC TOXICITY

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	E	Evidence of non-carcinogenicity for humans	1	Low
Mutagenicity	Negative	- -	2	Low
Neurotoxicity - (NOAEL)	--	Negative	4	Low
Endocrine Disruption	--	Negative	3	Low
Developmental Toxicity (NOAEL)	2 mg/kg/day	Skeletal alterations + weight loss	3	Check risk
Reproductive Toxicity (NOAEL)	4 mg/kg/day	Decrease in live pups + kidney lesions	3	Check risk
Chronic Toxicity (NOAEL)	0.5 mg/kg/day	Cataracts, decreased adrenal weights	3	Check risk

Chronic Toxicity Summary:

Testing of diquat dibromide showed that it does not cause neurotoxicity, mutagenicity, or endocrine disruption (Reference 3). The EPA cancer classification is "E" for evidence of non-carcinogenicity for humans. Reproductive and developmental toxicity was observed at doses that were higher than those that caused maternal toxicity. The first adverse effects observed in the long-term toxicity tests were cataracts, and decreased adrenal and epididymides weights.

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Post-application contact exposure was not assessed						
Aggregate exposure not evaluated						
Drinking water exposure not evaluated						
Dietary exposure was not evaluated						

Chronic Toxicity Risk Assessment Summary:

The EPA did not identify any herbicidal uses of diquat dibromide that would result in a long-term exposure except when they are used on crops. Thurston County's reviews do not include herbicidal use on crops. Since there are no other identified long-term exposures to diquat dibromide, the hazard for toxicity from a long-term exposure is considered low.

Degradation Products:

Unknown

Comments:

Diquat dibromide is a moderate to severe eye irritant but is not considered a skin sensitizer.

References

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4. USEPA, Office of Prevention, Pesticides and Toxic Substances. TXR #: 0050379. December 14, 2001. Memorandum: Toxicology Chapter for DIQUAT DIBROMIDE.
5. Final Risk Assessment for Diquat Dibromide Appendix A. Publication Number 02-10-046. Washington State Department of Ecology Water Quality Program, November 2002.
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7. Syngenta Crop Protection Inc., Post Office Box 18300, Greensboro, NC 27419. Material Safety Data Sheet. REWARD LANDSCAPE AND AQUATIC HERBICIDE.
8. USEPA, Prevention, Pesticides and Toxic Substances. (7508W), EPA-738-F-95-015, July 1995. R.E.D. FACTS Diquat Dibromide.
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