triclopyr BEE (butoxyethyl ester)

Review Date: 4/28/2009

Type	Terrestrial herbicide - systemic and selective for broadleaf weeds
Controls	Selective woody plant and broadleaf herbicide.
Mode of Action	Triclopyr acts as a synthetic growth hormone that causes an overdose and plant death.

Thurston County Review Summary:

Herbicide products containing triclopyr BEE, as the only active ingredient, both pass and fail Thurston County's review criteria - so are rated "conditional" because some applications are considerd high in hazard and others are considered moderate in hazard. Broadcast applications of triclopyr BEE herbicides, at rates that exceed 2 pounds of active ingredient per acre (read product label for mixing and application rate information), are considered high in hazard for toxicity to birds and small mammals, and fail the review criteria. Applications at lower rates are considered moderate in hazard, and do not fail the review.

MOBILITY

Property	Value	Reference	Rating
Solubility (mg/L)	6.8	4	Low
Soil Sorption (Kd=mL/g)	Not found		
Organic Sorption (Koc=mL/g)	560	1	High

Mobility Summary:

Triclopyr BEE will quickly convert to triclopyr acid after application, which is highly water soluble and adheres poorly to soil, therefore, herbicides containing triclopyr BEE are considered high in mobility hazard.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	0.0000036	4	Moderate
Biotic or Aerobic Half-life (days)	<20	1	Moderate
Abiotic Half-life (days)	<730	4	High
Terrestrial Field Test Half-life (days)	39	2	Moderate
Hydrolysis Half-life (days)	0.5	4	Low
Anaerobic Half-life (days)	26	1	High
Aquatic Field Test Half-life (days)	<5	1	Low

Persistence Summary:

Triclopyr BEE will convert to the acid form within a day of application and it is unlikely to dissipate into the air or break down interacting with water (hydrolysis). Triclopyr is primarily broken down by microorganisms in the top 12 inches of soil but when it gets deep into soil, where there is less oxygen, it can persist for years. Triclopyr is likely to break down to less than 50% of the applied concentration within 60 days of a land application, which is rated as moderately persistent.

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	<10	1	Low
Octanol/Water Partition Coefficient	log Kow = 4.1	4	Moderate

Bioaccumulation Summary:

Triclopyr BEE and triclopyr acid have a fairly strong attraction to organic matter (logKow > 4), but the bioaccumulation hazard is calculated as being low.

ACUTE TOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	630 mg/kg	1	Moderate
Avian (LD50)	2,055 mg/kg	1	Low
Honey bee or insect (LD50)	60.4 ug/bee	4	Low
Annelida -worms (LC50)	Not found		
Fish (LC50)	0.36 ppm	4	Low
Crustacean (LC50)	895 ppm	1	Low
Mollusk (LC50)	58 ppm	1	Moderate
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Summary:

Lethal dose testing (single dose) of triclopyr indicates that it is moderately toxic to mammals and oysters, and low in toxicity to birds, insects, fish and crustaceans. Risk of toxicity to non-target birds and small foraging animals is considered moderate or high in hazard depending on application rates and location. The EPA made the following statements about triclopyr BEE: "There is a high potential for acute risk to birds from triclopyr BEE." and "Endangered species of birds, mammals, fish, aquatic invertebrates, estuarine/marine species, and plants may be affected by triclopyr BEE." (Reference 1).

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Applicator / handler exposure was not evaluated						
Child drinking treated water	0.3 mg/kg/day	0.036 mg/kg/day	8.3	Ingestion	1	Moderate
Adult female drinking treated water	0.3 mg/kg/day	0.012 mg/kg/day	25	Ingestion	1	Low
Adult female ingesting treated food and water	0.3 mg/kg/day	0.024 mg/kg/day	12.5	Ingestion	1	Low

Acute Toxicity Risk Assessment Summary

Short-term exposures to triclopyr by inhalation and / or by absorption through skin is considered minimal (dermal transfer is less than 2%). Because these routes of exposure are considered minimal, the short-term exposure assessment for mixing and applying triclopyr herbicides was waived by the EPA.

Because triclopyr is considered mobile and moderaely persistent there is a potential for it to contaminate drinking water. The short-term risk of ingesting triclopyr from contaminated drinking water has the potential exposure to children that is moderate in hazard for toxicity. The risk form a combined exposure to an adult ingesting contaminated water and eating treated food is considered low in hazard for toxicity.

Short-term exposures to birds and small animals foraging on short grasses and nuts/berries after applications at certain application rates exceeds EPA's level of concern. Applications that exceed 2 pounds of active ingredient per acre are considered high in hazard for potential toxicity to non-target organisms. Applications at lower rates are considered moderate in hazard to non-target organisms. Since some application rates are below the level of concern and others are above the level of concern, triclopyr products receive a review determination of "conditional".

CHRONIC TOXICITY

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	D	Not classifiable as to human carcinogenicity	1	Low
Mutagenicity	Negative	Negative	1	Low
Neurotoxicity - (NOAEL)	Not found			
Endocrine Disruption	Not found			
Developmental Toxicity (NOAEL)	30 mg/kg/day	embryonic deaths +	1	Check risk
Reproductive Toxicity (NOAEL)	25 mg/kg/day	Negative	1	Low
Chronic Toxicity (NOAEL)	5 mg/kg/day	Kidney histopathology	1	Check risk

Chronic Toxicity Summary:

Triclopyr is classified as EPA List D (not classifiable as to human carcinogenicity), it is not considered a mutagen, and no information could be found about neurotoxicity or endocrine disruption. Developmental toxicity was produced at the same concentration as the parental toxicity and reproductive toxicity studies produced offspring toxicity at concentrations higher than doses that produced paternal toxicity.

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Exposure to treated vegetation not evaluated						
Infant ingesting treated food and water	0.05 mg/kg/day	0.024 mg/kg/day	2.1	Ingestion	1	Moderate
Infant <1 drinking treated water	0.05 mg/kg/day	0.023 mg/kg/day	2.2	Ingestion	1	Moderate
Infants eating treated food	0.05 mg/kg/day	0.001325 mg/kg/day	37.7	Ingestion	1	Low

Chronic Toxicity Risk Assessment Summary:

Since triclopyr is considered mobile and moderately persistent it has a potential to leach into soil and groundwater. The exposure to an infant from a long-term exposure to drinking water containing triclopyr can reach almost half of the EPA's calculated dose of concern and is considered moderate in hazard. There are no expected uses of triclopyer that create a long-term exposure of concern other than drinking contaminated water.

DegradationProducts:

3,5,6-trichloro-2-pyridinol (TCP) is the major degradation product of triclopyr acid. TCP is rated as highly mobile and persistent with moderate to high acute toxicity. Chronic toxicity could not be determined. Acute and chronic toxicity RfDs for TCP are almost the same as the RfDs triclopyr (acute developmental toxicity RfD for triclopyr = 30 mg/kg/day and for TCP it is 25 mg/kg/day - chronic RfD for triclopyr is 10 times higher than that of TCP (Reference 1).

RESULT: Triclopyr degradation products do not seem to increase the toxicity hazard of triclopyr use.

Comments:

Triclopyr can cause severe eye irritation and is considered a skin sensitizer.

References

1. USEPA. "TRICLOPYR". Reregistration Eligibility Decision (RED). EPA 738-R-98-011, October 1998.
2. Washington State Department of Ecology Water Quality Program. Environmental Impact Statement for Permitted Use of Triclopyr. Final. May 2004. Publication Number 04-10-018.
3. Petty, David G. et al. Prepared for Headquarters, US Army Corps of Engineers and Aquatic Ecosystem Restoration Foundation, Inc. US Army Corps of Engineers, Waterways Experiment Station. Aquatic Plant Control Research Project, "Aquatic Dissipation of Triclopyr in a Whole Pond Treatment". Technical Report A-98-6. November 1998.
4. Ganapathy, C. Environmental Monitoring & Pesticide Management Branch, Department of Pesticide Regulation. Sacramento, CA. Environmental Fate of Triclopyr. January 1997.
5. M. Tu, C. Hurd, R. Robison & J.M. Randall. Weed Control Methods Handbook, The Nature Conservancy. April 2001.