fluazifop-P-butyl

Review Date: 6/15/2009

Type	Terrestrial - systemic, selective, post-emergent herbicide.
Controls	Broad spectrum control of annual and perennial grass weeds, wild oats, and volunteer cereals in turf, landscape, and ornamental production areas.
Mode of Action	Inhibits the synthesis of lipids required for growth and maintenance of cell membranes.

Thurston County Review Summary:

The worst-case potential exposures to applicators of herbicides containing fluazifop-P-butyl that later work in the treated vegetation are considered too high in hazard and fail the Thurston County review criteria. The exposures to applicators (that do not work in the treated vegetation) are rated as moderate in hazard, as are the exposures to children that play in turf grass treated for lawn renovation.

Fluazifop-P-butyl metabolite fluazifop-P is rated as high in hazard for mobility and moderate to high in hazard for persistence. The bioaccumulation potential is rated as low in hazard.

MOBILITY

Property	Value	Reference	Rating
Solubility (mg/L)	1.1 (780 fluazifop-P)	4	Low (moderate for fluazifop-P)
Soil Sorption (Kd=mL/g)	Not found		
Organic Sorption (Koc=mL/g)	5,800 (39 fluazifop-P)	4	Low (high for fluazifop-P)

Mobility Summary:

Fluazifop-P-butyl is not very soluble in water, adheres strongly to soils with organic material and can be expected to degrade in soil to fluazifop-P within one day (Reference 1). The metabolite and degradation chemical fluazifop-P adheres very poorly to soils with organic matter and is moderately soluble. So, the active ingredient fluazifop-P-butyl is considered low in mobility hazard although its metabolite that causes the toxic mode of action is considered high in mobility hazard.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	0.00000025	4	Moderate
Biotic or Aerobic Half-life (days)	<1 (<26 fluazifop acid)	5	Low (moderate for fluazifop)
Abiotic Half-life (days)	Not found		
Terrestrial Field Test Half-life (days)	<1	1	Low
Hydrolysis Half-life (days)	78	4	High
Anaerobic Half-life (days)	"stable"	5	High
Aquatic Field Test Half-life (days)	Not found		

Persistence Summary:

Active ingredient fluazifop-P-butyl can be expected to be converted to fluazifop-P within a day of ground application. Fluazifop-P can degrade to half of its original concentration within 30 days unless it leaches into the soil with rain or irrigation water where it can take over 60 days. Fluazifop-P-butyl and its major metabolite are rated as moderate to high in hazard for environmental persistence.

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	Not found		
Octanol/Water Partition Coefficient	log Kow = 4.5	4	Moderate

Bioaccumulation Summary:

The potential for bioaccumulation was rated on the octanol / water partition coefficient (log Kow) of fluazifop-P-butyl and its metabolite fluazifop-P and their metabolism studies. The octanol / water partition coefficient indicates a moderate potential for bioaccumulation, although the metabolism studies show that these chemicals are 96-100% eliminated in the urine and feces within 7 days. The hazard for bioaccumulation is rated as low.

ACUTE TOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	2,451mg/kg	5	Low
Avian (LD50)	4,321 mg/kg	6	Low
Honey bee or insect (LD50)	>200 ug/bee	4	Low
Annelida -worms (LC50)	>1,000 mg/kg	4	Low
Fish (LC50)	0.53 mg/L	6	High
Crustacean (LC50)	>1 mg/L	4	Moderate
Mollusk (LC50)	Not found		
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Summary:

Fluazifop-P-butyl toxicity to non-human mammals, birds, and insects is considered low but, it is considered highly toxic to fish and moderate to other aquatic organisms. The metabolite and degradation chemical fluazifop-P is practically non-toxic to fish and other aquatic organisms (Reference 5).

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Adult applicator	0.02 mg/kg/day	0.0081 mg/kg/day	2.5	Dermal (skin absorption)	1	Moderate
Adult working in treated vegetation	0.02 mg/kg/day	0.0053 mg/kg/day	3.8	Dermal	1	Moderate
Child playing in treated turf	0.02 mg/kg/day	0.0076 mg/kg/day	2.6	Dermal	1	Moderate
Adult applying and working in treated vegetation	0.02 mg/kg/day	0.013 mg/kg/day	1.5	Dermal	1	High

Acute Toxicity Risk Assessment Summary

The potential exposure from mixing, loading, and applying a concentrated liquid product containing fluazifop-P-butyl with a hose-end sprayer is considered the worst-case exposure for an applicator. This exposure is nearly half of the dose of concern and is rated as a moderate hazard for toxicity. The combined exposure to an adult applicator that also works in the treated vegetation afterwards can be more than half of the calculated dose of concern and is rated as high in hazard for toxicity.

The potential exposures to children playing in treated turf grass or to adults working in treated vegetation (on the same day as the application) are rated moderate in hazard for toxicity.

CHRONIC TOXICITY

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	"not likely" to be a human carcinogen	No human data suggesting potential for cancer	1	Low
Mutagenicity	Negative	- -	1	Low
Neurotoxicity - (NOAEL)	"no concern"	increased brain weight	4	Low
Endocrine Disruption	0.74 mg/kg/day	Decreased teste and pituitary weights (+	5	Check risk
Developmental Toxicity (NOAEL)	1 mg/kg/day	Delayed skeletal ossification	5	Check risk
Reproductive Toxicity (NOAEL)	0.74 mg/kg/day	Decreased organ weights	5	Check risk
Chronic Toxicity (NOAEL)	0.74 mg/kg/day	Decreased organ weights	1	Check risk

Chronic Toxicity Summary:

Fluazifop-P-butyl is "not likely to be carcinogenic to humans" (Reference 1) and is not considered mutagenic. In animal testing, reproductive and developmental toxicity was elicited without maternal toxicity (however, the EPA did not provide an extra safety factor on their uncertainty value when evaluating chronic toxicity).

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Long-term exposure from treated turf not expected						
Combined exposure assessments were not applicable						
Drinking water exposure was not evaluated alone						
Dietary exposure was not evaluated alone						

Chronic Toxicity Risk Assessment Summary:

The only expected long-term exposures are from eating treated food crops and drinking contaminated water. Thurston County Government does not spray food crops or include dietary exposures in the risk assessment. However, since fluazifop-P-butyl represents a potential to contaminate surface water and groundwater, a drinking water risk assessment was reviewed.

Drinking water risk assessments were combined with long-term dietary exposures and the data was not available to separate the inputs from food and water. The combined exposure was rated as high in hazard although the drinking water route alone is likely to be moderate in hazard. The scenario for contaminating surface water was also based on treating crops (peach orchards) and not indicative of a Thurston County risk scenario. There were no long-term exposures to treated vegetation expected from herbicidal use of fluazufop-P-butyl.

The risk for toxicity from non-crop herbicidal use of fluazufop-P-butyl is considered low in hazard.

DegradationProducts:

Fluazifop-P-butyl is quickly hydrolyzed to fluazifop-P in plants and is metabolized to fluazifop-P (up to 83%) in mammals. Fluazifop-P is further metabolized to 5-trifluoromethyl-2-pyridone and 2-(4-hydroxyphenoxy) propionic acid (which may be metabolized or conjugated ultimately to carbon dioxide) - References 3 & 4.

Comments:

The metabolite and degradation chemical fluazifop-P is less toxic to aquatic organisms (Rainbow trout LD50 = 117 mg/L and Daphnia magna LD50 = 240 mg/L) than fluazifop-P-butyl (Rainbow trout LD50 = 1.3 mg/L and Daphnia magna LD50 = 1 mg/L).

Fluazifop-P-butyl is a potential skin and eye irritant but is not a skin sensitizer (Reference 4).

References

1. USEPA. Prevention, Pesticides and Toxic Substances (7508C). Report of the Food Quality Protection Act (FQPA) Tolerance Reassessment Progress and Risk Management Decision (TRED) for Fluazifop-P-butyl. EPA 738-R-05-005. September 2005.
2. Memorandum: From: Rodia, Carem. Chemical Review Manager, Special Review and Reregistration Division, USEPA. To: Fluazifop-P-butyl TRED Team. Subject: Fluazifop-P-butyl Use Closure Memo. Date: November 26, 2003.
3. International Union of Pure and Applied Chemistry (IUPAC). Pesticide Properties Database. January 27, 2009. http://sitem.herts.ac.uk/aeru/iupac/index.htm
4. Kingtai Chemicals Co., Limited. Jiaxing, Zhejiang, P.R.China. Products; HERBICIDES - FLUAZIFOP-P-BUTYL.
5. Locke, D. et al. USEPA. MEMORANDUM: Fluazifop-P-butyl: Revised HED Chapter of the Tolerance Reassessment Eligibility Document (TRED). PC Code: 122809, Case # 2285, DP Barcode: D291903.
6. USEPA. Document ID - OPP-2004-0347. Overview of the Fluazifop-P-butyl Risk Assessments. January 5, 2005.