isoxaben

Review Date: 9/9/2010
CAS #: 82558-50-7

Type	Pre-emergent herbicide
Controls	Controls broadleaf weeds and vines with grasses tending to be more tolerant and young plants and seedlings being the most sensitive.
Mode of Action	Isoxaben disrupts root and stem development in germinating seeds (Reference 1).

Thurston County Review Summary:

The EPA is currently gathering toxicity data for isoxaben for use in risk assessments and to potentially register more uses of these herbicides. The EPA has published some of the toxicity data and has made some preliminary assessments - but has not finalized these decisions or incorporated them into the current registration. The EPA's timeline for isoxaben registration (and publishing of associated data) is currently set for 2013.

Based on currently available information isoxaben fails the Thurston County review criteria. Isoxaben is considered high in hazard for being classified as a possible human carcinogen, and because the preliminary risk assessments show the risk to mammals foraging on treated vegetation and insects greatly exceeds the calculated level of concern. Human risk assessments have yet to be performed by the EPA which is considered a significant data gap for the County review. Isoxaben is rated as high in hazard for moving off the site of application with rain or irrigation water, it is also considered high in hazard for persistence, and moderate in hazard for bioaccumulation potential.

MOBILITY

Property	Value	Reference	Rating
Solubility (mg/L)	1.04	1	Low
Soil Sorption (Kd=mL/g)	0.8 - 6.6	2	High
Organic Sorption (Koc=mL/g)	354	1	High

Mobility Summary:

Isoxaben is not very soluble in water and adheres poorly to almost all soil types (adheres better to soil with organic matter). The hazard of moving off the site of application with rain or irrigation water is rated high.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	0.00000039	2	High
Biotic or Aerobic Half-life (days)	105	1	High
Abiotic Half-life (days)	301	1	High
Terrestrial Field Test Half-life (days)	30 - 182	1	High
Hydrolysis Half-life (days)	Stable	1	High
Anaerobic Half-life (days)	>120 soil 18 aquatic	2	High - moderate
Aquatic Field Test Half-life (days)	Not found		

Persistence Summary:

Isoxaben is not metabolized quickly by soil microbes and is likely to take more than two or three months to degrade to half of the applied concentration. The hazard of persistence is rated high.

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	Not found		
Octanol/Water Partition Coefficient	2.64	2	Moderate

Bioaccumulation Summary:

Isoxaben has an octanol/water partition coefficient that indicates that it has a moderate affinity to bind with organic material (like fats and oil). Bioconcentration studies with fish indicate that they take in the chemical but it is flushed from their bodies when they are moved to clean water. Rat studies indicate that there can be as much as 15% of the administered chemical that is not metabolized. The EPA believes the rat study shows potential for bioaccumulation that needs to be further evaluated. The hazard for bioaccumulation is rated moderate.

ACUTE TOXICITY HAZARD - ECOTOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	>10,000 mg ai/kg-bw	2	Low
Avian (LD50)	>2,000 mg ai/kg-bw	2	Low
Honey bee or insect (LD50)	>101.7 ug ai/bee	2	Low
Annelida -worms (LC50)	>100 mg ai/kg	2	Low
Fish (LC50)	>1.1 mg ai/L	2	Moderate
Crustacean (LC50)	>1 mg ai/L	2	Moderate
Mollusk (LC50)	>0.96 mg ai/L	2	Moderate
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Summary:

Single-dose toxicity testing indicates that isoxaben is low in toxicity to mammals, birds, bees, and worms but, moderate in hazard to fish and other aquatic organisms. Draft risk assessments for non-target wildlife indicate that there is a potential to apply concentrations of isoxaben, from labeled uses, that are within 10% of the lethal dose to aquatic organisms and to birds foraging on treated short grass. Short-term exposures to mammals foraging does not appear to be a concern, however, long-term exposures to mammals foraging on grasses, broadleaf plants, or small insects can be nearly 6 times higher than the EPA's level of concern. Until the EPA publishes a refinement of these risk assessments the risk to birds and aquatic organisms is rated moderate and the risk to non-target mammals is rated high in hazard.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Residential exposures have not been assessed						
Occupational exposures have not been assessed						
Post-application exposures have not been assessed						
Drinking water exposures have not been assessed						

Acute Toxicity Risk Assessment Summary

Human risk assessments from short-term exposures to isoxaben have not been performed by the EPA. Thurston County considers the lack of these risk assessments to be a significant data gap.

CHRONIC TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Group C	Possible human carcinogen	2	High
Mutagenicity	"not an overt mutagenicity concern"	- -	2	Low
Neurotoxicity - (NOAEL)	Not found			
Endocrine Disruption	Not listed	- -	3 and 4	Low
Developmental Toxicity (NOAEL)	1,000 mg/kg/day (LOAEL)	Preimplantation loss +	2	Check risk
Reproductive Toxicity (NOAEL)	1,000 mg/kg/day	None noted	2	Low
Chronic Toxicity (NOAEL)	5 mg/kg/day	Increased BUN, increased heart/body weight +	2	Check risk

Chronic Toxicity Summary:

Isoxaben is in the EPA's Group C for possible human carcinogenicity (which is rated as high in hazard). Developmental toxicity was noted at maternally toxic doses and included an increase of preimplantation loss, increased resorptions, smaller litter sizes, and increased number of runt fetuses. Reproductive toxicity tests with rabbits did not produce any toxicity to the fetuses or parents. The EPA states that "The weight-of-evidence suggests there is not an overt mutagenicity concern for isoxaben." Isoxaben has not been identified as a known endocrine disruptor.

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Occupational risk has not been assessed						
Post-application exposures have not been assessed						
Drinking water risks have not been assessed						
Combined exposures have not been assessed						

Chronic Toxicity Risk Assessment Summary:

Long-term risk assessments have not been performed by the EPA for exposures to isoxaben from herbicidal use, which Thurston County considers a significant data gap.

DegradationProducts:

Major degredation chemicals include N-[3-(1-hydroxy-1-methyl-propyl)-5-isoxazolyl]-2,6,dimethoxybenzamide; N-[3-(1-ethyl-1-methyl-2-oxypropyl)isoxazol-5-yl]-2,6-dimethoxybenzamide; dimethoxy benzamide; methoxyphenyl pyrimidinol and AEM hexenoyl isoxaben.

Comments:

Isoxaben is not considered an eye or skin irritant and is not considered a skin sensitizer (Reference 2).

References

1. International Union of Pure & Applied Chemistry (IUPAC). Pesticide Properties Database (Accessed 8/11/2010). http://sitem.herts.ac.uk/aeru/iupac/
2. USEPA. Isoxaben Summary Document, Registration Review Docket [Docket Number: EPA-HQ-OPP-2007-1038]. December 2007.
3. Scorecard - The Pollution Information Site. Health Effects / Endocrine Toxicants (Accessed 9/10/2010). http://www.scorecard.org/health-effects/
4. Illinois EPA. "Endocrine Disruptors Strategy" February 1997.