

Type	Terrestrial post-emergent herbicide.
Controls	Selective control of perennial and annual grass weeds.
Mode of Action	Stops the production of lipids (fats / oils) in plant cells.

Thurston County Review Summary:

Sethoxydim is rated as high in hazard for the potential to move off the site of application with rain or irrigation water. Sethoxydim is likely to degrade to half of the applied concentration in a couple of weeks unless water moves it into deeper soil where it will likely take months. The potential for chemical bioaccumulation in fish or animal tissue is considered low. The risk for reproductive toxicity to birds exposed to sethoxydim can exceed the EPA's level of concern with one application to short grasses and is rated as high in hazard.

The herbicide active ingredient sethoxydim fails the review criteria because the risk for toxicity to birds at expected environmental concentrations.

MOBILITY

Property	Value	Reference	Rating
Solubility (mg/L)	4,700	1	High
Soil Sorption (Kd=mL/g)	0.03 - 0.94	4	High
Organic Sorption (Koc=mL/g)	50	1	High

Mobility Summary:

Sethoxydim is very soluble in water, dissociates readily when introduced to the environment, and adheres poorly to inorganic and organic soil. The hazard of sethoxydim to move off the site of application is considered high.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	0.00000016	1	Moderate
Biotic or Aerobic Half-life (days)	<1	2	Low
Abiotic Half-life (days)	>60	4	High
Terrestrial Field Test Half-life (days)	Up to 10	4	Moderate
Hydrolysis Half-life (days)	40	1	Moderate
Anaerobic Half-life (days)	Up to 40	4	Moderate
Aquatic Field Test Half-life (days)	Not found		

Persistence Summary:

On vegetation and surface soil, sethoxydim will likely degrade or dissipate to less than half of its applied concentration within one week. Since this chemical has the potential to move with water, it may leach into deeper soil where it can take up to 60 days to reach half of the applied concentration. The persistence hazard of sethoxydim is low on vegetation and surface soil and moderate in deeper soil (greater than one foot deep).

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	7 - 21	4	Low
Octanol/Water Partition Coefficient	log Kow = 1.38	4	Low

Bioaccumulation Summary:

Sethoxydim has a low octanol water partition coefficient (greater attraction to water than it does to organic solvents) and a low calculated bioconcentration factor, therefore the bioaccumulation hazard of sethoxydim is considered low.

ACUTE TOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	2,676 mg/kg	2	Low
Avian (LD50)	>5,000 mg/kg	6	Low
Honey bee or insect (LD50)	10 ug/bee	4	Moderate
Annelida -worms (LC50)	542 mg/kg	6	Moderate
Fish (LC50)	1.2 mg/L	4	Moderate
Crustacean (LC50)	2.6 mg/L	4	Moderate
Mollusk (LC50)	25 mg/L	3	Moderate
Amphibian (LD50 or LC50)	5.5 mg/L	3	Moderate

Acute Toxicity Summary:

Single dose toxicity of sethoxydim indicates that it is low in toxicity to terrestrial mammals and birds, and moderate toxicity to worms, frogs, fish and other aquatic organisms.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Right-of-way sprayer	0.81 mg/kg/day	0.026 mg/kg/day	31	Inhalation	2	Low
Toddlers interacting with treated vegetation	1.8 mg/kg/day	0.0088 mg/kg/day	204	Ingestion - hand to mouth activities	2	Low
Females 13+	1.8 mg/kg/day	0.015 mg/kg/day	120	Ingestion - treated drinking water	5	Low
Combined exposures were not evaluated						

Acute Toxicity Risk Assessment Summary

The worst-case exposure to applicators was identified as inhalation of sethoxydim during right of way applications. These potential exposures are calculated to be 31 times less than the EPA's dose of concern, and are rated as low in hazard. Exposures to residential applicators are calculated to be 14,000 times less than the EPA's dose of concern.

The worst-case short term exposures following an application of sethoxydim are to toddlers playing in treated vegetation and to women drinking treated water. Both of these potential exposures are 100 times less than the EPA's dose of concern and are rated as low in hazard.

Since sethoxydim is practically non-toxic to birds on a single-dose basis the EPA does not believe that birds are at risk from short-term exposures (Reference 2).

The risk of toxicity from a one-day exposure to sethoxydim from herbicidal use is rated as low in hazard.

CHRONIC TOXICITY

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	"not likely"	No human data suggesting potential for cancer	2	Low
Mutagenicity	Negative	- -	5	Low
Neurotoxicity - (NOAEL)	See narrative	"non-specific"	2	Check risk
Endocrine Disruption	Not listed	- -	7	Low
Developmental Toxicity (NOAEL)	180 mg/kg/day	Irregular gait	5	Check risk
Reproductive Toxicity (NOAEL)	>150 mg/kg/day	Negative	5	Check risk
Chronic Toxicity (NOAEL)	13.8 mg/kg/day	Liver effects	2	Check risk

Chronic Toxicity Summary:

Animal testing of sethoxydim concluded that it is not a mutagen and is "not likely" a carcinogen (References 5 and 2). Suggestive evidence of neurotoxicity was seen at doses that were high enough for the EPA to conclude that the responses were non-specific and do not warrant a developmental neurotoxicity study. Developmental toxicity studies showed no concerns over pre- or post-natal toxicity and reproductive toxicity was seen at maternally toxic doses (Reference 2). Sethoxydim is not currently listed as a known or suspected endocrine toxicant.

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 was not evaluated						
Dietary exposure was not evaluated						

Chronic Toxicity Risk Assessment Summary:

The EPA does not believe there is a chance for long-term human exposures from herbicidal applications of sethoxydim unless it is used on crops (Reference 5). So, the only long-term exposures that were assessed by the EPA involved applications to crops. Thurston County uses of sethoxydim would not include crop applications, so long-term human exposures were not evaluated for this review.

In the ecotoxicity assessment the risk for reproductive toxicity to birds was evaluated at different sethoxydim application rates. One application to short grasses at the maximum application rate (0.47 pounds of active ingredient per acre) exceeds EPA's level of concern for birds. This sub-lethal response at expected environmental concentrations is considered high in hazard.

Degradation Products:

Soil degradation produces sulfoxide and sulfone derivatives of the parent compound (MSO and MSO₂), in water M1S and M2S are also expected to be found. These compounds are of unknown toxicity and so the EPA assumed they are as toxic as the parent compound in risk assessments for drinking water exposures (Reference 2).

Comments:

Sethoxydim is not considered an skin or eye irritant (EPA toxicity category IV) or a skin sensitizer (Reference 2).

References

- "Sethoxydim" Pesticide Information Profile. Extension Toxicology Network. Publication Date: 9/93.
- USEPA. Reregistration Eligibility Decision (RED) for Sethoxydim. September 30, 2005.
- "Sethoxydim - Identification, toxicity, use, water pollution potential, ecological toxicity and regulatory information". PAN Pesticide Database - Chemicals. http://www.pesticideinfo.org/Detail_Chemical.jsp?Rec_Id=PC35437.
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- USEPA. "Sethoxydim; Pesticide Tolerance". [Federal Register: October 8, 1998 (Volume 63, Number 195)]. [Rules and Regulations]. [Page 54066-54073]. From the Federal Register Online via GPO Access [wais.access.gpo.gov] [DOCID: fr08oc98-11].
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- Scorecard - The Pollution Information site. Health Effects: Endocrine Toxicants (Accessed 7/1/2009) . <http://www.scorecard.org/health-effects/>