

Type	Selective pre-emergent herbicide.
Controls	Oryzalin controls annual grasses, broadleaf weeds, woody shrubs and vines.
Mode of Action	Inhibits cell division in plants.

Thurston County Review Summary:

Herbicides containing oryzalin fail Thurston County's review criteria for several reasons;
 1) oryzalin has an EPA carcinogen classification of "Group C" - possible human carcinogen,
 2) oryzalin herbicides are rated as high in hazard for the risk of toxicity to adults who mix, load, and apply at the maximum application rate with a low pressure hand wand (two acres) or a whirlybird or belly grinder style spreader (one acre), and
 3) at many application rates the risk of toxicity to birds eating treated short grass exceeds the EPA's level of concern which is rated as high in hazard.

MOBILITY

Property	Value	Reference	Rating
Solubility (mg/L)	2.5 mg/L	1	Low
Soil Sorption (Kd=mL/g)	2 - 13	1	Moderate to high
Organic Sorption (Koc=mL/g)	600	1	Moderate

Mobility Summary:

Oryzalin is not very soluble in water and adheres moderately to soil with organic matter (loam, silt, or clay soil mixtures) and poorly to soil without organic matter (sand and gravelly soil types). The hazard of oryzalin moving off the site of application with rain or irrigation water is rated as moderate.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	8.2	3	High
Biotic or Aerobic Half-life (days)	>60	1	High
Abiotic Half-life (days)	122	3	High
Terrestrial Field Test Half-life (days)	58 - 77	1	High
Hydrolysis Half-life (days)	Stable	1	High
Anaerobic Half-life (days)	32.7	3	Moderate
Aquatic Field Test Half-life (days)	Not found		

Persistence Summary:

Oryzalin has a very low vapor pressure so it is not expected to dissipate into the air and it is not expected to be broken down by water alone. The main route of chemical degradation is by sunlight and microbial activity, but it is still likely to take more than 60 days to break down to half of the applied concentration. The hazard for persistence is rated as high.

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	32 - 106	1	Low
Octanol/Water Partition Coefficient	3.73	3	Moderate

Bioaccumulation Summary:

As a chemical, oryzalin is moderately attracted to organic matter (so it is not expected to bind well to fats and oils). Bioconcentration studies also indicate that it does not accumulate in fish tissue. The hazard for bioaccumulation is rated as low.

ACUTE TOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	>10,000 mg/kg	1	Low
Avian (LD50)	506.7 mg/kg	1	Moderate
Honey bee or insect (LD50)	>11 ug/bee	1	Low
Annelida -worms (LC50)	>500 mg/kg	3	Low
Fish (LC50)	3.54 mg/L	3	Moderate
Crustacean (LC50)	1.4 ppm	1	Moderate
Mollusk (LC50)	Not found		
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Summary:

Single-dose toxicity testing indicates that oryzalin is low in toxicity to animals, bees, and worms - but is considered moderately toxic to birds, fish and other aquatic organisms. Herbicide applications of oryzalin are not expected to cause harm to small animals. Ground or aerial applied herbicide is not expected to create oryzalin concentrations in water that would cause harm to aquatic organisms. Inadvertent applications directly to water is expected to exceed the EPA's level of concern for organisms in shallow water. Oryzalin does not appear to pose a chronic risk to birds at single application rates of 4 pounds of active ingredient per acre (lb a.i./A) or less. However, single applications at the 6 lb a.i./A rate, 3 turf applications at the 1.5 lb a.i./A rate, and 4 applications at the 2.0 lb a.i./A rate - may have potential for chronic risk to birds feeding on short grass. This potential is increased because of the chemical persistence of oryzalin (Reference 1).

The risk to non-target birds from the herbicidal use of oryzalin is rated as high in hazard when annual applications are at 6 lb a.i./A or greater.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Mix/load/apply with handwand	0.125 mg/kg/day	0.149 mg/kg/day	None	Dermal	1	High
Mix/load/apply with handwand	0.125 mg/kg/day	0.064 mg/kg/day	<2	Dermal	1	High
Adult applying with a backpack sprayer	0.125 mg/kg/day	0.008 mg/kg/day	15.6	Dermal	1	Low
Adult applying with groundboom	0.125 mg/kg/day	0.010 mg/kg/day	12.5	Dermal	1	Low

Acute Toxicity Risk Assessment Summary

Potential intermediate-term exposures (exposures of one week or more within a year) to adults who mix, load, and apply at the maximum application rate with a low pressure hand wand (two acres) or a whirlybird or belly grinder style spreader (one acre) are rated as high in hazard.

The hazard for applicators that do not mix or load the application device, and use a groundboom system on an open cab tractor (applying to 80 acres) or using a backpack sprayer (applying to 2 acres) are considered low in hazard.

The EPA did not calculate the risk to people contacting treated vegetation.

CHRONIC TOXICITY

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Group C	Possible human carcinogen	1	Fail
Mutagenicity	"not mutagenic"	- -	1	Low
Neurotoxicity - (NOAEL)	Not found			
Endocrine Disruption	Not listed	- -	4	Low
Developmental Toxicity (NOAEL)	50 mg/kg/day	Reduced weight gain	1	Check risk
Reproductive Toxicity (NOAEL)	12.5 mg/kg/day	"fetotoxicity"	1	Check risk
Chronic Toxicity (NOAEL)	12.16 mg/kg/day	Hematological changes	1	Check risk

Chronic Toxicity Summary:

The EPA has oryzalin listed within cancer classification - Group C, as a "possible human carcinogen". Mutagenicity testing determined that it is non-mutagenic and developmental toxicity was only observed along with maternal toxicity. Reproductive toxicity tests produced fetotoxicity in the form of reduced pup growth with no other toxicity noted up to the highest doses tested. In long-term toxicity testing the first toxic endpoints noted were reduced growth, weight, and hematological changes.

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Not calculated						
Not calculated						
Not calculated						
Not calculated						

Chronic Toxicity Risk Assessment Summary:

The long-term risk assessments conducted for EPA registration for exposures to oryzalin were not documented in a format that was consistent with other registration documents and were difficult to interpret. The tabulated data presented the exposures to the increased risk of cancer (but not to the most vulnerable chronic toxic endpoint) - although the EPA did insinuate that all long-term dietary exposures were more than 5000 times less than the reference dose (RfD) calculated from toxicity testing. If the standard safety factor of 100 is applied to the RfD then the expected exposures from eating treated crops would have a safety factor greater than 50 - from the calculated dose of concern (RfD divided by the uncertainty factor). If these assumptions are correct than all dietary exposures would be rated as low in hazard.

The risk from long-term exposures has not been adequately evaluated and is considered a data gap.

Degradation Products:

7-amino-2-ethyl-1-propyl-1H-benzimidazole-5-sulfonamide (anaerobic soil) and 2-ethyl-7-nitro-1-propyl-5-sulfonylamino-benzimidazole-3-oxide (water photolysis) Reference 3.

Comments:

Oryzalin is considered a moderate skin and eye irritant (EPA Category III) and is not considered a skin sensitizer (Reference 1).

References

- USEPA Prevention, Pesticides and Toxic Substances (7508W). EPA-738-F-94-012. Oryzalin. September 1994.
- E X T O X N E T. Extension Toxicology Network, Pesticide Information Profiles. "Oryzalin" Revised June 1996.
- International Union of Pure & Applied Chemistry (IUPAC). Pesticide Properties Database (Accessed 7/2/2010). <http://sitem.herts.ac.uk/aeru/iupac/>
- Illinois EPA. "Endocrine Disruptors Strategy" February 1997.