

Type	Trifluralin is a selective pre-emergent herbicide.
Controls	Controls annual grasses and broadleaf weeds on food crops and non-crop areas including residential sites.
Mode of Action	Trifluralin is a dinitroaniline herbicide that enters plants through developing roots and stops plant cells from dividing and elongating (Reference 1).

Thurston County Review Summary:

Herbicides containing trifluralin as an active ingredient fail the Thurston County review process because they are rated as high in hazard for human toxicity and for the potential to cause adverse effects to small animals using treated grass, insects, and seeds for food. Trifluralin is also considered a skin sensitizer.

Trifluralin is classified as a possible human carcinogen by the EPA and is perceived as having the potential to cause endocrine disruption. Trifluralin is not likely to move off the site of application with rain or irrigation water, but it is rated as high in hazard for persistence (likely to be present at over half the applied concentration more for more than 100 days), and has a moderate potential for the hazard of bioaccumulation.

MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	0.2 mg/L	3	Low
Soil Sorption (Kd=mL/g)	55 - 155	1	Moderate to low
Organic Sorption (Koc=mL/g)	8,765	3	Low

Mobility Summary:

Trifluralin is not very soluble in water and binds strongly to soil containing organic matter but only adheres moderately to soil with little or no organic matter. The hazard of trifluralin to move off the site of application with rain or irrigation water is rated as low.

PERSISTENCE

Property	Value	Reference	Value Rating
Vapor Pressure (mm Hg)	0.00007	1	Moderate
Biotic or Aerobic Half-life (days)	181	3	High
Abiotic Half-life (days)	181	3	High
Terrestrial Field Test Half-life (days)	170	3	High
Hydrolysis Half-life (days)	Stable	3	High
Anaerobic Half-life (days)	25 - 59	1	Moderate
Aquatic Field Test Half-life (days)	8 - 20	1	Moderate

Persistence Summary:

Trifluralin has a relatively high vapor pressure for an herbicide, which makes it vulnerable to dissipating into the air. However, this herbicide needs to be incorporated into the soil to work effectively (which minimizes air dissipation). Field testing and laboratory testing indicates that it takes well over 100 days for trifluralin to degrade to half of its applied concentration in soil. The persistence hazard for trifluralin is rated high.

BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	5,674	3	High
Octanol/Water Partition Coefficient	5.27	3	High

Bioaccumulation Summary:

Trifluralin is not very soluble in water and would rather bind to fats and oil than combine with water. Bioconcentration studies indicate that it is likely to accumulate in fish tissue, although 8- to 88% of the chemical was eliminated when the fish were moved to clean water (deuration). Mammal metabolism studies with trifluralin indicate that very little of the ingested chemical is absorbed. About 80% of the absorbed chemical is excreted in the feces and what is left can be metabolized into 40 different chemicals that are eliminated in the urine within 3 days. Due to the metabolism and deuration studies, the hazard for bioaccumulation is rated as moderate.

ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

Test Subject	Value	Reference	Value Rating
Mammalian (LD50)	>5,000 mg/kg	1	Low
Avian (LD50)	>2,000 mg/kg/day	1	Low
Honey bee or insect (LD50)	>100 ug/bee	1	Low
Annelida -worms (LC50)	>500 mg/kg	1	Low
Fish (LC50)	0.041 ppm	1	High
Crustacean (LC50)	0.56 ppm	1	High
Mollusk (LC50)	Not found		
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Testing and Ecotoxicity Summary:

Single-dose toxicity testing indicates that trifluralin is low in toxicity to mammals, birds, insects, and worms. It is considered highly toxic to fish and other aquatic organisms. Use of herbicides containing trifluralin can result in concentrations on grasses, seeds and insects that could adversely impact small mammals feeding on them. The EPA also concluded that fish and other aquatic organisms may be adversely affected by the use of trifluralin herbicides.

ACUTE HUMAN TOXICITY - Risk Assessment

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

Acute Toxicity Risk Assessment Summary:

Risk assessments were not calculated for acute dietary, short-term (or intermediate-term) occupational or residential exposures because the EPA did not identify any endpoints to evaluate (Reference 1).

CHRONIC HUMAN TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	EPA Group "C"	Possible human carcinogen	1	Fail
Mutagenicity	- -	"No evidence of mutagenicity"	1	Low
Neurotoxicity - (NOAEL)	Not found			
Endocrine Disruption	Unknown	"Substances with potential evidence"	4	High
Developmental Toxicity (NOAEL)	225 mg/kg/day	Reduced fetus weight	1	Low
Reproductive Toxicity (NOAEL)	200 mg/kg/day	Reduced weanling body weights	1	Low
Chronic Toxicity (NOAEL)	0.75 mg/kg/day	Increase in kidney weight & methemoglobin	1	Check risk

Chronic Toxicity Hazard Summary:

Long-term toxicity testing indicates that trifluralin is not considered a developmental or reproductive toxicant, nor is it considered a chemical mutagen. It is classified in the EPA's Group C as a possible human carcinogen and for which "...the preponderance of the evidence (in both intact animals and in bioassays) suggests that the chemical can cause disruption of the endocrine system..." (Reference 5). The toxicity hazards identified for long-term exposures to trifluralin are rated as high.

CHRONIC HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Occupational mixer/loader	Dermal + inhalation	0.024 mg/kg/day	0.0016 mg/kg/day	15	1	Low
Residential applicator - push spreader	Dermal + inhalation	0.024 mg/kg/day	0.000016 mg/kg/day	1500	1	Low
Residential applicator - whirlybird spreader	Dermal + inhalation	0.024 mg/kg/day	0.000066 mg/kg/day	363	1	Low
Occupational applicator - backpack sprayer	Dermal + inhalation	0.024 mg/kg/day	0.003 mg/kg/day	8	1	Moderate

Chronic Toxicity Risk Assessment Summary:

Risk assessments were evaluated by the EPA only for long-term exposures to trifluralin for adult applicators (both residential and occupational). All of the scenarios were considered low in hazard except the potential occupational exposures from the use of backpack sprayers (mixing and applying 40 gallons) which is rated as moderate in hazard.

Metabolites and Degradation Products:

Trifluralin degrades to 3-nitro-N2, N2-dipropyl-5-(trifluoromethyl)benzene-1,2-diamine

Comments:

Trifluralin is a slight eye irritant (EPA category III) but not a skin irritant (EPA category IV), however, it is considered a skin sensitizer (Reference 1).

References

- USEPA. Prevention, Pesticide and Toxic Substances. Reregistration Eligibility Decision (RED) Trifluralin. EPA 738-R-95-040. April 1996
- USEPA. Prevention, Pesticide and Toxic Substances. Report of the Food Quality Protection Act (FPQA), Tolerance Reassessment Progress and Risk Management Decision (TRED) for Trifluralin. August 31, 2004.
- International Union of Pure & Applied Chemistry (IUPAC). Pesticide Properties Database (Accessed 6/16/2010). <http://sitem.herts.ac.uk/aeru/iupac/>
- COMMISSION OF THE EUROPEAN COMMUNITIES. Brussels, 28.10.2004. SEC(2004) 1372. Commission Staff Working Document on implementation of the Community Strategy for Endocrine Disrupters - a range of substances suspected of interfering with the hormone systems of humans and wildlife (COM (1999) 706).
- Illinois EPA. "Endocrine Disruptors Strategy" February 1997.