indaziflam

Review Date: 03/01/2016
CAS #: 950782-86-2

Type	Pre- and post emergent
Controls	Annual grasses and broadleaf weeds
Mode of Action	Inhibits cellulose biosynthesis

Thurston County Review Summary:

Indaziflam herbicides are rated conditional by Thurston County's pesticide review process. The conditional rating is based on the difference in calculated risk from potential exposures to occupational applicators. The risk from specific occupational application methods, as described in the chronic risk assessment summary, are calculated to be high in hazard, although all other potential exposures from mixing, applying and from all post-application exposures are rated low in hazard (including all residential exposures).

Indaziflam is low in toxicity to mammals, birds, bees, and worms but is highly toxic to fish. Risk to non-target organisms from labeled uses of indaziflam herbicides is rated low in hazard.

MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	2.8 mg/L	1	Low
Soil Sorption (Kd=mL/g)	4.9 to 27.4	4	Low - moderate
Organic Sorption (Koc=mL/g)	434 to 1544	4	Moderate

Mobility Summary:

Indaziflam is not very soluble in water and is expected to adhere moderately to most soil types (binds tighter to soil with more organic matter). Indaziflam is rated moderate to low in hazard for the potential to move off the site of application with rain or irrigation water.

PERSISTENCE

Property	Value	Reference	Value Rating
Vapor Pressure (mm Hg)	0.00000000019	1	High
Biotic or Aerobic Half-life (days)	>150	1	High
Photolysis Half-life (days)	<5	1	Low
Terrestrial Field Test Half-life (days)	Value not found		
Hydrolysis Half-life (days)	Stable	2	High
Anaerobic Half-life (days)	Stable (soil and aquatic)	1	High
Aquatic Field Test Half-life (days)	>200	1	High

Persistence Summary:

Indaziflam is not likely to dissipate into the air, and it is expected to degrade slowly in soil. Although sunlight can degrade indaziflam quickly in clear water, it is expected to degrade slowly in most aquatic settings. Because indaziflam is expected to take more than 60 days to degrade to half of the applied concentration, it is rated high in hazard for chemical persistence.

BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Value not found		
Bioconcentration Factor	Value not found		
Octanol/Water Partition Coefficient	2.8	1	Moderate

Bioaccumulation Summary:

In animals, indaziflam is quickly metabolized and excreted with over 90% eliminated within 24 hours (Reference 1).

ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

Test Subject	Value	Reference	Toxicity Rating
Mammalian (LD50)	>2,000	1	Low
Avian (LD50)	>2,000 mg/kg	3	Low
Honey bee or insect (LD50)	>100 ug/bee	3	Low
Annelida -worms (LC50)	>1,000 mg/kg	3	Low
Fish (LC50)	<1 mg/L	3	High
Crustacean (LC50)	<9.88 mg/L	3	Moderate
Mollusk (LC50)	Value not found		
Amphibian (LD50 or LC50)	Value not found		

Acute Toxicity Testing and Ecotoxicity Summary:

Indaziflam is highly toxic to freshwater and marine fish, moderately toxic to freshwater invertebrates, and low in toxicity to mammals, birds, worms and honeybees (References 1 and 3). Risk assessments evaluated by the EPA indicate that risk to birds, mammals, bees, earthworms, fish and other aquatic organisms (listed or unlisted species) is low following the labeled use of indaziflam herbicides.

ACUTE HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Risk Rating
Residential applicator (0.5 acres)	Dermal + inhalation	0.075 mg/kg/day	0.0025 to 0.00001 mg/kg/day	30 to 5,100	1	Low
Child playing in treated lawn	Dermal + incidental oral	0.075 mg/kg/day	0.0042 mg/kg/day	18	1	Low
Adult entering treated lawn	Dermal	0.075 mg/kg/day	0.0016 to 0.00075 mg/kg/day	47 to 100	1	Low
Adult golfer on treated turf	Dermal	0.075 mg/kg/day	0.000083 mg/kg/day	900	1	Low

Acute Toxicity Risk Assessment Summary:

The EPA selected neurotoxicy as the adverse effect for short term oral exposures to indaziflam based on clinical signs observed in test animals.

Dermal (skin) absorption of indaziflam is conservatively estimated at 42.7% of the applied dose. Dermal absorption decreases with increased concentration, which indicates that the skin can get saturated and inhibits greater absorption (Reference 1).

Risk from short-term and intermediate-term exposures to indaziflam (dermal and/or ingestion) were compared to a dose of concern based on a no observeable adverse effect level of 7.5 mg/kg body weight with an uncertainty factor of 100, creating a dose of concern for oral and inhalation of 0.075 mg/kg body weight.

Potential short-term exposures to residential applicators applying indaziflam to 0.5 acres of lawn with a belly grinder, push spreader, or a "Ready-To-Use" product applied with a hose-end sprayer, or a "mix your own" product applied with a hose-end sprayer are all rated low in hazard.

Potential exposures to a child playing in treated grass or an adult entering treated grass or playing golf on treated turf are also rated low in hazard.

CHRONIC HUMAN TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Not likely	- -	1	Low
Mutagenicity	Value not found	No evidence of mutagenicity	1	Low
Neurotoxicity - (NOAEL)	7.5 mg/kg/day	Degenerative neuropathology of brain & spinal cord	1	Check risk
Endocrine Disruption	Value not found			
Developmental Toxicity (NOAEL)	25 mg/kg/day	Decreased maternal and pup weight	1	Check risk
Reproductive Toxicity (NOAEL)	69.3 mg/kg (M) & 85.2 m/kg (F)	Decreased weight + clinical observations	1	Check risk
Chronic Toxicity (NOAEL)	2 mg/kg/day	Degenerative nerve fibers in brain & spinal cord	1	Check risk

Chronic Toxicity Hazard Summary:

Reproductive and developmental toxicity was only observed at doses that also caused maternal and/or parental toxicity (Reference 1). The EPA classifies indaziflam as "not likely" to cause cancer, and testing showed no evidence of mutagenicity (Reference 1).

CHRONIC HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Risk Rating
Mix/apply to 5 acres forestry/non-crop	Dermal + inhalation	0.075 mg/kg	0.046 mg/kg	1.1 to 1.6	1	High
Mix/apply 40 gal or to 5 acres with backpack spray	Dermal + inhalation	0.075 mg/kg	0.003 to 0.0013 mg/kg	25 to 56	1	Low
Adult hand weeding / transplaniting turf	Dermal + inhalation	0.075 mg/kg	0.002 mg/kg	34	1	Low
Working with outdoor ornamentals in treated area	Dermal + inhalation	0.075 mg/kg	0.000145 mg/kg	510	1	Low

Chronic Toxicity Risk Assessment Summary:

Risk from short-term and intermediate-term (seasonal) exposures to indaziflam were compared to a dose of concern of 0.07.5 mg/kg-bw. The EPA determined that there are no long-term exposures expected from indaziflam herbicide use, and they did not calculate risk from potential long-term exposures.

Risk from potential occupational exposures were evaluated for handling, mixing and applying indaziflam herbicides to forestry, non-crop areas, turf grass, nurseries, landscapes, golf courses, lawns, recreational fields and parks.

The largest occupational exposures were calculated for mixing and applying with a low-pressure handwand. Potential exposures from mixing and applying to 5 acres of forestry land at a rate of 0.125 lb ai/acre with a low pressure handwand is rated high in hazard. However, potential exposures from mixing and applying 40 gallons at the lower rate of 0.0248 lb ai/gallon with a low pressure handwand is rated low in hazard. Potential exposures from mixing and applying to 5 acres of non-crop areas with a low pressure handwand at a rate of 0.089 lb ai/acre is rated high in hazard. Potential exposures from mixing and applying 40 gallons to non-crop areas at a rate of 0.0178 lb ai/gallon with a low pressure handwand is rated high in hazard when the risk assessment is calculated using a more conservative dermal transfer coefficient.

All other potential occupational exposures from mixing and applying indaziflam herbicides at the highest application rate using different application devices were calculated to be at least ten times less than the dose of concern and are rated low in hazard. All potential post-application occupational exposures were calculated to be at least 34 to 1,000 times less than the dose of concern and are rated low in hazard.

Metabolites and Degradation Products:

The major metabolite of ingested indaziflam is carboxylic acid with low levels of 3-hydroxyindane acid epimer, diaminotriazine and 3-ketohydroxymethyl metabolites (Reference 1). The EPA also lists fluoroethyldiaminotriazine (FDAT) as a metabolite of indaziflam (Reference 1). Indaziflam degradates are more mobile than indaziflam, and the degradate FDAT is mobile and has the potential to leach to the ground water (Reference 1).

Comments:

Indaziflam is not considered an eye or skin irritant (EPA Toxicity Category IV) and is not a skin sensitizer (Reference 1).

References

1. USEPA. PESTICIDE FACT SHEET. Indaziflam. Conditional Registration. Date Issued: July 26, 2010.
2 New York State Department of Environmental Conservation, Division of Materials Management. Registration of the New Active Ingredient Indaziflam as Contained in Alion Herbicide (EPA Reg. No. 264-1106), Esplanade 200 SC (EPA Reg. No. 432-1516), and Marengo (EPA Reg. No. 432-1518) and the Withdrawal of Specticle 20 WSP (EPA Reg. No. 432-1499). October 5, 2012.
3. International Union of Pure & Applied Chemistry. Pesticide Properties Database. Indaziflam. Record last updated: Thursday 19 November 2015.
4. Diego G. Alonso, William C. Koskinen, Rubem S. Oliveira, Jr., Jamil Constantin, and Suresh Mislankar. Journal of Agricultural and Food Chemistry. Sorption Desorption of Indaziflam in Selected Agricultural Soils. 2011.