bifenthrin

Review Date: 12/12/2012

CAS #: 82657-04-3

Type	Type I pyrethroid insecticide
Controls	Various insects; aphids, worms, ants, beetles, spiders, moths, mites, ticks, yellow jackets, maggots, fleas, caterpillars, flies, etc.
Mode of Action	Bifenthrin is a neurotoxin and it affects the peripheral and central nervous system.

Thurston County Review Summary:

Bifenthrin is rated high in hazard and insecticide products containing it fail Thurton County's pesticide review criteria. Bifenthrin is rated high in hazard because it is classified by the EPA as a possible human carcinogen and it is rated high in hazard for the combination of high chemical persistence and a high potential to bioaccumulate.

MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	0.000014	3	Low
Soil Sorption (Kd=mL/g)	992 to 5430	3	Low
Organic Sorption (Koc=mL/g)	>100,000	3	Low

Mobility Summary:

Bifenthrin is not soluble in water and is expected to bind well to all soil types. The hazard for bifenthrin to move off the site of application with rain or irrigation water is rated low.

PERSISTENCE

Property	Value	Reference	Value Rating
Vapor Pressure (mm Hg)	0.00000018	3	High
Biotic or Aerobic Half-life (days)	78 to 345	3	High
Abiotic Half-life (days)	Stable to photolysis	3	High
Terrestrial Field Test Half-life (days)	>100 average	3	High
Hydrolysis Half-life (days)	Stable	3	High
Anaerobic Half-life (days)	>60	3	High
Aquatic Field Test Half-life (days)	Value not found		

Persistence Summary:

Bifenthrin is not likely to dissipate into the air and is stable in sunlight. Degradation in soil, sediment and aquatic environments isslow and it is expected to to take more than 60 days to degrade to 50% of the applied concentration (Reference 3). The hazard for persistence is rated high.

BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Value not found		
Bioconcentration Factor	2110 (edible) 6090 (whole fish)	3	Moderate to high
Octanol/Water Partition Coefficient	log Kow = 6.4	3	High

Bioaccumulation Summary:

The octanol/water partition coefficient for bifenthrin (log Kow = 6.4) indicates that it binds well to organic material and has a potential to accumulate in fish or animal tissue. Bioconcentration studies with fish indicates that it accumulates highly throughout the fish although only moderatley in the edible portions. When contaminated fish were moved to clean water it took over 40 days forhalf of the bifenthrin to be eliminated from the fish. The hazard for bioaccumulation is rated high.

ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

Test Subject	Value	Reference	Value Rating
Mammalian (LD50)	53.8 mg/kg	3	Moderate
Avian (LD50)	1,800 mg/kg	3	Moderate
Honey bee or insect (LD50)	0.015 ug/bee	3	Very high
Annelida -worms (LC50)	>8 mg/kg	4	High to moderate
Fish (LC50)	0.15 ug/L	3	Very high
Crustacean (LC50)	1.6 ug/L	3	Very high
Mollusk (LC50)	Value not found		
Amphibian (LD50 or LC50)	Value not found		

Acute Toxicity Testing and Ecotoxicity Summary:

Single-dose toxicity testing indicates that bifenthrin is very highly toxic to insects, fish and other aquatic organisms, but moderately toxic to animals and birds.

Registered uses of bifenthrin products used as a building spray and on residential turf has been implicated in hundreds of fish deaths that the EPA classified as "highly likely" to have been caused by bifenthrin.

ACUTE HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Child playing on treated turf	Oral (hand to mouth)	0.01 mg/kg/day	0.0005 mg/kg/day	20	5	Low
Child playing on treated turf	Dermal	0.01 mg/kg/day	0.0011 mg/kg/day	9	5	Moderate
Child in home after perimeter termite application	Inhalation (oral equivalent)	0.01 mg/kg/day	Up to 0.00054 mg/kg/day	18.5	6	Low
Adult in home after perimeter termite application	Inhalation (oral equivalent)	0.01 mg/kg/day	Up to 0.00036 mg/kg/day	28	6	Low

Acute Toxicity Risk Assessment Summary:

Bifenthrin products are registered for both indoor and outdoor applications. Indoor uses include crack and crevice sprays, dusts, and termite treatments (and as paint additives). Outdoor uses include application of granular products, broadcast applications of sprays, and spot-spray applications. Use areas include turf grass, ornamental plants, trees, pathways, patios, and vehicles. Risk assessments for indoor uses of bifenthrin products could not be found.

Potential inhalation exposures (within the home) to children or adults following an outdoor perimeter termite application to a home is rated low in hazard. Potential exposures to children interacting with treated turf grass is rated moderate in hazard.

CHRONIC HUMAN TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Group C	"Possible human carcinogen"	2	High
Mutagenicity	Mixed results	"Marginally mutagenic"	1	Moderate
Neurotoxicity - (NOAEL)	1.3 mg/kg/day	Tremors	1	Check risk
Endocrine Disruption	Value not found			
Developmental Toxicity (NOAEL)	Value not found	No biologically significant effects	1	Low
Reproductive Toxicity (NOAEL)	Value not found	No reproductive or offspring toxicity	1	Low
Chronic Toxicity (NOAEL)	1.3 mg/kg/day	Tremors	1	Check risk

Chronic Toxicity Hazard Summary:

Bifenthrin is classified by the EPA as a possible human carcinogen because testing with rats provided some evidence for carcinogenic potential (Reference 1). Possible human carcinogens are rated high in hazard by Thurston County's pesticide review criteria. Mutagenicity studies showed that bifenthrin was marginally mutagenic in a mouse lymphoma gene mutation assay (which has not been reproduced in repeated testing) and there was presumtive evidence in another study that the EPA classified as unacceptable (Reference 1). Mixed results for mutagenicity are rated moderate in hazard (unless an agency has made a conclusive decision about the interpretation of the reported studies). Bifenthrin has been included in the EPA's list of chemicals to review for endocrine disruption potential, but is currently not a known endocrine disruptor.

CHRONIC HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Occupational applicator of perimeter termiticide	Inhalation + dermal	0.01 mg/kg/day	Average 0.007 mg/kg/day (oral eq.)	<2	6	High
Occupational applicator of perimeter termiticide	Inhalation + dermal	0.015 mg/kg/day	Average 0.003 mg/kg/day (oral eq.)	5	5 and 6	Moderate
Occupational mixer/applicator for groundboom spray	Dermal (water soluble bags)	0.01 mg/kg/day	0.0008 mg/kg/day	12.5	5	Low
Occupational mixer/applicator for groundboom spray	Dermal (emulsibiable	0.01 mg/kg/day	0.0012 mg/kg/day	8	5	Moderate

Chronic Toxicity Risk Assessment Summary:

California EPA performed a risk assessment for potential exposures from bifenthrin use for termite control around buildings (including residential homes). The dose of concern that was calculated for short-term exposures was derived from the oral NOAEL of 1 mg/kg/day and a safety factor of 100 and then compared to the oral equivalent dose from potential exposures from skin contact and inhalation. The potential short-term exposure to occupational (commercial) applicators performing perimeter treatments to 17 homes or 11 preconstruction foundation applications can be more than half of the calculated dose of concern, which is rated high in hazard. The potential lifetime occupational exposure from performing the same termite perimeter treatments is calculated to be moderate in hazard.

Risk from potential exposures to occupational applicators were calculated for mixing and applying emulsifiable concentrates and water soluble bags for groundboom spray applications to 80 acres. The risk to applicator was higher for the use of the emulsifiable concentrate products due to the increased exposures during the mixing of the product. The overall hazard to the applicator was calculated to be moderate in hazard for the emulsifiable concentrate product and low in hazard for the water soluble bag products.

Metabolites and Degradation Products:

Metabolites of bifenthrin include; (1RS,3RS)-3-((Z)-2chloro-3,3,3-trifluoroprop-1-enyl)-2,2-dimethylcyclopropanecarboxylic acid, OH-methyl bifenthrin, 4'-OH bifenthrin, 2-methyl-phenylbenzoic acid and 2-methyl-3-phenylbenzyl alchohol (Reference 4).

Comments:

Bifenthrin is not considered and eye or skin irritant (EPA Toxicity Category IV) and is not considered a skin sensitizer (Reference 2).

References

1. USEPA. Office of Chemical Safety and Pollution Prevention. Bifenthrin Human Health Scoping Document in Support of Registration. May 25, 2010.
2. USEPA. Bifenthrin Summary Document Registration Review: Initial Docket, Case #7402. June 2010.
3. USEPA. Environmental Fate and Effects Division. Environmental Fate and Ecological Risk Assessment Problem Formulation in Support of Registration Review for Bifenthrin; June 09, 2010.
4. International Union of Pure & Applied Chemistry. Pesticide Properties Database. Bifenthrin (Ref: FMC 54800). Accessed 12/17/2012.
5. USEPA. Office of Prevention, Pesticides and Toxic Substances. FQPA Human Health Risk Assessment for Bifenthrin - Proposal for Tolerances of Residues in/on Globe Artichoke, Curcubits, Eggplants, Legume Vegetables, Peas and Beans, Sweet Corn, Head and Stem Brassica Vegetables, and Canola. 6/11/97.
6. California EPA. Department of Pesticide Regulation.