Tau-fluvalinate

Review Date: 05/24/2013
CAS #: 102851-06-9

Type	Pyrethroid insecticide that works on contact or when eaten.
Controls	Broad spectrum insecticide - kills aphids, mites, caterpillars, whiteflies, beetles, mealybugs, root weevils, thrips, etc.
Mode of Action	Inhibits sodium channel modulation within nerves causing repetitive nerve discharges leading to paralysis and death.

Thurston County Review Summary:

Tau-fluvalinate is found in insecticides intended to be applied by commercial applicators although they can be used in both residential and agricultural settings. Potential exposures to humans and wildlife following non-agricultural applications are expected to be samll and are rated low in hazard (with the exception of bees and other beneficial insects where the hazard is high). There are no known toxicities of concern noted for tau-fluvalinate and therefore it passes Thurston County's pesticide review criteria.

MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	0.012	1	Low
Soil Sorption (Kd=mL/g)	850-1,700	1	Low
Organic Sorption (Koc=mL/g)	110,000-370,00	1	Low

Mobility Summary:

Tau-fluvalinate is not soluble in water and adheres strongly to all soil types. The hazard for tau-fluvalinate 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)	0.0000007	1	Low
Biotic or Aerobic Half-life (days)	4	3	Low
Abiotic Half-life (days)	Value not found		
Terrestrial Field Test Half-life (days)	3.5	3	Low
Hydrolysis Half-life (days)	22	3	Moderate
Anaerobic Half-life (days)	48 (water/sediment	3	Moderate
Aquatic Field Test Half-life (days)	1	3	Low

Persistence Summary:

Tau-fluvalinate is not expected to dissipate into the air after application and is likely to degrade to less than half of the applied concentration in less than one week when the application is outside and above ground. Tau-fluvalinate applications that are made indoors or underground are likely to take longer to degrade but an estimated half-life cannot be determined. The hazard of chemical persistence is rated low based on the half-life for outdoor and above ground applications.

BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Value not found		
Bioconcentration Factor	1,979	3	Moderate
Octanol/Water Partition Coefficient	Kow = 1,000,000	2	High

Bioaccumulation Summary:

Tau-fluvalinate has a high octanol/water partition coefficient (Kow = 1,000,000) which indicates that it is expected to bind well to fish or animal tissue and potentially bioaccumulate. The caclulated bioconcentration factor indicates a moderate potential for bioaccumulation. In metabolism studies with rats, 75% of administered tau-fluvalinate was eliminated from their body within 24 hours at low doses (1 mg/kg) and 45% eliminated at higher doses [200 mg/kg (Reference 2)]. Elimination of 50% or more of a chemical within 24-hours is rated low in risk for accumulation.

ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

Test Subject	Value	Reference	Value Rating
Mammalian (LD50)	261 mg/kg	1	Moderate
Avian (LD50)	>2,510 mg/kg	3	Low
Honey bee or insect (LD50)	0.2 ug/bee	1	High
Annelida -worms (LC50)	>500 mg/kg	3	Moderate
Fish (LC50)	0.00035	1	High
Crustacean (LC50)	0.00002 mg/L	1	High
Mollusk (LC50)	0.012 mg/L	1	High
Amphibian (LD50 or LC50)	Value not found		

Acute Toxicity Testing and Ecotoxicity Summary:

The ecological risk assessment calculated for fish and other aquatic organisms involved two different types of large-scale agricultural applications. One assessment was calculated for 2 broadcast applications to carrot crops and the other was for 12 broadcast applications to ornamental plants. Thurston County does not use agricultural applications for the review rating because these types of applications are not applicable to County uses. The ornamental plant risk assessment was not for landscape plants but for broadcast applications to potted plants at a plant nursery. The risk assessment for 12 ornamental plant applications (along a shoreline with no vegetative buffer) was right at the EPA's level of concern for fish and invertebrates. The agricultural assessments are not relevant to residential or expected County applications but indicate that runoff that can get into a waterbody may pose a concern to aquatic organisms. There were no other assessments for non-agricultural uses that exceeded the short-term level of concern.

Risk to birds and animals was evaluated by the EPA and they determined that the highest expected environmental concentration (at maximum use rates and multiple applications to crops) did not exceed the lethal dose concentration. There is a potential for sublethal effects to birds and the level of concern from long-term exposures was slightly exceeded for small animals (Reference 1). Like the aquatic risk assessment, the applications that the EPA evaluated were from multiple applications to crops at the highest allowable concentration, these assessments are not relevant to expected Thurston County or residential applications. The risk to birds and animals from expected County or residential uses are rated low in hazard.

Multiple broadcast applications at the highest agricultural application rates can create exposures of concern to wildlife but single non-agricultural applications are rated low in hazard.

ACUTE HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
All infants	Dietary + drinking water	0.005 mg/kg/day	0.000257 mg/kg/day	>10	1	Low
All adults	Dietary + drinking water	0.005 mg/kg/day	0.000069 mg/kg/day	>10	1	Low
Residential application risk not assessed by EPA						
Non-dietary risk assessments not required by EPA						

Acute Toxicity Risk Assessment Summary:

The EPA determined that it was not necessary to calculate risk from post-application exposures from residential applications due to the low potential for exposure (Reference 1). The EPA did not evaluate risk from skin exposures because they determined that the itching and tingling sensations caused by tau-fluvalinate would cause people to limit skin contact (Reference 1). Also, dermal absorption of tau-fluvalinate is expected to be less than 1.5% (Reference 4).Risk from non-occupational exposures were only calculated for potential diatary and drinking water sources. Dietary exposures are not part of Thurston County's pesticide review rating criteria because the County does not perform any crop management. However, the dietary and drinking water risk assessment is described here due to lack of other risk assessment data and to portray the low risk from the worst-case oral exposures. Risk from potential exposures from combining all dietary sources with a calculated worst-case concentration of contaminated drinking water is rated low in hazard.

All potential occupational exposures from inhalation were below the EPA's level of concern (Reference 1).

CHRONIC HUMAN TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	"Not likely to be a human carcinogen"	Not likely to be a human carcinogen	1	Low
Mutagenicity	Value not found	"Not a concern"	1	Low
Neurotoxicity - (NOAEL)	0.5 mg/kg/day	Bulging eyes, excessive grooming	1	Check risk
Endocrine Disruption	Nothing specific for tau-fluvalinate	Inconclusive	4	N/A
Developmental Toxicity (NOAEL)	25 mg/kg/day	Curved tibia/fibula with maternal toxicity	1	Check risk
Reproductive Toxicity (NOAEL)	10.5 mg/kg/day	Fetal abnormalities + maternal toxicity	1	Check risk
Chronic Toxicity (NOAEL)	0.5 mg/kg/day	Bulging eyes, excessive grooming	1	Check risk

Chronic Toxicity Hazard Summary:

Reproductive toxicity in the form of tremors, decreased pup weights, and lower litter size was observed along with maternal toxicity. The EPA evaluated mutagenicity and genetic toxicity data and determined that there was not a concern for mutagenicity. The EPA stated that tau-fluvalinate may be classified as "not likely to be a human carcinogen" (Reference 1).

CHRONIC HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Mix/apply 1000 gallons with high pressure handwand	Inhalation	0.005 mg/kg/day	0.0027 mg/kg/day	<2	1	High
Mix/apply 40 gallons with low pressure handwand	Inhalation	0.005 mg/kg/day	0.000027 mg/kg/day	>100	1	Low
All infants	Dietary + drinking water	0.005 mg/kg/day	0.000045 mg/kg/day	>100	1	Low
All adults	Dietary + drinking water	0.005 mg/kg/day	0.000014 mg/kg/day	>100	1	Low

Chronic Toxicity Risk Assessment Summary:

Potential long-term exposures from all dietary sources combined with a calculated worst-case concentration of contaminated drinking water is rated low in hazard. The EPA determined that there were no occupatioanl exposures >6 months in duration. Potential occupational exposures from mixing, loading, and applying 40 gallons for a low pressure handwand application to ornamental plants or to ant mounds is rated low in hazard. Potential occupational exposures from mixing, loading, and applying 1,000 gallons for a high pressure handwand application to industrial outdoor areas , buildings or structures could be more than half of the EPA's calculated dose of concern and are rated high in hazard.

Metabolites and Degradation Products:

The EPA determined that the only chemical residue of concern is the parent compound tau-fluvalinate (Reference 1). Soil metabolites include anilino acid and haloanaline (Reference 3).

Comments:

Tau-fluvalinate is an eye irritant (EPA Toxicity Category III) a mild skin irritant (EPA Toxicity Category IV) but is not a skin sensitizer (Reference 1). Although not considered a significant skin irritant, it is known to cause a severe itching or tingling sensation known as the "pyrethroid reaction" (Reference 1).

References

1. USEPA. Office of Prevention, Pesticides and Toxic Substances. Reregistration Eligibility Decision for tau-Fluvalinate. September 2005.
2. USEPA. Office of Prevention, Pesticides and Toxic Substances.Tau-fluvalinate: Revised HED Chapter of the Reregistration Eligibility Decision Document (RED).09/29/2005.
3. International Union of Pure & Applied Chemistry. Pesticide Properties Database. Tau-fluvalinate (Ref: SAN 527l). Data accessed 5/23/2013.
4. National Poisons Information Service (Birmingham Centre, United Kingdom). InChem UKPID Monograph. TAU-FLUVALINATE. 28/1/98.