abamectin

Review Date: 06/06/2011
CAS #: 71751-41-2

Type	Contact and edible insecticide with limited systemic activity.
Controls	Ants, mites, nematodes, cockroaches, and other insects.
Mode of Action	Blocks electrical activity in nervous system resulting in paralysis and death.

Thurston County Review Summary:

Abamectin is a natural fermentation product of the bacterium Streptomyces avermitilis and is a mixture of avermectin B1a (80%) and avermectin B1b (20%). Even though avermectin B1 and abamectin have different chemical abstract numbers (CAS), Thurston County perceives them as being the same. The Washington State Department of Agiculture also uses the chemical names avermectin and abamectin synonymously in pesticide registration.

Abamectin is rated high in hazard and products containing it fail Thuston County's review criteria. Abamectin is rated high in hazard because it is considered a reproductive toxicant and because the first observable adverse effect in toxicity testing was death to test animals.

MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	1.2	3	Low
Soil Sorption (Kd=mL/g)	53	3	Moderate
Organic Sorption (Koc=mL/g)	5,638	3	Low

Mobility Summary:

Abamectin is not very soluble in water and adheres strongly to soil with organic matter and moderately to soil with little organic matter. The hazard of abamectin 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)	0.0000000015	7	High
Biotic or Aerobic Half-life (days)	28	3	Moderate
Abiotic Half-life (days)	Not found		
Terrestrial Field Test Half-life (days)	1	3	Low
Hydrolysis Half-life (days)	Stable	3	High
Anaerobic Half-life (days)	89	3	High
Aquatic Field Test Half-life (days)	2.4	3	Low

Persistence Summary:

Field testing indicates that abamectin degrades rapidly on the soil surface and in water, however, laboratory testing has shown that abamectin can take several weeks to reach half of the applied concentration and even longer if it gets into sediment or deep soil. In most situations abamectin will stay in the upper soil and likely degrade rapidly by sunlight and soil microbes, however, there are many areas where it will take more than a week to degrade to half of the applied concentration. The hazard for pesistence is rated moderate.

BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	69	3	Low
Octanol/Water Partition Coefficient	log Kow = 4.4	3	Moderate

Bioaccumulation Summary:

The octanol/water partition coefficient for abamectin indicates that it has a moderate potential to bind to fish or animal tissue. Laboratory testing with fish shows that there is very little accumulation of abamectin in fish tissue. Abamectin has a half-life of 1.2 days following oral ingestion by rats and testing with other mammals also shows that it is not absorbed into the bloodstream very well and is eliminated from the body within 2 days. The hazard for bioaccumulation is rated low.

ACUTE TOXICITY HAZARD - ECOTOXICITY

Test Subject	Value	Reference	Value Rating
Mammalian (LD50)	10 mg/kg	2	High
Avian (LD50)	77 mk/kg	3	Moderate
Honey bee or insect (LD50)	0.0022 ug/bee	3	Very high
Annelida -worms (LC50)	33 mg/kg	3	Moderate
Fish (LC50)	0.0036 mg/l	3	Very high
Crustacean (LC50)	0.01 mg/l	3	Very high
Mollusk (LC50)	0.4 mg/l	4	Very high
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Testing and Ecotoxicity Summary:

Single-dose toxicity testing indicates that abamectin is moderately toxic to birds and worms, highly toxic to mammals, and very highly toxic to honey bees, fish, and other aquatic organisms. No assessment of risk to non-target animals and birds from use of abamectin products could be located.

The European Union evaluated the hazards of abamectin for designation of signal words for products. They concluded that it was appropriate to use the hazard symbols for: "very toxic" and "dangerous for the environment" as well as the risk phrases: "Very toxic by inhalation, Very toxic if ingested," and " Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment" (Reference 8).

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Infant exposure to crack and crevice -dust product	Oral, skin, inhalation	0.0005 mg/kg/day	0.000147 mg/kg/day	3.4	7	Moderate
Commercial applicator (6 hrs)	Inhalation and dermal	0.0005 mg/kg/day	0.000082 mg/kg/day	6	7	Moderate
Infant exposure to crack and crevie - dust product	Oral, skin, inhalation	0.005 mg/kg/day	0.000147 mg/kg/day	34	7 and 8	Low
Commercial applicator (6 hrs)	Inhalation and dermal	0.005 mg/kg/day	0.000082 mg/kg/day	60	7 and 8	Low

Acute Toxicity Risk Assessment Summary:

A very specific exposure assessment was conducted by California EPA for applicator and infant exposures to dust formulations for indoor crack and crevice insect control. The applicator is assumed to apply 12 containers of dust formulated product in a 6-hour workday. The infant exposure scenario includes skin contact, hand-to-mouth activities, and inhalation. The assessment calculated potential exposures that were 3 to 6 times less than the dose of concern (which is rated moderate in hazard). However, in 2010, the European Union evaluated available toxicological studies and found the developmental studies that the EPA utilized with the CF-1 mice were unacceptable for human comparison (apparently the CF-1 mice are more susceptible to that specific developmental toxicity than humans). The European Union suggested the use of the next lowest dose of concern (0.005 mg/kg/day). The same risk scenarios, calculated with the European dose of concern, are rated low in hazard.

The only other human risk assessments located were for exposures from food sources (which are not included into Thurston County's review criteria). Exposures through drinking water sources are expected to be low based on abamectin's limited mobility potential and low persistence in surface water.

The hazard for toxicity from potential exposures to abamectin, from insecticidal use, is considered a data gap because most potential exposure scenarios have not been evaluated.

CHRONIC TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Cancer tests were negative	- -	4	Low
Mutagenicity	- -	Negative in mutagenicity testing	2, 8	Low
Neurotoxicity - (NOAEL)	Not found			
Endocrine Disruption	Not listed	- -	5, 6	Low
Developmental Toxicity (NOAEL)	0.8 mg/kg/day	Cleft palate	8	Uncertain
Reproductive Toxicity (NOAEL)	0.12 mg/kg/day	Increase of dead pups +	1	High
Chronic Toxicity (NOAEL)	(Acute) 0.05 mg/kg/day	Death	7	Check risk

Chronic Toxicity Hazard Summary:

In a two-generation reproductive toxicity study, death was one of the first observable toxic effects seen in the test group. The EPA included an additional safety factor (x3) to the dietary risk assessments because of the severity of the toxic effect (Reference 1). Re-evaluation of developmental toxicity studies noted that toxicity was observed only with maternal toxicity and mutagenicity and carcinogenicity tests were negative.

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Long-term risk assessments were not performed						
Long-term risk assessments were not performed						
Long-term risk assessments were not performed						
Long-term risk assessments were not performed						

Chronic Toxicity Risk Assessment Summary:

The risk assessment for short-term exposures was more protective than risk assessments for long-term exposures - so, California EPA decided that since the short-term exposures were not of concern, then long-term exposures would not be of concern either (Reference 7). There were no other short or long-term risk assessments located for abamectin.

Metabolites and Degradation Products:

Abamectin degrades in sunlight to its delta-8,9-isomer - they are considered similar in toxicology by the EPA. Other photo degradation chemicals are considered toxicologically insignificant (Reference 1).

Comments:

Abamectin is considered slightly irritating to the eyes (EPA Toxicity Category III), non-irritating to the skin and not considered a skin sensitizer.

At very high doses abamectin can cause symptoms of nervous system depression such as incoordination, tremors, lethargy, excitation, and pupil dilation (Reference 2).

References

1. USEPA. Integrated Risk Information System. Avermectin B1 (CASRN 65195-55-3). 07/01/1989.
2. Extension Toxicology Network. Pesticide Information Profiles - Abamectin. Revised June 1996
3. International Union of Pure & Applied Chemistry. Pesticide Properties Database. abamectin (Ref: MK 936) Accessed 6/6/11. http://sitem.herts.ac.uk/aeru/iupac/
4. USEPA. Pesticide Fact Sheet "Avermectin B1" May 1989.
5 Scorecard - The Pollution Information Site. Health Effects / Endocrine Toxicants (Accessed 6/6/2011). http://www.scorecard.org/health-effects.
6. Illinois EPA. "Endocrine Disruptors Strategy". February, 1997.
7. California EPA. Department of Pesticide Regulation. Abamectin - Avert Prescription Treatment 310 (Section 3 Registration). Risk Characterization Document. August 12, 1993.
8. European Chemicals Agency. Committee for Risk Assessment. Annex 1 - Abamectin and Avermectin B1A - Background Document to RAC Opinion. March 17, 2010