azadirachtin

Review Date: 04/06/2011
CAS #: 11141-17-6

Type	Insecticide
Controls	Insects; whiteflies, moth larvae, mites, aphids, and many others.
Mode of Action	Smother and desiccate insects, interferes with insect growth hormones, and can affect an insect's ability to feed.

Thurston County Review Summary:

Azadirachtin is considered low in hazard and passes Thurston County's pesticide review criteria.

Azadirachtin is a chemical that is separated from neem seed oil with the use of alcohol (the remaining oil is called Clarified Hydrophobic Extract of Neem Oil). It does not bind well to soil and can easily move off the application area with rain or irrigation water. It is not expected to persist long after it is applied and is not expected to bioaccumulate. Adverse effects to human or other non-target organisms from the use of products containing azadirachtin, as a sole active ingredient, are not expected.

MOBILITY

Property	Value	Reference	Rating
Water Solubility (mg/L)	260	3	Moderate
Soil Sorption (Kd=mL/g)	Not found		
Organic Sorption (Koc=mL/g)	7	3	High

Mobility Summary:

Azadirachtin is slightly soluble in water and adheres poorly to soil. The hazard for azadirachtin to move off the application site with rain or irrigation water is rated high.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	0.000000000027	3	High
Biotic or Aerobic Half-life (days)	26	3	Moderate
Abiotic Half-life (days)	Not found		
Terrestrial Field Test Half-life (days)	26	3	Moderate
Hydrolysis Half-life (days)	13	3	Moderate
Anaerobic Half-life (days)	Not found		
Aquatic Field Test Half-life (days)	25 to 40	8	Moderate

Persistence Summary:

Azadirachtin is likely to degrade to half of the applied concentration in more than one week but less than 60 days. Azadirachtin is rated moderate in hazard for persistence.

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	Not found		
Octanol/Water Partition Coefficient	log Kow = 1.09	3	Low

Bioaccumulation Summary:

Based soley on the low octanol/water partition coefficient (log Kow = 1.09), azadirachtin is not likely to accumulate in fish or animal tissue. The potential for bioaccumulation is rated low in hazard.

ACUTE TOXICITY HAZARD - ECOTOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	4,241 mg/kg	3	Low
Avian (LD50)	816 mgkd	3	Moderate
Honey bee or insect (LD50)	2.5 ug/bee	3	Moderate - high
Annelida -worms (LC50)	Not found		
Fish (LC50)	>4 mg/L	3	Moderate
Crustacean (LC50)	11.6 mg/L	3	Moderate
Mollusk (LC50)	Not found		
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Testing and Ecotoxicity Summary:

Single-dose toxicity testing indicates that azadirachtin is low in toxicity to mammals, moderate in toxicity to birds, fish, and other aquatic organisms, and moderate to high in toxicity to honey bees and other insects.

Concerning toxicity, the EPA stated: "When used as directed on product labels, neither clarified hydrophobic extract of neem oil nor azadirachtin are expected to harm non-target organisms." The EPA also stated that these products should not be directly applied to water bodies or when honeybees are actively foraging.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Rating
Short term exposures were not evaluated						
Short term exposures were not evaluated						
Short term exposures were not evaluated						
Short term exposures were not evaluated						

Acute Toxicity Risk Assessment Summary:

Risk assessments evaluating the potential for toxicity from short-term exposures to azadirachtin could not be found. The EPA waived the requirement for risk assessments for azadirachtin registration and made the following statement:

"Adverse effects are not expected to humans, wildlife, or the environment when products containing these active ingredients [Azadirachtin and Clarified Hydrophobic Extract of Neem Oil] are used according to label directions. Labels direct users not to contaminate water and not to apply when honeybees are actively visiting flowers in the area."

CHRONIC TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Waived requirement	- -	2	Low
Mutagenicity	- -	"non-mutagenic"	4	Low
Neurotoxicity - (NOAEL)	Not found			
Endocrine Disruption	Unknown (insect dose)	Decreased ovarian ecdysteroid levels	6 and 7	*Low
Developmental Toxicity (NOAEL)	50 mg/kg-bw/day	No toxic effect	5	Low
Reproductive Toxicity (NOAEL)	50 mg/kg-bw/day	No toxic effect	5	Low
Chronic Toxicity (NOAEL)	1500 mg/kg-bw/day	No toxic effects	4	Check risk

Chronic Toxicity Hazard Summary:

*Endocrine disruptor testing indicates that azadirachtin has caused endocrine disruptor effects in insects but evaluation by the European Commission has classified the mammalian potential in Category 3 - (no evidence of endocrine disrupting activity or no data available). Thurston County will use the current European Commission classification to rate the endocrine disruption potential as low in hazard. Mutagenicity testing indicates that azadirachtin is non-mutagenic. Carcinogenicity testing was waived by the EPA and IARC did not evaluate its carcinogenic potential. Long-term toxicity testing with rats did not produce any adverse effects for developmental, reproductive or general toxicity. Long-term toxicity effects associated with azadirachtin are rated low in hazard.

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Rating
Long term exposures were not evaluated						
Long term exposures were not evaluated						
Long term exposures were not evaluated						
Long term exposures were not evaluated						

Chronic Toxicity Risk Assessment Summary:

Risk assessments evaluating long-term exposures to azadirachtin could not be found and the EPA waived the requirements for risk assessments for azadirachtin registration.

Metabolites and Degradation Products:

Not found

Comments:

References

1. Amy E. Brown. Maryland Cooperative Extension. "Mode of Action of Insecticides and Related Pest Control Chemicals for Production Agriculture, Ornamentals, and Turf." Pesticide Information Leaflet No. 43. Revised May 2006.
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3. International Union of Pure & Applied Chemistry. Pesticide Properties Database. Azadirachtin (Ref: N 3101). Accessed 4/6/2011 http://sitem.herts.ac.uk/aeru/iupac/
4. Raizada, Srivastava, Kaushal, Singh. "Azadirachtin, a neem biopesticide: subchronic toxicity assessment in rats." Food and Chemical Toxicology 39 (2001) 477-483.
5. M.K. Srivastava, R.B. Raizada. "Lack of toxic effect of technical azadirachtin during postnatal development of rats." Food and Chemical Toxicology 45 (2007) 465-471.
6. Sayah, Idaomar, Soranzo, and Karlinsky. "Endocrine and neuroendocrine effects of Azadirachtin in adult females of the earwig Labidura riparia." Tissue and Cell. Volume 30, Issue 1, February 1998.
7. European Commission. Endocrine Disrupters Website. Accessed 4/7/2011. http://ec.europa.eu
8. Thompson, Chartrand, and Kreutzweiser. "Fate and effects of azadirachtin in aquatic mesocosms 1: fate in water and bottom sediments." Ecotoxicology and Environmental Safety 59 (2004).