

Type	Insecticide - biopesticide (spinosad is a fermentation product of a soil bacterium)
Controls	Caterpillars, loopers, leafminers, leafrollers, thrips, etc. - but has little effect on mites and sucking insects (Reference 2).
Mode of Action	Spinosad kills susceptible species by causing uncontrolled excitation of the nervous system.

Thurston County Review Summary:

The EPA registered spinosad (consisting of spinosyn A and spinosyn D) in 1997 for use on cotton. After reviewing the toxicological information the EPA determined spinosad to be eligible for registration as a "reduced risk pesticide". It is rated as low in hazard for the potential to move off the site of application, although high in hazard for persistence (likely to have more than half of the applied concentration remaining in the soil after 60 days). It is rated as a moderate hazard for bioaccumulation but low in toxicity to mammals, birds, and worms. It is considered moderately toxic to fish and crustaceans although the risk to non-target organisms from the use of spinosad products is considered low.

Insecticides containing spinosad as a sole active ingredient are considered low in hazard and pass Thurston County's review criteria.

MOBILITY

Property	Value	Reference	Rating
Water Solubility (mg/L)	235	1	Low
Soil Sorption (Kd=mL/g)	91.6	3	Low - Moderate
Organic Sorption (Koc=mL/g)	34,600	3	Low

Mobility Summary:

Spinosyn A and D are not very soluble in water and adhere strongly to soil with and without organic matter. The hazard for spinosad to move of the site of application is considered low.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	1.5 E-10	3	Low
Biotic or Aerobic Half-life (days)	17	2	Moderate
Abiotic Half-life (days)	Up to 240	2	High
Terrestrial Field Test Half-life (days)	3.3	2	High
Hydrolysis Half-life (days)	Stable	3	High
Anaerobic Half-life (days)	Not found		
Aquatic Field Test Half-life (days)	0.9	3	Low

Persistence Summary:

Spinosad is comprised of about 90% spinosyns (85% spinosyn A and 15% spinosyn D) and about 10% fermentation biproducts. Spinosyns A and D demethylate in about 9-17 days, with spinosyn A becoming spinosyn B (which also has insecticidal activity) and the demethylated spinosyn D has a half life of about 4 months. The overall persistence hazard of spinosad and its biologically active metabolites is rated high.

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	114	4	Moderate
Octanol/Water Partition Coefficient	4 and 4.5	2	Moderate

Bioaccumulation Summary:

Spinosyn A and D both bind well to organic matter and bioconcentration testing indicates that the hazard for bioaccumulation is moderate.

ACUTE TOXICITY HAZARD - ECOTOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	3,738 mg/kg	2	Low
Avian (LD50)	>2,000 mg/kg	3	Low
Honey bee or insect (LD50)	0.0029 ug/bee	2	High
Annelida -worms (LC50)	>970 mg/kg	2	Low
Fish (LC50)	5.9 mg/L	2	Moderate
Crustacean (LC50)	>1 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 spinosad is low in toxicity to mammals, birds, and earthworms; moderately toxic to fish and crustaceans, and highly toxic to bees. Caution should be used when using this insecticide around beneficial insects (like bees and wasps). The EPA believes that the expected environmental concentrations of spinosad do not exceed the level of concern for non-target organisms. The hazard for toxicity to non-target organisms from the use of spinosad is considered low.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Rating
Not calculated						
Not calculated						
Not calculated						
Not calculated						

Acute Toxicity Risk Assessment Summary:

The risk assessment performed by the EPA included the worst-case scenario (dietary exposure) for exposures to spinosad. Although the EPA did not tabulate the data used for the calculations they indicate that all exposures to each population group was below the level of concern. It was indicated that the potential exposures were all 100 times less than the level of concern. The risk of toxicity from the insecticidal use of spinosad is rated as low in hazard.

CHRONIC TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Unknown	"no evidence of carcinogenicity"	1	Low
Mutagenicity	--	"no evidence"	1	Low
Neurotoxicity - (NOAEL)	Unknown	None noted	2	Low
Endocrine Disruption	Not found			
Developmental Toxicity (NOAEL)	10 mg/kg/day	No evidence	4	Low
Reproductive Toxicity (NOAEL)	10 mg/kg/day	None noted	4	Low
Chronic Toxicity (NOAEL)	2.68 mg/kg/day	Unknown	4	Check risk

Chronic Toxicity Hazard Summary:

In laboratory testing, reproductive toxicity was attributed to maternal toxicity and there was no evidence of carcinogenicity, mutagenicity, neurotoxicity or developmental toxicity (Reference 1).

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Rating
Not calculated						
Not calculated						
Not calculated						
Not calculated						

Chronic Toxicity Risk Assessment Summary:

The risk assessment performed by the EPA included the worst-case scenario (dietary exposure) for exposures to spinosad. Although the EPA did not tabulate the data used for the calculations, they indicate that all exposures to each population group was below the level of concern. It was indicated that these potential exposures were all 100 times less than the level of concern. The risk of toxicity from the insecticidal use of spinosad is rated as low in hazard.

Metabolites and Degradation Products:

Spinosad B, N-demethylated spinosyn D, and ultimately carbon dioxide (Reference 2).

Comments:

It is unknown if spinosad is an eye or skin irritant.

References

1. Kirst, Herbert A. Japan Antibiotics Research Association. Journal of Antibiotics - "The spinosyn family of insecticides: realizing the potential of natural products research." February 2010.
2. National Organic Standards Board Technical Advisory Panel Review, Compiled by OMRI for the USDA National Organic Program. "Spinosad - Crops". April 4, 2002.
3. International Union of Pure & Applied Chemistry (IUPAC). Pesticide Properties Database (Accessed 6/14/2010). <http://sitem.herts.ac.uk/aeru/iupac/>
4. USEPA. Office of Pesticide and Toxic Substances. Pesticide Fact Sheet: Spinosad. 1997.