



Pesticide Toxicity Profile: Synthetic Pyrethroid Pesticides¹

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This document provides a general overview of human toxicity, provides a listing of laboratory animal and wildlife toxicities and a cross reference of chemical and common names with their trade names of many synthetic pyrethroid pesticides registered for use in Florida.

General

Pyrethrins were originally derived from East African chrysanthemum flowers and shown to have insecticidal activity. In a natural environment, they were chemically unstable and broke down rapidly upon exposure to air and sunlight. Beginning in the 1970s, synthetic pyrethroids came into the market for agricultural purposes as they were synthesized from petroleum derivatives. They are also widely used as home and garden insecticides along with uses on pets and livestock, mosquito control, treatment of transport vehicles, and for treatment of ectoparasitic disease. Their desirable features are providing a quick knockdown of insects at low rates, relatively low mammalian toxicity and improved stability in outdoor environments, which has increased their

marketability in agriculture. They are effective against a wide range of insect and mite pests and may be mixed with other pesticides for a broad spectrum of pest control. Formulations that are commercially available include aerosols, dips, emulsifiable concentrates, wettable powders, granules, and concentrates for ultra low volume applications targeting mosquitoes. Pyrethroids may be mixed with piperonyl butoxide, a synergist, which enhances the effect of the active ingredient. Their mode of action is interference with transmission of nerve impulses.

Toxicity

Pyrethroids are one of the least acutely toxic insecticides to mammals because they are quickly deactivated by metabolic processes. However, rats fed high doses (1,000 mg/kg of body weight) showed liver damage (Hayes, 1982). Toxicity by inhalation and dermal absorption is low. Sensitization sometimes occurs in some individuals after a single exposure which causes either an asthmatic condition or a skin rash or inflammation. After the initial exposure to the sensitizing agent, the sensitized

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The use of trade names in this publication is solely for the purpose of providing specific information. UF/IFAS does not guarantee or warranty the products named, and references to them in this publication does not signify our approval to the exclusion of other products of suitable composition. Use pesticides safely. Read and follow directions on the manufacturer's label.

individual responds to a dose smaller than the initial dose. Symptoms are more common with exposure to the pyrethroids whose structures include cyano-groups. Sensations are described as stinging, burning, itching, and tingling, progressing to numbness, with the face most commonly affected. Persons treated with permethrin for lice or flea infestations sometimes experience itching and burning at the site of application, but this is more of a reaction to the effects of the parasites themselves. Due to the inclusion of certain solvents, some formulations of fluvalinate are corrosive to the eyes. Scientists have no data from work-related, accidental poisonings, or epidemiological studies that indicate whether or not pyrethrins are likely to cause cancer in humans. There were no birth defects in pups of rabbits exposed to pyrethrins (Vettorazzi, 1979); however, rat pups born to rats fed very high doses of pyrethrins for three weeks prior to mating were of low body weights (Hayes, 1982). Pyrethrins are highly toxic to fish and tadpoles. They affect their skin touch receptors and balance organs (Tomlin, 1994). Mammalian toxicities for pyrethroid pesticides registered in Florida are shown in Table 1. Table 2 lists the toxicities to wildlife by the common name of the pyrethroid pesticide. Table 3 provides a cross listing of many of the trade names that these products are registered and sold by in Florida.

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Table 1. Pyrethroid pesticide mammalian toxicities (mg/kg of body weight).

Common name	Rat oral LD ₅₀	Rabbit dermal LD ₅₀
Allethrin	860	11,332
Bifenthrin	375	>2,000
Cyfluthrin	869 – 1271	>5,000 (rat)
Cyhalothrin	79	632 (rat)
Cypermethrin	250	>2,000
Deltamethrin	31 – 139 (female)	>2,000
Esfenvalerate	451	2,500
Fenpropathrin	70.6 -164	>2,000
Fluvalinate	261 - 282	>20,000
Permethrin	430 – 4,000	>2,000
Resmethrin	1,244 - >2,500	>2,500
Tefluthrin	969	>2,000 (rat)
Tetramethrin	>5,000	>2,000
Tralomethrin	284	>2,000

Table 2. Pyrethroid pesticide wildlife toxicity ranges.

Common name	Bird acute oral LD ₅₀ (mg/kg)*	Fish LC ₅₀ (ppm)**	Bee LD ₅₀ [†]
Allethrin	PNT	HT	HT
Bifenthrin	ST – PNT	HT	HT
Cyfluthrin	PNT	VHT	HT
Cyhalothrin	PNT	HT	HT
Cypermethrin	PNT	VHT	HT
Deltamethrin	PNT	HT	HT
Esfenvalerate	PNT	VHT	HT
Fenpropathrin	ST	VHT	HT
Fluvalinate	PNT	VHT	MT
Permethrin	PNT	VHT	HT
Resmethrin	PNT	VHT	HT
Tefluthrin	ST – PNT	VHT	HT
Tetramethrin	PNT	HT	---
Tralomethrin	---	VHT	HT

* Bird LD₅₀ : Practically nontoxic (PNT) = >2,000; slightly toxic (ST) = 501 – 2,000; moderately toxic (MT) = 51 – 500; highly toxic (HT) = 10 – 50; very highly toxic (VHT) = <10.

** Fish LC₅₀ : PNT = >100; ST = 10 – 100; MT = 1 – 10; HT = 0.1 – 1; VHT = <0.1.

† Bee: HT = highly toxic (kills upon contact as well as residues); MT = moderately toxic (kills if applied over bees); PNT = relatively nontoxic (relatively few precautions necessary).

Table 3. Cross reference list of common, trade and chemical names of pyrethroid insecticides.

Common name*	Trade names**	Chemical name
Allethrin	Many household products	(RS)-3-allyl-2-methyl-4-oxycyclopent-2-enyl (1RS)-cis-trans chrysanthemate
Bifenthrin	Capture®, Talstar®	[1- α ,3- α -(Z)]-(+)-(2-methyl[1,1'-biphenyl]-3-yl) methyl 3-(2-chloro-3,3,3-trifluoro-1-propenyl)-2,2-dimethylcyclopropanecarboxylate
Cyfluthrin	Baythroid®, Tame®	Cyano(4-fluoro-3-phenoxyphenyl)methyl 3-(2,2-dichloro-ethenyl)-2,2-dimethylcyclopropanecarboxylate
Cyhalothrin	Karate®, Warrior®, Demand®, Scimitar®	alpha-cyano-3-phenoxybenzyl 3-(2-chloro-3,3,3-trifluoroprop-1-enyl)-2,2-dimethylcyclopropanecarboxylate
Cypermethrin	Ammo®, Fury®, Mustang®	(+)-alpha-cyano-3-phenoxybenzyl (+)-cis,trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate
Deltamethrin	Decis®, DeltaGard®, Demand®	(S)-cyano(3-phenoxybenzyl) (1R,3R)-3-(2,2-dibromovinyl)-2,2-dimethylcyclopropanecarboxylate
Esfenvalerate	Asana®	(S)-cyano(3-phenoxyphenyl)methyl (S)-4-chloro-alpha-(1-methylethyl)-benzeneacetate
Fenpropathrin	Danitol®, Tame®	RS-alpha-cyano-3-phenoxybenzyl 2,2,3,3-tetramethylcyclopropanecarboxylate
Fluvalinate	Mavrik®, Zoecon®	Á-RS,2R)-fluvalinate [(RS)-alpha-cyano-3-phenoxybenzyl (R)-2-[2-chloro-4-(trifluoromethyl)anilino]-3-methyl-butanoate]
Permethrin	Ambush®, Pounce®	(3-phenoxyphenyl)methyl (+)-cis,trans-3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylate
Resmethrin	Many household products	([5-(phenylmethyl)-3-furanyl]methyl 2,2-dimethyl-3-(2-methyl-1-proenyl)cyclopropanecarboxylate)
Tefluthrin	Force®	2,3,5,6-tetrafluoro-4-methylbenzyl (Z)-(1RS, 3RS)-3-(2-chloro-3,3,3-trifluoroprop-1-ethyl)-2,2-dimethylcyclopropanecarboxylate
Tetramethrin	Many household products	3,4,5,6-tetrahydrophthalimidomethyl (1RS)-cis,trans-chrysanthemate
Tralomethrin	Scout®	(1R,3S)3[(1',2',2',-tetrabromoethyl)]-2,2-dimethylcyclopropanecarboxylic acid (S)-alpha-cyano-3-phenoxybenzyl ester

*Basic molecule; isomers not listed.
**Does not include manufacturers prepackaged mixtures; major agricultural brands for basic manufacturers.