

8. REGULATIONS AND ADVISORIES

Available information on international, national, and state regulations and standards of pyrethrins and pyrethroids is presented in Table 8-1. Information concerning tolerances for residues of pyrethrins and selected pyrethroids is presented in Table 8-2.

ATSDR has not derived acute-, intermediate-, or chronic-duration inhalation MRLs for pyrethrins or pyrethroids because adequate data were not available for this route of exposure.

ATSDR derived an acute-duration oral MRL of 0.3 mg/kg/day for permethrin, based on a NOAEL of 25 mg/kg/day for neurological impairment in rats. An uncertainty factor of 100 was used (10 for animal to human extrapolation and 10 to account for intrahuman variation) to derive the MRL.

ATSDR derived an acute-duration oral MRL of 0.02 mg/kg/day for cypermethrin (97% purity; 50/50 cis/trans), based on a LOAEL of 20 mg/kg for neurological impairment in rats (McDaniel and Moser 1993). An uncertainty factor of 1,000 was used (10 for lack of a NOAEL, 10 for animal to human extrapolation, and 10 to account for intrahuman variation) to derive the MRL.

ATSDR derived an acute-duration oral MRL of 0.01 mg/kg/day for cyhalothrin, based on a NOAEL of 1 mg/kg/day for gastrointestinal effects in dogs. An uncertainty factor of 100 was used (10 for animal to human extrapolation and 10 to account for intrahuman variation) to derive the MRL.

ATSDR derived an intermediate-duration oral MRL of 0.2 mg/kg/day for permethrin, based on a NOAEL of 15.5 mg/kg/day for neurological impairment in rats. An uncertainty factor of 100 was used (10 for animal to human extrapolation and 10 to account for intrahuman variation) to derive the MRL.

ATSDR derived an intermediate-duration oral MRL of 0.01 mg/kg/day for cyhalothrin, based on a NOAEL of 1 mg/kg/day for gastrointestinal effects in dogs. An uncertainty factor of 100 was used (10 for animal to human extrapolation and 10 to account for intrahuman variation) to derive the MRL.

8. REGULATIONS AND ADVISORIES

Table 8-1. Regulations and Guidelines Applicable to Pyrethrins and Pyrethroids

Agency	Description	Information	References
INTERNATIONAL			
Guidelines:			
IARC	Carcinogenic classification Deltamethrin Fenvalerate Permethrin	Group 3 ^a	IARC 2001
WHO	Drinking water guideline Permethrin	20 µg/L	WHO 2001
NATIONAL			
Regulations and Guidelines:			
a. Air			
ACGIH	TLV-TWA—pyrethrum	5 mg/m ³	ACGIH 2000
NIOSH	REL (TWA)—pyrethrum IDLH—pyrethrum	5 mg/m ³ 5,000 mg/m ³	NIOSH 2001
OSHA	PEL (8-hour TWA)—pyrethrum General industry (total dust)	5 mg/m ³	OSHA 2001a 29CFR1910.1000 Table Z-1
	PEL (8-hour TWA)—pyrethrum Construction industry (total dust)	5 mg/m ³	OSHA 2001c 29CFR1926.55 Appendix A
	PEL (8-hour TWA)—pyrethrum Shipyard industry (total dust)	5 mg/m ³	OSHA 2001b 29CFR1915.1000 Table Z
b. Water			
EPA	Water pollution; determination of reportable quantity—pyrethrin	1 pound	EPA 2001c 40CFR117.3
	Water pollution; designation of hazardous substance—pyrethrin		EPA 2001a 40CFR116.4
	NPDES; toxic pollutants and hazardous substances required to be identified by existing dischargers if expected to be present—pyrethrins		EPA 2001d 40CFR122 Appendix D
c. Food			
FDA	Pyrethrins in combination with piperonyl butoxide may be safely used for insect control on bags intended for use in contact with dried food		FDA 2000a 21CFR178.3720

8. REGULATIONS AND ADVISORIES

Table 8-1. Regulations and Guidelines Applicable to Pyrethrins and Pyrethroids

Agency	Description	Information	References
NATIONAL (cont.)			
USDA	Labeling of treated seed with pyrethrins—"don't use for food, feed, or oil purposes"		USDA 2001b 7CFR201.31a(d)
	Oat	1 ppm	
	Sorghum	3 ppm	
d. Other			
ACGIH	Carcinogenicity classification—pyrethrum	A4 ^b	ACGIH 2000
DOT	Superfund—reportable quantity Pyrethrins	1 pound	DOT 2001 49CFR172.101 Appendix A
EPA	RfD (mg/kg/day)		IRIS 2003e
	Type I Pyrethroids		
	Biphenrin	1.5×10^{-2}	
	Permethrin	5.0×10^{-2}	
	Resmethrin	3.0×10^{-2}	
	Type II Pyrethroids		
	Baythroid/Cyfluthrin	2.5×10^{-2}	
	Cyhalothrin/Karate	5.0×10^{-3}	
	Cypermethrin	1.0×10^{-2}	
	Danitol/Fenpropathrin	2.5×10^{-2}	
	Fluvalinate	1.0×10^{-2}	
	Pydrin/Fenvalerate	2.5×10^{-2}	
	Tralomethrin	7.5×10^{-3}	
	Superfund—reportable quantity Pyrethrins	1 pound	EPA 2001b 40CFR302.4
	Toxic chemical release reporting; Community Right-to- Know—effective date		EPA 2001e 40CFR372.65
	Fenvalerate	01/01/95	
	Permethrin	01/01/95	
FDA	New animal drug—for use in the treatment of ear mites in dogs and cats	0.05% pyrethrins	FDA 2000b 21CFR524.2140
STATE			
Regulations and Guidelines:			
a. Air			
Alaska	Air contaminant standard (TWA)—pyrethrum	5 mg/m^3	BNA 2001
California	Airborne contaminant —pyrethrum		BNA 2001
Connecticut	HAP—pyrethrum		BNA 2001
Hawaii	Air contaminant—pyrethrum		BNA 2001
	PEL	5 mg/m^3	
	STEL	10 mg/m^3	

8. REGULATIONS AND ADVISORIES

Table 8-1. Regulations and Guidelines Applicable to Pyrethrins and Pyrethroids

Agency	Description	Information	References
STATE (cont.)			
Idaho	Toxic air pollutants—pyrethrum OEL EL AAC	5 mg/m ³ 3.33x10 ⁻¹ pounds/hour 0.25 mg/m ³	BNA 2001
Kentucky	Air quality—pyrethrum TAL Averaging time Significant levels	20.0 mg/m ³ 8 hours 1.276x10 ⁻³ pounds/hour	BNA 2001
Michigan	Air contaminant—maximum allowable concentrations Pyrethrum Air contaminant (PEL-TWA) Pyrethrum	5 mg/m ³ 5 mg/m ³	BNA 2001 BNA 2001
Montana	Occupational air contaminant (TLV) for pyrethrum	5 mg/m ³	BNA 2001
New Hampshire	Toxic air pollutants—pyrethrum	5 mg/m ³	BNA 2001
New Mexico	Toxic air pollutants—pyrethrum OEL Emissions	5.05 mg/m ³ 3.33x10 ⁻¹ pounds/hour	BNA 2001
New York	Air contaminant (TLV) Pyrethrum	5 mg/m ³	BNA 2001
Oregon	Air contaminant (TLV) Pyrethrum	5 mg/m ³	BNA 2001
South Carolina	Toxic air emissions—pyrethrum Maximum allowable concentration	50 µg/m ³	BNA 2001
Washington	Toxic air pollutants (ASIL 24-hour average) for pyrethrum	1.7 µg/m ³	BNA 2001
Wisconsin	Emission limits—pyrethrum <25 feet emission point >25 feet emission point	4.176x10 ⁻¹ pounds/hour 1.7520 pounds/hour	BNA 2001
b. Water			
Arizona	Drinking water guideline Fenvalerate	180 µg/L	HSDB 2001
Florida	Drinking water guideline Permethrin Cypermethrin	350 µg/L 700 µg/L	HSDB 2001
c. Food			
d. Other			
California	Pesticide registration—active ingredients Fluvalinate Permethrin Pyrethrins Resmethrin		BNA 2001

8. REGULATIONS AND ADVISORIES

Table 8-1. Regulations and Guidelines Applicable to Pyrethrins and Pyrethroids

Agency	Description	Information	References
<u>STATE (cont.)</u>			
	Hazardous substance Pyrethrins Pyrethrum		BNA 2001
Florida	Toxic substances in the workplace—pyrethrum		BNA 2001
Georgia	Regulated substances and soil concentrations that trigger notification Pyrethrin I Pyrethrin II Pyrethrins and Pyrethroids Pyrethrum Pyrethrum I		BNA 2001
Massachusetts	Containers adequately labeled pursuant to federal law —pyrethrum Oil and hazardous material Pyrethrin 1 Pyrethrin 2 Pyrethrins Pyrethroids Pyrethrum		BNA 2001 BNA 2001
Minnesota	Hazardous substance —pyrethrum		BNA 2001
New Jersey	Hazardous substance Permethrin Phenothrin Pyrethrin I Pyrethrin II Pyrethrum Resmethrin Tetramethrin		BNA 2001

^aGroup 3: not classifiable as to its carcinogenicity to humans

^bA4: not classifiable as a human carcinogen

AAC = acceptable ambient concentrations; ACGIH = American Conference of Governmental Industrial Hygienists; ASIL = acceptable source impact levels; CFR = Code of Federal Regulations; DOT = Department of Transportation; EL = emissions levels; EPA = Environmental Protection Agency; FDA = Food and Drug Administration; HAP = hazardous air pollutant; HSDB = Hazardous Substances Data Bank; IARC = International Agency for Research on Cancer; IDLH = immediately dangerous to life and health; NIOSH = National Institute of Occupational Safety and Health; NPDES = National Pollutant Discharge Elimination System; OEL = occupational exposure limit; OSHA = Occupational Safety and Health Administration; PEL = permissible exposure limit; REL = recommended exposure limit; RfD = oral reference dose; STEL = short-term exposure limit; TAL = threshold ambient limits; TLV = threshold limit value; TWA = time-weighted average; USDA = United States Department of Agriculture; WHO = World Health Organization

8. REGULATIONS AND ADVISORIES

Table 8-2. Tolerances for Residues Applicable to Pyrethrins and Pyrethroids (ppm)

	Type I Pyrethroids			Type II Pyrethroids					
	Pyrethrin	Allethrin	Permethrin	Cypermethrin	Deltamethrin	Fenproprathrin	Fenvalerate	Fluvalinate	Tralomethrin
	40CFR 180.128	40CFR 180.113	40CFR 180.378	40CFR 180.418	40CFR 180.435	40CFR 180.466	40CFR 180.379	40CFR 180.427	40CFR 180.422
Alfalfa, fresh	—	—	25.0	—	—	—	—	—	—
Alfalfa, hay	—	—	55.0	—	—	—	—	—	—
Almond hulls	—	—	0.05	—	—	—	15.0	—	—
Almonds	1.0	—	20.0	—	—	—	0.2	—	—
Apples	1.0	4.0	0.05	—	—	—	2.0	—	—
Artichokes	—	—	10.0	—	—	—	0.2	—	—
Asparagus	—	—	1.0	—	—	—	—	—	—
Avocados	—	—	1.0	—	—	—	—	—	—
Barley	3.0	2.0	—	—	—	—	—	—	—
Beans	1.0	—	—	—	—	—	—	—	—
Beans, dried	—	—	—	—	—	—	0.25	—	—
Beans, snap	—	—	—	—	—	—	2.0	—	—
Birdseed mixtures	3.0	—	—	—	—	—	—	—	—
Blackberries	1.0	4.0	—	—	—	—	—	—	—
Blueberries	1.0	4.0	—	—	—	—	3.0	—	—
Boysenberries	1.0	4.0	—	—	—	—	—	—	—
Brassica, head and stem	—	—	—	2.0	—	3.0	—	—	—
Brassica, leafy	—	—	—	14.0	—	—	—	—	—
Broccoli	—	—	1.0	—	—	—	2.0	—	0.5
Brussels sprouts	—	—	1.0	—	—	—	—	—	—
Buckwheat	3.0	—	—	—	—	—	—	—	—
Cabbage	—	—	6.0	—	—	—	10.0	—	—
Cranberries	—	—	—	—	—	—	3.0	—	—
Cantaloupes	—	—	—	—	—	—	1.0	—	—
Carrots	—	—	—	—	—	—	0.5	—	—
Cattle, fat	0.1	—	3.0	0.05	—	1.0	1.5	0.01	—
Cattle, meat	0.1	—	0.25	0.05	—	0.1	1.5	0.01	—
Cattle, meat byproducts	0.1	—	2.0	0.05	—	0.1	1.5	0.01	—
Cauliflower	—	—	1.0	—	—	—	0.5	—	—
Celery	—	—	5.0	—	—	—	—	—	—
Cherries	1.0	4.0	3.0	—	—	—	—	—	—
Citrus, dried	—	—	—	—	—	4.0	—	—	—

8. REGULATIONS AND ADVISORIES

Table 8-2. Tolerances for Residues Applicable to Pyrethrins and Pyrethroids (ppm)

	Type I Pyrethroids			Type II Pyrethroids					
	Pyrethrin	Allethrin	Per-methrin	Cypermethrin	Delta-methrin	Fenproprathrin	Fenvalerate	Fluvalinate	Tralomethrin
	40CFR 180.128	40CFR 180.113	40CFR 180.378	40CFR 180.418	40CFR 180.435	40CFR 180.466	40CFR 180.379	40CFR 180.427	40CFR 180.422
pulp									
Citrus, oil	—	—	—	—	—	75.0	—	—	—
Cocoa beans	1.0	—	—	—	—	—	—	—	—
Coffee	—	—	—	—	—	—	—	0.01	—
Collards	—	—	20.0	—	—	—	10.0	—	—
Copra	1.0	—	—	—	—	—	—	—	—
Corn, fodder	—	—	60.0	—	—	—	50.0	—	—
Corn, forage	—	—	60.0	—	—	—	50.0	—	—
Corn, grain	—	2.0	0.05	—	—	—	0.02	—	—
Corn, including popcorn	3.0	—	—	—	—	—	—	—	—
Corn, sweet, kernels and cobs	—	—	0.1	—	—	—	0.1	—	—
Cottonseed	1.0	—	0.5	0.5	0.04	1.0	0.2	0.1	0.02
Cottonseed, hulls	—	—	—	—	—	—	—	0.3	—
Cottonseed oil	—	—	—	—	0.2	3.0	—	1.0	0.2
Crabapples	1.0	4.0	—	—	—	—	—	—	—
Cucumbers	—	—	—	—	—	—	0.5	—	—
Currants	1.0	4.0	—	—	—	—	3.0	—	—
Dewberries	1.0	4.0	—	—	—	—	—	—	—
Eggplant	—	—	1.0	—	—	—	1.0	—	—
Eggs	0.1	—	1.0	—	—	0.05	—	0.01	—
Elderberries	—	—	—	—	—	—	3.0	—	—
English walnuts	—	—	—	—	—	—	0.2	—	—
Figs	1.0	4.0	—	—	—	—	—	—	—
Filberts	—	—	0.05	—	—	—	0.2	—	—
Flaxseed	1.0	—	—	—	—	—	—	—	—
Fruits, citrus, crop group 10	—	—	—	—	—	2.0	—	—	—
Fruits, pome, crop group 11	—	—	—	—	—	5.0	—	—	—
Garlic	—	—	0.1	—	—	—	—	—	—
Goats, fat	0.1	—	3.0	0.05	—	1.0	1.5	0.01	—

8. REGULATIONS AND ADVISORIES

Table 8-2. Tolerances for Residues Applicable to Pyrethrins and Pyrethroids (ppm)

	Type I Pyrethroids			Type II Pyrethroids					
	Pyrethrin	Allethrin	Permethrin	Cypermethrin	Deltamethrin	Fenproprathrin	Fenvalerate	Fluvalinate	Tralomethrin
	40CFR 180.128	40CFR 180.113	40CFR 180.378	40CFR 180.418	40CFR 180.435	40CFR 180.466	40CFR 180.379	40CFR 180.427	40CFR 180.422
Goats, meat	0.1	—	0.25	0.05	—	0.1	1.5	0.01	—
Goats, meat byproducts	0.1	—	2.0	0.05	—	0.1	1.5	0.01	—
Gooseberries	1.0	4.0	—	—	—	—	3.0	—	—
Grain, sorghum	1.0	2.0	—	—	—	—	—	—	—
Grapes	—	4.0	—	—	—	5.0	—	—	—
Grasses, range	—	—	15.0	—	—	—	—	—	—
Guavas	—	4.0	—	—	—	—	—	—	—
Hogs, fat	0.1	—	3.0	0.05	—	1.0	1.5	0.01	—
Hogs, meat	0.1	—	0.25	0.05	—	0.1	1.5	0.01	—
Hogs, meat byproducts	0.1	—	3.0	0.05	—	0.1	1.5	0.01	—
Honey	—	—	—	—	—	—	—	0.05	—
Honeydew melons	—	—	—	—	—	—	1.5	—	—
Horseradish	—	—	1.0	—	—	—	—	—	—
Horses, fat	0.1	—	3.0	0.05	—	1.0	1.5	0.01	—
Horses, meat	0.1	—	0.25	0.05	—	0.1	1.5	0.01	—
Horses, meat byproducts	0.1	—	2.0	0.05	—	0.1	1.5	0.01	—
Huckleberries	—	4.0	—	—	—	—	3.0	—	—
Kiwifruit	—	—	2.0	—	—	—	—	—	—
Leafy vegetables, except Brassica	—	—	20.0	—	—	—	—	—	—
Lettuce, head	—	—	20.0	10.0	—	—	—	—	1.0
Lettuce, leaf	—	—	—	—	—	—	—	—	3.0
Loganberries	1.0	4.0	—	—	—	—	—	—	—
Mangoes	1.0	4.0	—	—	—	—	—	—	—
Milk	—	—	—	0.05	—	—	0.3	0.01	—
Milk, fat	0.5	—	6.25	—	—	2.0	7.0	—	—
Milo	—	2.0	—	—	—	—	—	—	—
Mushrooms	—	—	6.0	—	—	—	—	—	—
Muskmelons	1.0	4.0	—	—	—	—	1.0	—	—

8. REGULATIONS AND ADVISORIES

Table 8-2. Tolerances for Residues Applicable to Pyrethrins and Pyrethroids (ppm)

	Type I Pyrethroids			Type II Pyrethroids					
	Pyrethrin	Allethrin	Permethrin	Cypermethrin	Delta-methrin	Fenproprathrin	Fenvalerate	Fluvalinate	Tralomethrin
	40CFR 180.128	40CFR 180.113	40CFR 180.378	40CFR 180.418	40CFR 180.435	40CFR 180.466	40CFR 180.379	40CFR 180.427	40CFR 180.422
Oats	1.0	2.0	—	—	—	—	—	—	—
Okra	—	—	—	—	—	—	0.1	—	—
Onion, bulb	—	—	0.1	0.10	—	—	—	—	—
Onions, green	—	—	—	6.0	—	—	—	—	—
Oranges	1.0	4.0	—	—	—	—	—	—	—
Papayas	—	—	1.0	—	—	—	—	—	—
Peaches	1.0	4.0	5.0	—	—	—	—	—	—
Peanut, hay	—	—	—	—	—	20.0	—	—	—
Peanut, nutmeat	—	—	—	—	—	0.01	—	—	—
Peanuts	—	—	—	—	—	—	0.02	—	—
Peanuts, with shell removed	1.0	—	—	—	—	—	—	—	—
Pears	1.0	4.0	3.0	—	—	—	2.0	—	—
Peas	1.0	—	—	—	—	—	1.0	—	—
Peas, dried	—	—	—	—	—	—	0.25	—	—
Pecans	—	—	—	0.05	—	—	0.2	—	—
Peppers	—	—	—	—	—	—	1.0	—	—
Peppers, bell	—	—	1.0	—	—	—	—	—	—
Pineapples	1.0	4.0	—	—	—	—	—	—	—
Pistachios	—	—	0.1	—	—	—	—	—	—
Plums	1.0	4.0	—	—	—	—	—	—	—
Potatoes	0.05	—	0.05	—	—	—	0.02	—	—
Poultry, fat	0.2	—	0.15	—	—	0.05	—	0.01	—
Poultry, meat	0.2	—	0.05	—	—	0.05	—	0.01	—
Poultry, meat byproducts	0.2	—	0.25	—	—	0.05	—	0.01	—
Pumpkins	—	—	—	—	—	—	1.0	—	—
Radish, roots	—	—	—	—	—	—	0.3	—	—
Radish, tops	—	—	—	—	—	—	8.0	—	—
Raisins	—	—	—	—	—	10.0	—	—	—
Raspberries	1.0	4.0	—	—	—	—	—	—	—
Rice	3.0	—	—	—	—	—	—	—	—
Rye	3.0	2.0	—	—	—	—	—	—	—
Sheep, fat	0.1	—	3.0	0.05	—	1.0	.5	0.01	—
Sheep, meat	0.1	—	0.25	0.05	—	0.1	1.5	0.01	—

8. REGULATIONS AND ADVISORIES

Table 8-2. Tolerances for Residues Applicable to Pyrethrins and Pyrethroids (ppm)

	Type I Pyrethroids			Type II Pyrethroids					
	Pyrethrin	Allethrin	Permethrin	Cypermethrin	Delta-methrin	Fenproprathrin	Fenvalerate	Fluvalinate	Tralomethrin
	40CFR 180.128	40CFR 180.113	40CFR 180.378	40CFR 180.418	40CFR 180.435	40CFR 180.466	40CFR 180.379	40CFR 180.427	40CFR 180.422
Sheep, meat byproducts	0.1	—	2.0	0.05	—	0.1	1.5	0.01	—
Soybeans	—	—	—	—	—	—	0.05	—	0.05
Soybean hulls	—	—	0.05	—	—	—	1.0	—	—
Spinach	—	—	20.0	—	—	—	—	—	—
Squash/cucumber subgroup	—	—	—	—	—	0.5	—	—	—
Stone fruits	—	—	—	—	—	—	10.0	—	—
Strawberry	—	—	—	—	—	2.0	—	—	—
Sugarcane	—	—	—	—	—	—	2.0	—	—
Summer squash	—	—	—	—	—	—	0.5	—	—
Sunflower seed	—	—	—	—	—	—	1.0	—	0.05
Sweet potatoes	0.05	—	—	—	—	—	—	—	—
Tomatoes	1.0	4.0	2.0	—	0.2	0.6	1.0	—	—
Tomato (product) concentrated	—	—	—	—	0.1	—	—	—	—
Turnip greens	—	—	20.0	—	—	—	—	—	—
Turnip roots	—	—	1.0	—	—	—	0.5	—	—
Turnip tops	—	—	—	—	—	—	20.0	—	—
Vegetables, curcubit	—	—	3.0	—	—	0.5	—	—	—
Walnuts	1.0	—	0.05	—	—	—	—	—	—
Watercress	—	—	5.0	—	—	—	—	—	—
Watermelons	—	—	—	—	—	—	1.0	—	—
Wheat	3.0	2.0	—	—	—	—	—	—	—
Winter squash	—	—	—	—	—	—	1.0	—	—

Source: EPA 2001f