



Sod webworm, Purdue University Entomology



Verticillium wilt, California Polytechnic State University



Catchweed bedstraw, K. Schaefer, Iowa State University



Read the label, Jed Findlay, Iowa State University

# Toxicity of Common Lawn, Garden, and Ornamental Pesticides in Iowa

By design, pesticides are toxic to the target pests. Insecticides target insects and mites, herbicides target weeds, and fungicides target plant pathogens. In general, the quicker a pest problem is solved the better, but anyone considering the use of a pesticide should be aware of the potential harm the chemical could pose to themselves or the environment.

## Pesticide Labels

In addition to the trade name of a pesticide (e.g., Bonide Chickweed, Clover & Oxalis Killer), each pesticide product label lists its common name (e.g., dicamba) under the active ingredient statement. This quickly identifies what is in the product. Knowing the active ingredient(s) will help a person begin to identify potential harm.

## LD<sub>50</sub> Values

Toxicity is the potential of a chemical to cause injury to or result in poisoning of an organism. Laboratory testing (using specially bred mice, rabbits, or rats) develops estimates of toxicity to humans. One of these estimates is the LD<sub>50</sub> value – the amount of a toxic compound that will kill 50 percent of a test population. These values are calculated for oral (via the mouth) and dermal (via the skin) exposures.

The lower the LD<sub>50</sub> number, the more toxic the chemical. Consider an example of two common names of insecticides available for garden use: dinotefuran has an oral LD<sub>50</sub> value of greater than 2,000 mg/kg compared to the dimethoate value of 60 mg/kg – dimethoate is much more toxic orally than is dinotefuran. But both pesticides are relatively non-toxic on a dermal basis (>2,000). LD<sub>50</sub> values are found on the safety data sheet for a given pesticide.

## Signal Words

The United States Environmental Protection Agency (EPA) requires that a signal word is featured prominently on the product label – on the front panel and in capital letters – for easy visibility. Signal words are an indication of the toxicity of the product. Three signal words are used on pesticide labels: Caution, Warning, and Danger. CAUTION is listed on slightly toxic products, WARNING indicates the pesticide is moderately toxic, and DANGER means that a pesticide is highly toxic.

## Bee Toxicity

Read the label before purchasing a product to learn if it is toxic to bees. Pesticides that are toxic to bees will notify the reader either in the Bee Advisory Box or the Environmental Hazards Statements of the label. Purchase a pesticide that is less toxic to pollinators, especially if making the application to one or more flowering plants. Specific [pesticide toxicity information](#) for pollinators is not found on the product label, but can be located at [www2.ipm.ucanr.edu/beeprecaution](http://www2.ipm.ucanr.edu/beeprecaution) or by an internet search.

The following tables provide information on commonly used insecticides (Table 1), herbicides (Table 2), and fungicides (Table 3) as of January 2019. Refer to the Iowa Department of Agriculture and Land Stewardship Pesticide Bureau [product database](#) for updates ([www.kellysolutions.com/ia/pesticideindex.asp](http://www.kellysolutions.com/ia/pesticideindex.asp)). For more information on using pesticides in the garden see the publication [“Home and Garden Pesticide Guidelines”](#) available free to download at the ISU Extension Store (<https://store.extension.iastate.edu/product/15457>).

**Table 1. Information for commonly used lawn, garden, and ornamental insecticides.**

Common Name	Trade Name Examples	Signal Word	LD <sub>50</sub> (mg/kg) <sup>1</sup>	Bee Toxicity <sup>2</sup>
abamectin, avermectin	Avid, Divanem, Enforcer, Homeplus, Maggie's Farm, Quali-Pro, Raid Double Control, Sirocco, Terro, Trufin, Vendetta	Caution or Warning	221 (O) 330 (D)	3
acephate	Acephate, Avatar PLX, Bayer 2-in-1 Systemic Rose & Flower Care, Bonide Systemic Insect Control, Lepitect, Orthene	Caution	1,750 (O) >2,000 (D)	1
acetamiprid	Ortho Bug B Gon Garden Insect Killer, Ortho Rose and Flower Insect Killer, Retriever Insecticide, Transport, Tristar	Caution	> 2,000 (O) > 2,000 (D)	2
allethrin, D allethrin, trans bioallethrin	Ace Wasp & Hornet Killer 3, Black Flag Flying Insect Killer 2, Green Thumb Flying Insect Killer, Hot Shot Flying Insect Killer, No-Pest, Off! Mosquito Coil, Raid, Real-Kill, Tat, Thermacell	Caution	685 (O) >11,000 (D)	1
azadirachtin	Aza Max, Azaguard Botanical Insecticide, Azera Insecticide, Biosafe Insect Control, Ecozin Plus, Ornazin, Safer Bioneem	Caution	>5,000 (O) >5,050 (D)	2
<i>Bacillus thuringiensis</i> var. <i>israelensis</i>	Aquabac 200G, Bonide Mosquito Beater, Fourstar Briquets 180, Gnatrol WDG Biological Larvicide, Mosquito Bits, Summit BTI Briquets, Vectobac DT Biological Larvicide	Caution	>10,000 (O) >10,000 (D)	[3]
<i>Bacillus thuringiensis</i> var. <i>kurstaki</i>	Ferti-Lome Dipel BT, Garden Safe BT Worm & Caterpillar Killer, Hi-Yield, Monterey BT, Natural Guard Brand Ferti-Lome, Safer Brand Caterpillar Killer for Trees, Shrubs & Vegetables, Thuricide	Caution	>5,050 (O) >2,020 (D)	3
bifenazate	Bifenamite, Floramite, Sirocco	Caution or Warning	>5,000 (O) >5,000 (D)	[2]
bifenthrin	Aloft LC, Avalon, Baseline, Bonide 8, Earl May Midwest Lawn Insect Control, Hi-Yield Bug Blaster, Martin's Surrender G Insect Killer, Onyx Insecticide, Ortho Bug B Gon, Talstar, Up-Star Gold	Caution	632 (O) >2,000 (D)	1
boric acid orthoboric acid	Intice 10 Perimeter Bait, Maggie's Farm Simply Effective Snail, Slug and Insect Bait, Mother Earth Granular Scatter Bait, Niban Granular Bait, Terro Multi-purpose Insect Bait	Caution	>5,000 (O) >5,050 (D)	3
buprofezin	Talus	Caution	>5,000 (O) >2,000 (D)	2
canola oil	Bayer Advanced Natria Multi-Insect Control, Earth-tone Insect Control, Espoma Insect!, Ortho Elementals Garden Insect Killer, Pycana, Pyola Insect Spray, Whitney Farms Outdoor Insect Killer	Caution	Not available	[3]
capsaicin, hot peppers	Bonide Shotgun Hot Pepper Wax, Hot Pepper Wax Repellent, Repellex Systemic Tablets, Safer Brand Critter Ridder, Sweeney's Deer & Rabbit Repellent	Caution	148 (O) >2,500 (D)	2
carbaryl	A Complete Fruit Spray, Earl May Fruit Tree Spray, Garden Tech Sevin, Gordon's Fruit Tree Spray, Sevin	Caution or Warning	230 (O) 2,000 (D)	1
chlorantraniliprole	Acelepryn, Altacor, Grubex, Roundup for Lawns Bug Destroyer	[none required]	>5,000 (O) >5,000 (D)	3
clofentezine	Notavo	Caution	>3,200 (O) >1,332 (D)	[3]
clothianidin	Aloft, Arena, Bioadvanced Science-based Solutions	Caution	>5,000 (O) >5,000 (D)	1
cyantraniliprole	Mainspring GNL	[none required]	>5,000 (O) >5,000 (D)	1

<sup>1</sup> O = Oral toxicity based on male rat testing; D = Dermal toxicity based on rabbit or rat testing – Data pulled from safety data sheet

<sup>2</sup> **Bee toxicity categories:** [www2.ipm.ucanr.edu/beeprecaution](http://www2.ipm.ucanr.edu/beeprecaution)

1 = Category I – LD<sub>50</sub> < 2 µg/bee = High toxicity to bees

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Number in bracket from safety data sheet or university/governmental source(s)

**Table 1. Information for commonly used lawn, garden, and ornamental insecticides (continued).**

Common Name	Trade Name Examples	Signal Word	LD <sub>50</sub> (mg/kg) <sup>1</sup>	Bee Toxicity <sup>2</sup>
cyfluthrin, beta-cyfluthrin	Bioadvanced Science-based Solutions 24 Hour Lawn Insect Killer, Decathlon, Discus, Raid Yard Guard Mosquito Fogger, Tempo 20WP, Temprid SC	Caution or Warning	960 (O) >2,000 (D)	1
cyhalothrin – gamma	Optimate CS, Spectracide Acre Plus Triazicide Insect Killer for Lawns & Landscapes, Spectracide Insect Killer for Lawns	Caution	>5,000 (O) >5,000 (D)	1
cyhalothrin – lambda	Amdro Rose & Flower Care, Bonide Beetle Killer, Demand, Earl May Eight Insect Control, Martin's Cyonara Lawn & Garden Insect Control, Repel Camp Outdoor Insect Control, Scimitar CS	Caution	>5,000 (O) >2,000 (D)	1
cypermethrin, zeta-cypermethrin	Bonide Cyper Eight Insect Control, Bug-No-More Large Property Insect Control, Cutter Backyard Bug Control, Cynoff, Harris Ant Kill, Raid Max Foaming Wasp & Hornet Killer, Up-Cide 2.5EC	Caution or Danger	294 (O) >2,000 (D)	1
deet	Army Type Insect Repellent, Ben's 30 Wilderness Formula, CRC Insect Repellent, Cutter Backwoods Dry Insect Repellent, Insect Shield, Off! Active Insect Repellent, Repel Sun & Bug Stuff, Swat Pro	Caution or Warning	3,735 (O) >2,000 (D)	Not available
deltamethrin, cis-deltamethrin	Amdro Home Perimeter, Buggslayer, Deltagard, Enforcer Bugmax Insect, Harris Home Pest Control, Hi-Yield Multi-Use Dust, Raid Max Bug Barrier, Rainbow Multi-bug III, Suspend SC	Caution	2,613 (O) >5,000 (D)	1
diatomaceous earth	Alpine D, Bonide Diatomaceous Earth Crawling Insect Killer, Garden Safe Brand Crawling Insect Killer, Natural Guard Ferti-Lome Diatomaceous Earth, Safer Brand Diatomaceous Earth	Caution	>5,000 (O) >5,000 (D)	2
diflubenzuron	Adept, Cavalletta, Dimilin	Caution	>10,000 (O) >20,000 (D)	2
dimethoate	Dimethoate	Warning	60 (O) >2,000 (D)	1
dinotefuran	Alpine, Emerald Ash Borer Killer, Gordon's, Hot Shot, Safari, Transtect, Zylam	Caution	>2,000 (O) >2,000 (D)	1
D-limonene citrus extracts	Orange Guard for Ornamental Plants, Safer Flying Insect Killer, Sentry Natural Defense	Caution	>5,000 (O) >5,000 (D)	3
esfenvalerate	Advantage Yard & Premise, Asana XL, Bengal, Champion Sprayon FS+, Onslaught Fast Cap, Sect-B-Gone, Yard Spray	Caution	1,470 (O) >2,000 (D)	1
essential oils: garlic, lemon eucalyptus	Captiva, Coleman Botanicals Insect Repellent, Cutter Lemon Eucalyptus, Murphy's Naturals Plant Based Deet Lemon Eucalyptus, Repel Plant-Based Lemon Eucalyptus Repellent <sup>2</sup>	Caution	>5,000 (O) >5,000 (D)	2
fipronil	Combat Max, Maxforce Fleet	Caution	>5,000 (O) >5,000 (D)	3
fluralinate, tau-	Bioadvanced Science-based Solutions 3-in-1 Insect, Disease and Mite Control, Mavrik Aquaflo, Mavrik Perimeter	Caution	5,150 (O) >2,120 (D)	2
hydramethylnon	Amdro Ant Block, Combat Outdoor Ant Killing Granules, Grant's Kills Ants, Maxforce Granular Insect Bait, Ortho Home Defense Roach Bait	Caution	>5,000 (O) >2,000 (D)	[3]
imidacloprid	Allectus G, Atera GC, Compare-N-Save Systemic Tree & Shrub Insect Drench, Criterion 75WSP, Discus, Green Thumb Granules, Marathon, Merit, Shaw's Turf Food w/ Grub Control, Temprid	Caution	>4,820 (O) >2,000 (D)	1
imiprothrin	Hot Shot Ant Roach & Spider Killer, Raid Ant & Roach Killer 17	Caution	1,800 (O) 2,000 (D)	[1]
indoxacarb	Advion Insect Granule, Arilon, Avaunt, Provaunt, Spectracide Ant Shield Ant Bait	Caution	1,909 (O) >5,000 (D)	1
lime sulfur (calcium polysulfide)	Brandt Lime Sulfur, Miller Lime Sulfur Solution, Miller Sulforix	Danger	820 (O) >2,000 (D)	2
malathion	A Complete Fruit Spray, Drexel Malathion, Earl May Fruit Tree Spray, High Yield 55%, Malathion Insect Control 50%, Martin's Malathion, Ortho Max Insect Spray, Spectracide Malathion	Caution or Warning	5,500 (O) 4,100 (D)	1

<sup>1</sup> O = Oral toxicity based on male rat testing; D = Dermal toxicity based on rabbit or rat testing – Data pulled from safety data sheet<sup>2</sup> **Bee toxicity categories:** [www2.ipm.ucanr.edu/beeprecaution](http://www2.ipm.ucanr.edu/beeprecaution)1 = Category I – LD<sub>50</sub> < 2 µg/bee = High toxicity to bees2 = Category II – LD<sub>50</sub> 2 – 11 µg /bee = Toxic to bees3 = Category III – LD<sub>50</sub> > 11 µg /bee = Relatively nontoxic to bees

Number in bracket from safety data sheet or university/governmental source(s)

**Table 1. Information for commonly used lawn, garden, and ornamental insecticides (continued).**

Common Name	Trade Name Examples	Signal Word	LD <sub>50</sub> (mg/kg) <sup>1</sup>	Bee Toxicity <sup>2</sup>
methiocarb	Mesuroil 75W Ornamental Insecticide	Danger	60 (O) >2,000 (D)	[1]
methoprene, S-	Amdro Quick Kill Mosquito Pellets, Gordon's Mosquito Prevent, Strike Pellets, Trufin Ant Bait, Zoecon Altosid Pellets	Caution	>5,100 (O) >2,000 (D)	3
mineral oil	All Seasons Horticultural Oil, Biocover MLT, Bonide All Seasons Horticultural & Dormant Oil, Civitas Turf Defense, Lesco Horticultural Oil +, Ortho Volk Oil, Purespray Green, Sunspray	Caution	>2,000 (O) >2,000 (D)	[3]
neem oil	70% neem oil, Bayer Advanced Natria Neem Oil, Ferti-Lome Triple Action, Fruit Tree Spray, Natural Guard Neem, Ortho Tree & Shrub Fruit Tree, Safer Brand Neem, Triact 70, Trilogy	Caution	>5,000 (O) >5,000 (D)	2
<i>Nosema locustae</i>	Nolo Bait	[none required]	Not available	3
permethrin	Astro, Bayer Advanced Vegetable & Garden Dust, Earl May Eight Insect Garden Dust, Ferti-Lome Indoor/Outdoor, Homefront Yard & Garden, Martin's Permethrin 10%, Spectracide Immunox Plus	Caution	1,030 (O) >2,000 (D)	1
petroleum oils horticultural grade	Ferti-Lome Horticultural Oil, Hi-Yield Dormant Spray, Suffoil-X, Sunspray, Tritex	Caution	>5,000 (O) >2,000 (D)	2
phenothrin (sumithrin)	Coleman Outdoor Yard & Camp, Raid House & Garden Bug Killer	Caution	>5,000 (O) >5,000 (D)	[1]
potassium salts of fatty acids (insecticidal soap)	Bonide Insecticidal Soap, End All Insect Killer, Fruit & Vegetable Insect Killer, Miracle-Gro Nature's Care, Monterey Garden Insect Spray, M-Pede, Whitney Farms Insecticidal Soap	Caution	>5,000 (O) >5,000 (D)	3
prallethrin	Ace Wasp & Hornet Killer 4, Claire Multi-kill, Off! Backyard Fogger, Raid House & Garden, Talstar, Ultra-Kill Wasp & Hornet	Caution	640 (O) >2,000 (D)	[1]
pyrethrins [with or without piperonyl butoxide]	Azera Gardening, Bonide Garden Dust, Earth-tone Insect Control, Gardentech Worry Free, Harmonix Insect Spray, Miracle-Gro Nature's Care, Pyganic, Pyola, Safer Tomato & Vegetable Insect	Caution	>2,000 (O) >2,000 (D)	1
pyriproxyfen	Fulcrum	Caution	>5,000 (O) >2,000 (D)	2
soybean oil	Captiva, Golden Pest Spray Oil	Caution	Not available	[2]
spinosad, spinosyns	Bonide Captain Jack's Deadbug Brew, Bull's-eye Bioinsecticide, Conserve SC, Entrust SC, Ferti-Lome Borer, Bagworm, Leafminer, and Tent Caterpillar Spray, Monterey Garden Insect Spray	Caution	>5,000 (O) >5,000 (D)	2
sulfur	3-in-1 Garden Spray II, High-Yield Snake's Eye Brand, Lilly Miller Sulfur Dust, Safer Brand Flower, Fruit, and Vegetable Garden, That Flowable Sulfur, Whitney Farms 3-in-1 Rose & Flower Care	Caution	>5,000 (O) >2,000 (D)	3
tetramethrin (neo-pynamin)	Coleman Outdoor Yard & Camp Fogger, Cutter Backyard Bug Control, Kill Zone Indoor & Outdoor Insect Killer, Ortho Home Defense Backyard Bug Killer, Repel Outdoor Camp Fogger	Caution	>5,000 (O) >5,000 (D)	[1]
thiamethoxam	Amdro Quick Kill Lawn & Landscape Insect Killer, Amdro Rose & Flower Care, Bonide Rose Shield, Meridian, Optigard, Tandem	Caution	>5,000 (O) >2,000 (D)	1
trichlorfon	Bioadvanced Science-based Solutions 24-hour Grub Killer, Dylox	Caution	>5,100 (O) >2,000 (D)	[3]

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Number in bracket from safety data sheet or university/governmental source(s)

**Table 2. Information for commonly used lawn, garden, and ornamental herbicides.**

Common Name	Trade Name Examples	Signal Word	LD <sub>50</sub> (mg/kg) <sup>1</sup>	Bee Toxicity <sup>2</sup>
2, 4-D	Armortech Surezone, Compare-N-Save Weed Killer, Jet –Spray Spot Weed Killer, Preen Lawn Weed Control, Speedzone Broadleaf Herbicide, T Zone SE, Vigoro Fall Weed & Feed, Weed Beater Lawn Weed Killer, Weed Whacker	Caution	1,670 (O) >2,000 (D)	2
benfluralin (benefin)	Lebanon Balan 2.5G, Ferti-Lome A-Vert, Green Light Amaze Grass & Weed Preventer, Hi-Yield Crabgrass Control, XL2G	Caution	>2,000 (O) >2,000 (D)	3
carfentrazone	Bonide Weed Beater Ultra, Ferti-Lome Weed Free Zone, Gordon’s Speed Zone Lawn Weed Killer, Gordon’s Trimec Speed Lawn Weed Killer, Homefront Lawn Weed Killer RTU, Quicksilver T&O Herbicide, Speedzone Broadleaf Herbicide	Caution	4,077 (O) >4,000 (D)	3
clethodim	Agrisel Grassout Max, Mossy Oak Biologic Weed Reaper, Nufarm IVM Clethodim, Omni Brand Clethodim 2EC	Caution	>3,129 (O) >5,050 (D)	3
DCPA	Dacthal Flowable Herbicide	Caution	>5,000 (O) >2,000 (D)	3
dicamba	Bonide Chickweed, Clover & Oxalis Killer, Compare-N-Save Weed Killer, Earl May Lawn Spot Weeder, Last Call Selective Herbicide, Maxlawn Weed & Feed, Scotts Weed Control for Lawns, Touch Up Weed Control for Your Lawn	Caution	2,000 (O) >5,050 (D)	3
diquat dibromide	Bioadvanced Science-based Solutions Durazone Concentrate Weed & Grass Killer, Roundup Concentrate Extended Control Weed & Grass Killer Plus Weed Preventive, Spectracide Weed & Grass Killer w/ Extended Control	Caution	886 (O) >5,050 (D)	3
dithiopyr	Ace Green Turf Crabgrass Preventer (CP), Ferti-Lome Weed-Out Pro Turf, Forevergreen Lawn Builder, Green Thumb 3-in1 Weed & Feed, Preen One Lawncare, Spread IT & Forget It Plus Dimension, Vigoro CP, Wondergro CP	Caution	>5,000 (O) >5,000 (D)	3
fenoxaprop-p	Acclaim Extra, Bioadvanced Science-based Solutions Crabgrass Killer, Last Call Selective Herbicide	Caution	>5,000 (O) >4,000 (D)	3
fluzifop-p-butyl	Fusilade II Turf & Ornamental, Ortho Grass B Gon Garden Grass Killer, Spectracide Weed & Grass Foaming Edger, Spectracide Weed & Grass Killer 3	Caution	>5,000 (O) >2,000 (D)	3
flumioxazin	Sure Power Selective Herbicide, Sureguard Herbicide	Caution	>5,000 (O) >2,000 (D)	3
fluroxypyr	Change Up Selective Herbicide, Last Call Selective Herbicide, Sure Power Selective Herbicide	Caution or Warning	3,162 (O) >2,000 (D)	[3]
foramsulfuron	Revolver Herbicide, Tribute Total	Caution	>5,000 (O) >5,000 (D)	2
glufosinate	Finale Herbicide	Warning	3,750 (O) >2,000 (D)	3
glyphosate	Gordon’s Barrier Year-long Vegetation Killer, HDX Quick Acting Weed & Grass Killer, Hi-Yield Killzall Extended Control, Martin’s Eraser Max, Roundup Concentrate Max Control 365, Ultra-Kill Weed & Grass Killer, Zap-It Ultimate	Caution	>5,000 (O) >5,000 (D)	2
halosulfuron-methyl	Empero Q-Pak, Halomax, Hi-Yield Nutsedge & Horsetail Control, Nufarm Prosedge Selective, Nutgrass Eliminator, Nutgrass Killer, Profine 75, Sedgexhammer, Tribute Total	Caution	1,287 (O) >5,000 (D)	2
imazapic-ammonium	Roundup Concentrate Extended Control Weed & Grass Killer Plus Weed Preventive, Roundup Concentrate Max Control 365, Roundup RTU Extended Control	Caution	>5,000 (O) >5,000 (D)	[3]
imazapyr	Bonide Kleenup Weed & Grass Killer 365, Gordon’s Barrier Year-long Vegetation Killer, Green Thumb Vegetation Killer, Martin’s TVC Total Vegetation Control, Spectracide Vegetation Killer 3	Caution	>5,000 (O) >5,000 (D)	[3]

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Number in bracket from safety data sheet or university/governmental source(s)

**Table 2. Information for commonly used lawn, garden, and ornamental herbicides (continued).**

Common Name	Trade Name Examples	Signal Word	LD <sub>50</sub> (mg/kg) <sup>1</sup>	Bee Toxicity <sup>2</sup>
indaziflam	Bioadvanced Science-based Solutions Durazone Concentrate Weed & Grass Killer	Caution	>5,000 (O) >2,000 (D)	3
iodosulfuron-methyl	Celsius WG	Caution	>5,000 (O) >5,000 (D)	[3]
isoxaben	Bioadvanced Science-based Solutions Season Long Weed Control, Ferti-Lome A-Vert, Ferti-Lome Broadleaf Weed Control, Gallery SC, Preen Extended Weed Control, Preen Mulch Plus, Snapshot, Woodace	Caution	>5,000 (O) >5,000 (D)	3
MCPA	Bonide Weed Beater Ultra, Dandelion Destroyer, Earl May Super Brush & Weed Killer, Ferti-Lome RTU Weed Free Zone, Gordon's Speed Zone Lawn Weed Killer, Ortho Weed B Gon Weed Killer for Lawns, Roundup for Lawns	Caution	1,046 (O) >2,000 (D)	2
MCP-P	Basic Control Weed & Feed, Earl May Lawn Spot Weeder, Gro Fine Weed & Feed, KGRO Premium Weed & Feed, Sta-Green RTS Weed & Feed, Super Turf Builder Weed & Feed, Touch Up Weed Control, Vigoro Fall Weed & Feed	Caution	930 (O) >2,000 (D)	3
mesotrione	Tenacity	Caution	>5,000 (O) >5,000 (D)	[3]
metsulfuron-methyl	Manor Selective, Mansion, Omni Brand MSM 60DF, Rometsol	Caution	>5,000 (O) >2,000 (D)	[3]
oryzalin	Alligare Oryzalin, Compare-N-Save Crabgrass & Sandbur Preventer, Green Light Amaze Grass & Weed Preventer, Nufarm Double O SPC, Weed Impede	Caution	>5,000 (O) >2,000 (D)	3
oxyfluorfen	Nufarm Double O SPC, Spectracide Weed & Grass Killer w/ Extended Control	Caution	>2,985 (O) >4,000 (D)	3
pelargonic acid	Eliminator Weed & Grass Killer III, HDX Weed & Grass Killer, Hi-Yield Killzall Quick Weed & Grass Killer, Martin's Eraser Foaming Weed Killer, Rainbow Johnson Grass & Weed Killer Foam, Roundup RTU Weed & Grass Killer III	Caution	>2,000 (O) >2,000 (D)	3
pendimethalin	Crabgrass Preventer Plus, Pendulum, Roundup Landscape Weed Preventer, Scotts Weedex Prevent with Halts, Step 1 Crabgrass Preventer, Super Turf Builder with Halts, Turf Builder with Halts, Vigoro Crabgrass Preventer	Caution	3,956 (O) >2,000 (D)	3
picloram	Tordon RTU	Caution	>5,000 (O) >2,000 (D)	[3]
prodiamine	Barricade, Bonide Sedge Ender, EC Grow Award, Evade, Ferti-Lome For All Seasons II, Howard Johnson's Crabgrass Control, Scott's Fertilizer with Halts II, Sedge Ender, Shaw's Turf Food/Crabgrass Control, Weed Impede 2-in-1	Caution	>5,000 (O) >2,000 (D)	3
quinclorac	Amdro Nutsedge & Crabgrass Weed Killer, Crab-E-Rad Plus, Drive XLR8, Earl May Total Weed Control, Ortho Weed B Gon Max + Crabgrass Control, Roundup for Lawns, Spectracide Weed Stop for Lawns Plus Crabgrass Killer	Caution or Warning	>2,000 (O) >2,000 (D)	3
sethoxydim	Bonide Grass Beater Over-the-top Grass Killer, Ferti-Lome Over-the-top II, Grass Getter, Hi-Yield Grass Killer Postemergence, Nufarm Sethoxydim SPC, Segment Herbicide	Caution	>4,285 (O) >4,000 (D)	2
sulfentrazone	Armortech Surezone, Bonide Sedge Ender, Image Herbicide Consumer, Ortho Nutsedge Killer for Lawns, Roundup for Lawns, Sedge Ender, Spectracide Weed Stop for Lawns Plus Crabgrass Killer, T Zone SE	Caution or Warning	2,084 (O) >2,000 (D)	3
sulfosulfuron	Certainty Turf Herbicide	Caution	>5,000 (O) >5,000 (D)	3
thiencarbazone-methyl	Celsius WG, Tribute Total	Caution	3,129 (O) >5,000 (D)	[3]
triclopyr	Brushtox with Triclopyr, Cool Power Selective Herbicide, Earl May Super Brush & Weed Killer, Gordon's Brush No More Brush Killer, Martin's Clear Pasture, Ortho Max Poison Ivy & Tough Brush Killer, T Zone SE, Turflon Ester	Caution	1,000 (O) 3,535 (D)	[3]
trifluralin	Easy Weeder Flower & Garden Weed Preventer, Eliminator Garden Weed Preventer, Ferti-Lome A-Vert, Garden Weed Preventer, Miracle-Gro Garden Weed Preventer 1, Preen Mulch Plus, TCS Elegant Garden Weed Preventer	Caution	4,013 (O) >2,000 (D)	[3]

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<sup>2</sup> **Bee toxicity categories:** [www2.ipm.ucanr.edu/bee precaution](http://www2.ipm.ucanr.edu/bee precaution)

1 = Category I – LD<sub>50</sub> < 2 µg/bee = High toxicity to bees

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Number in bracket from safety data sheet or university/governmental source(s)

**Table 3. Information for commonly used lawn, garden, and ornamental fungicides.**

Common Name	Trade Name Examples	Signal Word	LD <sub>50</sub> (mg/kg) <sup>1</sup>	Bee Toxicity <sup>2</sup>
azoxystrobin	Armor Tech Zoxy-T, Azoxy 50 WDG, Compendium, Goliath, Headway, Heritage, Ortho Disease Control Pro, Renown, Scotts DiseaseEx Lawn, Strobe	Caution	1,714 (O) >5,000 (D)	3
boscalid	Bonide Fruit Tree & Plant Guard, Emerald	Caution	>2,000 (O) >2,000 (D)	2
captan	A Complete Fruit Tree Spray, Bonide Captan Fruit & Ornamental, Earl May Fruit Tree Spray, Gordon's Liquid Fruit Tree Spray, Hi-Yield Captan 50W	Warning	>5,050 (O) >5,050 (D)	2
chlorothalonil	Bonide Fung-onil Multipurpose, Daconil, Docket DF, Hi-Yield Vegetable, Flower, Fruit & Ornamental, Lesco Manicure Turf & Ornamental, Ortho Disease B Gon Garden	Warning	3,260 (O) 2,020 (D)	2
cyazofamid	Segway	Caution	>5,000 (O) >2,000 (D)	[3]
difenoconazole	Bonide Rose Shield, Contend A	Caution	1,453 (O) <2,010 (D)	2
fluazinam	Secure	Warning	>5,000 (O) >2,000 (D)	[3]
fludioxonil	Instrata Turf & Ornamental Fungicide, Medallion, Nivales	Caution	>5,000 (O) >5,000 (D)	3
fluopicolide	Adorn Fungicide, Presidio Fungicide	Caution	>2,000 (O) >4,000 (D)	3
fluopyram	Broadform, Exteris Stressgard, Idemnify	Caution	>2,000 (O) >2,000 (D)	2
fluoxastrobin	Fame	Caution	>5,000 (O) <5,000 (D)	[3]
flutolanil	Prostar 70WDG	Caution	>5,000 (O) >5,000 (D)	2
fluxapyroxad	Xzemplar	Warning	>2,000 (O) >5,000 (D)	3
fosetyl aluminum	Signature XTRA Stressgard	Caution	2,860 (O) >2,020 (D)	2
hydrogen dioxide	Biosafe Disease Control, Zerotol 2.0	Danger	>2,000 (O) >5,000 (D)	[1]
iprodione	Chipco 26019	Caution	4,619 (O) >2,000 (D)	2
lime sulfur (calcium polysulfide)	Brandt, Miller, Miller Sulforix	Danger	820 (O) >2,000 (D)	2
mancozeb	Bonide Mancozeb Flowable, Dithane, Lesco 4 Flowable, Penncozeb, Protect DF	Caution	>4,470 (O) >2,000 (D)	3
mandestrobin	Pinpoint	Caution	3,129 (O) >5,000 (D)	[3]
mefenoxam	Ariel, Quali-Pro Mefenoxam	Caution or Warning	>2,000 (O) >2,000 (D)	3
metconazole	Tourney Fungicide	Caution	1,750 (O) >5,000 (D)	3

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**Table 3. Information for commonly used lawn, garden, and ornamental fungicides (continued).**

Common Name	Trade Name Examples	Signal Word	LD <sub>50</sub> (mg/kg) <sup>1</sup>	Bee Toxicity <sup>2</sup>
myclobutanil	Eagle WSP, Ferti-Lome F-Stop, Monterey Fungi-Max, Quali-Pro Myclobutanil 20EW	Caution	>5,000 (O) >5,000 (D)	2
neem oil	Bayer Advanced Natria, Bonide Bon-Neem II, Ferti-Lome, Fruit Tree Spray, Garden Safe, Natria, Ortho Tree & Shrub Fruit Tree, Triact 70, Trilogy, Triple Action	Caution	>5,000 (O) >5,000 (D)	2
penthiopyrad	Velista	Caution	>5,000 (O) >5,000 (D)	3
polyoxin	Affirm	Caution	4,916 (O) >2,000 (D)	3
potassium bicarbonate	Agricure, Bi-Carb Old Fashioned Fungicide, Green Cure, Milstop	Caution	>2,931 (O) >2,020 (D)	3
potassium phosphite	Appear	Caution	>5,000 (O) >4,000 (D)	[3]
propamocarb hydrochloride	Banol, Proplant	Caution	>2,000 (O) >3,000 (D)	[3]
propiconazole	Black Flag Extreme Lawn, Bonide Infuse Systemic Disease Control, Goliath, Headway, Instrata, Lesco Spectator, Nufarm Propiconazole SPC, Spectracide Immunox, Strider	Caution	4,340 (O) >2,020 (D)	2
pyraclostrobin	Bonide Fruit Tree & Plant Guard, Lexicon Intrinsic Brand, Pillar G Intrinsic Brand	Caution	>500 (O) >5,000 (D)	3
sulfur	Bayer Advanced 3-in-1, Bonide Citrus, Fruit, & Nut Orchard, Earth-Tone 3-in-1 Disease Control, Miracle-Gro Natures Care 3-in-1, Ortho Elementals 3-in-1, Safer Brand Rose & Flower	Caution	>5,000 (O) >2,000 (D)	3
tebuconazole	Armor Tech Zoxy-T, Bioadvanced Science-based Solutions All-in-one, Bonide Rose Rx Systemic Drench, Ferti-Lome 2-in-1 Systemic, Mirage Stressgard, Monsoon Turf Foliar Fungicide	Caution	>2,000 (O) >2,000 (D)	2
thiophanate-methyl	3336 F, Bonide Infuse Systemic Disease Control Lawn & Landscape, Hummert's Dynagreen T-Methyl Granular, Lesco T-Storm, Quali-Pro TM/C, Topsin, Transom, Zyban WSB	Caution	>5,000 (O) >5,000 (D)	3
thiram	Defiant, Spotrete F Fungicide	Caution	1,800 (O) >2,000 (D)	3
triadimefon	Andersons Golf Products Fungicide VII, Armada 50WDG, Bayleton, Strike Plus, Tartan Stressgard, Trigo	Caution	>500 (O) >2,000 (D)	2
trifloxystrobin	Armada 50WDG, Compass, Tartan Stressgard, Trigo	Caution	>500 (O) >2,000 (D)	3
triticonazole	Trinity, Chipco Triton Flo, Triton 70WDG	Caution	>5,000 (O) >2,000 (D)	[3]

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Written by Mark Shour, entomology program specialist with ISU Extension and Outreach; Adam Thoms, assistant professor and extension turfgrass specialist at Iowa State; and Lina Rodriguez-Salamanca, plant pathology diagnostician with the Plant and Insect Diagnostic Clinic at Iowa State.

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