



Toxicity of Pesticides

All pesticides must be toxic, or poisonous, to be effective against the pests they are intended to control. Because pesticides are toxic, they are potentially hazardous to humans, animals, other organisms, and the environment. Therefore, people who use pesticides or regularly come in contact with them must understand the relative toxicity and potential health effects of the products they use.

The toxicity of a pesticide is its capacity or ability to cause injury or illness. The toxicity of a particular pesticide is determined by subjecting test animals to varying dosages of the active ingredient (a.i.) and each of its formulated products. The active ingredient is the chemical component in the pesticide product that controls the pest. The two types of toxicity are acute and chronic.

Acute toxicity of a pesticide refers to the chemical's ability to cause injury to a person or animal from a single exposure, generally of short duration. The four routes of exposure are dermal (skin), inhalation (lungs), oral (mouth), and eyes. Acute toxicity is determined by examining the dermal toxicity, inhalation toxicity, and oral toxicity of test animals. In addition, eye and skin irritation are also examined.

Acute toxicity is measured as the amount or concentration of a toxicant—the a.i.—required to kill 50 percent of the animals in a test population. This measure is usually expressed as LD₅₀ (lethal dose 50) or LC₅₀ (lethal concentration 50).

Additionally, the LD₅₀ and LC₅₀ values are based on a single dosage and are recorded in milligrams of pesticide per kilogram of body weight (mg/kg) of the test animal or in parts per million (ppm). LD₅₀ and LC₅₀ values are useful in comparing the toxicities of different active ingredients and different formulations containing the same active ingredient. *The lower the LD₅₀ or LC₅₀ of a pesticide product, the greater its toxicity to humans and animals.* Pesticides with a high LD₅₀ are the least toxic to humans if used according to the directions on the product label.

The chronic toxicity of a pesticide is determined by subjecting test animals to long-term exposure to the active ingredient. Any harmful effects that occur from small doses repeated over a period of time are termed chronic effects. Some of the suspected chronic effects from exposure to certain pesticides include birth defects, production of tumors, blood disorders, and neurotoxic effects (nerve disorders). The chronic toxicity of a pesticide is more difficult to determine through laboratory analysis than acute toxicity.

Products are categorized on the basis of their relative acute toxicity (their LD₅₀ or LC₅₀ values). Pesticides that are classified as highly toxic (Toxicity Category I) on the basis of either oral, dermal, or inhalation toxicity must have the signal words DANGER and POISON printed in red with a skull and crossbones symbol prominently displayed on the front panel of the package label. The Spanish equivalent for DANGER, “PELIGRO,” must also appear on the labels of highly toxic chemicals. The acute (single dosage) oral LD₅₀ for pesticide products in this group ranges from a trace amount to 50 mg/kg. For example, exposure of a few drops of a material taken orally could be fatal to a 150-pound person.

Some pesticide products have the signal word DANGER without the skull and crossbones symbol. This is because possible skin and eye effects are more severe than suggested by the acute toxicity (LD₅₀) of the product.

Pesticide products considered moderately toxic (Toxicity Category II) must have the signal word WARNING and “AVISO” (the Spanish equivalent) displayed on the product label. In this category, the acute oral LD₅₀ ranges from 50 to 500 mg/kg. A teaspoon to an ounce of this material could be fatal to a 150-pound person.

Pesticide products classified as either slightly toxic or relatively nontoxic (Toxicity Categories III and IV) are required to have the signal word CAUTION on the pesticide label. Acute oral LD₅₀ values in this group are greater than 500 mg/kg. An ounce or more of this material could be fatal to a 150-pound person.


Despite the fact that some pesticide products are considered only slightly toxic or relatively nontoxic, all pesticides can be hazardous to humans, animals, other organisms, and the environment if the instructions on the product label are not followed. Use the

pesticide only as recommended by the manufacturer. As the applicator, you are legally responsible for any misuse of a pesticide.

Table 1 summarizes the LD₅₀ and LC₅₀ values for each route of exposure for the four toxicity categories and their associated signal word. For example, an active ingredient with a dermal LD₅₀ of 1,000 mg/kg would be in Toxicity Category II with a WARNING signal word. Keep in mind, an active ingredient may have a high LD₅₀ placing it in a Toxicity Category II, III, or IV but also have corrosive eye/skin effects that take priority and place it in Toxicity Category I.

Although every pesticide is different and the product label should be consulted to determine the personal protective equipment (PPE) requirements for each chemical, some general rules apply for choosing PPE according to the different toxicity categories (Table 2).

Table 1. Toxicity Categories for Active Ingredients

Routes of Exposure	Toxicity Category			
	I	II	III	IV
Oral LD ₅₀	Up to and including 50 mg/kg	50–500 mg/kg	500–5,000 mg/kg	>5,000 mg/kg
Inhalation LC ₅₀	Up to and including 0.2 mg/l	0.2–2 mg/l	2–20 mg/l	>20 mg/l
Dermal LD ₅₀	Up to and including 200 mg/kg	200–2,000 mg/kg	2,000–20,000 mg/kg	>20,000 mg/kg
Eye Effects	Corrosive corneal opacity not reversible within 7 days	Corneal opacity reversible within 7 days; irritation persisting for 7 days	No corneal opacity; irritation reversible within 7 days	No irritation
Skin Effects	Corrosive	Severe irritation at 72 hours	Moderate irritation at 72 hours	Mild or slight irritation at 72 hours
Signal Word	DANGER  POISON	WARNING	CAUTION	CAUTION

Adapted from 40 CFR Part 156.

Table 2. Minimum PPE and Work Clothing for Pesticide-Handling Activities

Route of Exposure	Toxicity Category of End-Use Product			
	I	II	III	IV
Dermal toxicity or skin irritation potential	Coveralls worn over long-sleeved shirt and long pants	Coveralls worn over short-sleeved shirt and short pants	Long-sleeved shirt and long pants	Long-sleeved shirt and long pants
	Socks	Socks	Socks	Socks
	Chemical-resistant footwear	Chemical-resistant footwear	Shoes	Shoes
	Chemical-resistant gloves	Chemical-resistant gloves	No minimum	No minimum
Inhalation toxicity	Respiratory protection device	Respiratory protection device	No minimum	No minimum
Eye irritation potential	Protective eyewear	Protective eyewear	No minimum	No minimum

The acute oral and dermal LD₅₀ values of commonly used pesticides are listed in the following tables and include acaricides, bactericides, fungicides, herbicides, insect growth regulators, insecticides, nematicides, and plant growth regulators. The common chemical name of the active ingredient followed by an example of a trade name is listed in the first column. Use categories (general or restricted) are indicated in the second column. The acute oral LD₅₀ and acute dermal LD₅₀ are in the third and fourth columns. The fifth column indicates the restricted-entry interval (REI). The REI is the time immediately after a pesticide application when entry into the treated area is limited.

Information presented here is for preliminary planning only. Exclusive reliance must be placed on the product label supplied by the manufacturer. All pesticide toxicity values, including the LD₅₀, can be found on the product's Material Safety Data Sheet (MSDS). Pesticide labels and MSDS can be obtained from retailers or manufacturers. In addition, most products also have information that can be found on the Internet. The following Web page lists some of the more common search engines used to find pesticide labels and MSDS: www.pested.psu.edu/resources/web/labels.shtml.

**Poison Control Centers
1-800-222-1222**

Calling the toll-free National Poison Center hotline above will connect you to the nearest poison center. Pennsylvania residents are served by the Pittsburgh Poison Center and the Poison Control Center in Philadelphia.

Table 3. Acaricide¹

Active Ingredient, Trade Name	Use Category ³	LD ₅₀ Values (mg/kg) ⁴		REI ⁵
		Oral	Dermal	(hours)
dicofol, Kelthane, Kelthane MF	G	570–595	>2,000	12
disulfoton, Di-syston	G	2–12	3.6–15.9	48
endosulfan, Phaser	G	160	359	24
etoxazole, Secure	G	>5,000	>2,000	12
fenbutatin-oxide, Vendex	R	2,631	>2,000	48
formetanate hydrochloride, Carzol	G	21	>10,200	48, 72
hexythiazox, Savey	G	>5,000	>5,000	12
pyridaben, Sanmite	G	820–1,350	>2,000	12
sulfur	G	>5,000	>5,000	12, 24, 48
tetradifon, Tedion	G	>10,000	>10,000	12

Table 4. Bactericide¹

Active Ingredient, Trade Name	Use Category ³	LD ₅₀ Values (mg/kg) ⁴		REI ⁵
		Oral	Dermal	(hours)
acibenzolar-S-methyl, Actigard	G	>5,000	>2,000	12
dimanin A, Bayclean	G	290	—	—
hydrogen dioxide, Terra Clean	G	330	1,410	0
oxytetracycline, Mycoshield	G	>5,000	>2,000	12
pseudomonas fluorescens A506, Blight Ban	G	—	—	4
streptomycin, Agri-Mycin-17, Agri-Strep	G	9,000	—	12

Table 5. Fungicide¹

Active Ingredient, Trade Name	Use Category ³	LD ₅₀ Values (mg/kg) ⁴		REI ⁵
		Oral	Dermal	(hours)
acibenzolar-S-methyl, Actigard	G	>5,000	>2,000	12
azoxystrobin, Abound, Quadris	G	>2,000	>5,000	4
<i>Bacillus subtilis</i> , Serenade	G	>5,000	>2,000	12
boscalid, Endura	G	>2,000	>2,000	12
captan*	G	9,000	—	96
carboxin, Vitavax	G	3,820	>4,000	24
chlorine, Clorox (bleach)	G	—	—	12
chloroneb	G	>5,000	>5,000	12
chloropicrin, Chloro-o-Pic	R-3,10	250	—	72
chlorothalonil*, Bravo	G	>10,000	>10,000	24
<i>Coniothyrium minitans</i> , Contans	G	—	—	4
copper, fixed ⁸	G	—	—	12, 24
copper hydroxide, Spin Out	G	1,000	—	24
cymoxanil, Curzate	G	1,100	>3,000	12
dichloropropene, Telone	R	127	423	120
dicloran, Botran	G	tech 5,000	—	12
difenoconazole, Dividend	G	1,453	2,010	48
dimethomorph, Acrobat	G	3,900	>2,000	24
dodine, Syllit	G	1,000	>6,000	48
etridiazole, Terrazole	R,G	1,077	>2,000	12
famoxodone, Famoxate	G	>5,000	>5,000	12
fenbuconazole, Enable, Indar	R,G	>2,000	>5,000	12
fenhexamid, Elevate	G	>5,000	>5,000	4
fluazinam, Omega	G	>5,000	>2,000	48
fludioxonil, Maxim	G	>5,000	>2,000	12
flutolanil, Folistar	G	10,000	>5,000	12
fosetyl Al, Aliette	G	5,000	>2,000	12, 24
harpin protein, Messenger	G	>5,000	>6,000	4
iprodione*, Rovral	G	>4,400	>2,000	12, 24
kresoxim-methyl, Sovran	G	5,000	>2,000	12
mancozeb, Dithane, Manzate	G	>5,000	>5,000	24
maneb, Manex	G	tech 7,990	>5,000	24
metalaxyl, Apron, Ridomil	G	tech 669	>3,100	12
metalaxyl-M, Ridomil Gold	G	>5,000	>2,000	48
metam potassium, K-Pam	G	630	>1,000	48
methyl bromide*, MC-2, Terr-O-Gas 67	R-8	See footnote 7		48

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Table 5. Fungicide¹ (continued)

Active Ingredient, Trade Name	Use Category ³	LD ₅₀ Values (mg/kg) ⁴		REI ⁵
		Oral	Dermal	(hours)
metiram, Polyram	G	tech >6,810	>2,000	12
myclobutanil, Nova	G	1,600	>5,000	24
PCNB, Terraclor	G	tech 1,700–5,000	2,000–4,000	12, 24
propamocarb hydrochloride, Previcar	G	2,900	>3,000	12
propiconazole*, Tilt, Orbit	G	1,517	>4,000	24
pyraclostrobin, Cabrio, Headline	G	>500	>4,000	12
sodium chlorite, Alcide	G	—	—	12
streptomyces, SoilGard	G	—	—	12
sulfur	G	>5,000	>5,000	12, 24, 48
tebuconazole, Horizon	G	4,000	5,000	12
thiabendazole*, Mertect	G	3,100	—	12
thiophanate-methyl, Topsin M	G	7,500	—	12
thiram, Thylate	G	tech 1,000	>5,000	12
triadimefon, Bayleton	G	812	>2,000	12
trifloxystrobin, Gem, Flint	G	>5,000	>2,000	12
triflumizole, Procure	G	2,230	>2,000	12
triphenyltin hydroxide, Super Tin	R-7	156–345	1,600	48
vinclozolin, Ronilan	G	tech 10,000	—	12
zoxamide, Gavel	G	>5,000	>5,000	48

Table 6. Herbicide¹

Active Ingredient, Trade Name	Use Category ³	LD ₅₀ Values (mg/kg) ⁴		REI ⁵
		Oral	Dermal	(hours)
acetochlor, Degree	R	2,148	4,166	12
acifluorfen, Blazer	G	2,025	>2,000	48
alachlor, Lasso, Partner	R-12	tech 930–1,350	13,300	12
ametryn, Evik	G	1,950	—	12
asulam, Asulox	G	>5,000	>2,000	12
atrazine, AAtrex	R	1,869	>3,100	12
bensulide, Prefar	G	tech 271–1,470	—	12
bentazon, Basagran	G	2,063	>6,050	12
bromoxynil, Brominal, Buctril	G	tech 260	>2,000	12
butylate, Sutan +	G	4,500	>4,640	2
carfentrazone-ethyl, Aim	G	5,143	>4,000	12
CDAA, Randox	G	750	—	12
chlorimuron ethyl, Classic	G	>4,000	>2,000	12
chlorpropham, Chloro IPC, Sprout Nip	G	3,800	—	48
clethodim, Select	G	3,610	>5,000	12, 24
clomazone, Command	G	1,369	>2,000	12
clopyralid, Stinger	G	>5,000	>2,000	12
cycloate*, Ro-Neet	G	3,160–4,640	—	12
dalapon*, Dowpon M	G	9,330	—	24
DCPA*, Dacthal	G	>10,000	>2,000	24
desmedipham, Betanex	G	>3,960	>10,000	24
dicamba, Banvel, Clarity	G	2,629	>2,000	12, 24
dimethenamid, Frontier, Outlook	G	849	>2,000	12
diquat	G	215–235	400	24
diquat dibromide, Reward	G	600	260	—
diuron, Karmex	G	tech >5,000	>5,000	12
endothall, Desiccate II	R	233	481	48
EPTC, Eradicane	G	tech 1,630	—	12
ethalfuralin, Curbit 3E	G	>10,000	>10,000	12
fenoxaprop-ethyl, Acclaim	G	2,565	>2,000	24
fluazifop-P-butyl*, Fusilade DX	G	3,328	—	12
flumetsulam, Python	G	>5,000	>2,000	12
flumiclorac-pentyl, Resource	G	3,200	>2,000	12
fomesafen, Reflex	G	1,858	—	24
foramsulfuron, Option	G	>3,881	>5,000	12

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Table 6. Herbicide¹ (continued)

Active Ingredient, Trade Name	Use Category ³	LD ₅₀ Values (mg/kg) ⁴		REI ⁵
		Oral	Dermal	(hours)
glufosinate-ammonium, Liberty	G	1,620	4,000	12
glyphosate, Roundup, Touchdown	G	>5,000	>5,000	24
halosulfuron-methyl, Manage, Permit	G	1,287	>5,000	12
hexazinone, Velpar	G	1,690	5,278	24
imazamox, Raptor	G	>5,000	>4,000	24
imazaquin, Scepter	G	>5,000	>5,000	12
imazethapyr, Pursuit	G	>5,000	>2,000	12, 24
lactofen, Cobra	G	>5,000	>2,000	12
linuron, Linex, Lorox	G	tech 4,000	—	24
MCPA, U 46 M-Fluid	G	900–1,160	>4,000	12, 24, 48
mesotrione, Callisto	G	>5,000	>2,000	12
S-metolachlor, Dual Magnum	G	tech 2,780	10,000	12
metribuzin, Sencor, Lexone	R-14	tech 1,100–2,300	>20,000	12
metsulfuron-methyl, Ally	G	>5,000	>2,000	4
napropamide, Devrinol	G	>4,640	—	12
naptalam, Alanap L	G	1,770	—	24
nicosulfuron, Accent	G	>5,000	>2,000	4
norflurazon, Solicam	G	>8,000	>20,000	12
oryzalin, Surflan	G	>10,000	—	12
oxyfluorfen, Goal	G	tech >5,000	>10,000	24
paraquat, Gramoxone Max	R-1,8	150	—	12, 48
pebulate, Tillam	G	tech 921–1,900	>4,640	12
pendimethalin, Prowl	G	1,250	>5,000	12, 24
phenmedipham*, Spin-aid	G	>8,000	>4,000	24
picloram, Tordon	R	8,200	>5,000	12
primisulfuron-methyl, Beacon	G	>5,050	>2,010	12
pronamide, Kerb	R-5	tech 8,350	5,620	12
propachlor, Ramrod	G	500–1,700	>20,000	48
propanil, Stampede	G	>2,500	>5,000	24
prosulfuron, Peak	G	4,360	2,020	12
quizalofop-P-ethyl, Assure II	G	1,210	—	12
rimsulfuron, Shadeout	G	>5,000	>2,000	4
sethoxydim, Poast	G	2,676–3,125	>5,000	12, 24
simazine, Princep	G	>5,000	>3,100	12
sulfentrazone, Authority	G	2,855	>2,000	12

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Table 6. Herbicide¹ (continued)

Active Ingredient, Trade Name	Use Category ³	LD ₅₀ Values (mg/kg) ⁴		REI ⁵
		Oral	Dermal	(hours)
terbacil*, Sinbar	G	5,000–7,500	—	12
thifensulfuron-methyl, Harmony GT	G	>5,000	>2,000	4
triasulfuron, Amber	G	>5,050	>2,000	4
triclopyr, Garlon, Remedy	G	tech 630	>2,000	48
trifluralin, Treflan, Trilin	G	>10,000	—	12, 24
2,4-D (acid)	R(NJ),G	375	—	12, 24
2,4-DB, Butyrac	G	>2,000	>10,000	48

Table 7. Insect Growth Regulator¹

Active Ingredient, Trade Name	Use Category ³	LD ₅₀ Values (mg/kg) ⁴		REI ⁵
		Oral	Dermal	(hours)
azadirachtin, Aza-Direct	G	>5,000	>2,000	12
cyromazine, Trigard	R,G	3,387	>3,100	12
fenoxycarb, Comply	G	16,800	>2,000	—
hydroprene, GenTrol	G	>34,000	5,100	—
S-kinoprene, Enstar II	G	4,900	9,000	4
S-methoprene, Precor	G	>34,000	>2,000	—
pyriproxyfen, Esteem, Knack	G	>5,000	>2,000	12

Table 8. Insecticide^{1,2}

Active Ingredient, Trade Name	Use Category ³	LD ₅₀ Values (mg/kg) ⁴		REI ⁵
		Oral	Dermal	(hours)
abamectin, Agri-Mek (FB)	R	300	>1,800	12
acephate, Address, Lancer (OP)	G	tech 980	>10,250	24
acetamiprid, Assail	G	1,064	>2,000	12
aldicarb*, Temik (CA)	R	5	>2,000	48
azadirachtin, Neemix	G	>5,000	>2,000	12
azinphos-methyl, Guthion (OP)	R-1,2,3,8,10,12	tech 5–20	220	48
<i>Bacillus thuringiensis aizawai</i> , XenTari (BT)	G	See footnote 6		4
<i>Bacillus thuringiensis aizawa + kurstaki</i> , Agree (BT)	G	See footnote 6		4
<i>Bacillus thuringiensis encapsulated delta endotoxin</i> , Match (BT)	G	See footnote 6		4
<i>Bacillus thuringiensis kurstaki</i> , Crymax (BT)	G	See footnote 6		4
<i>Bacillus thuringiensis tenebrionis</i> , Novodor (BT)	G	See footnote 6		4
bifenthrin, Brigade, Empower (PY)	R	262	>2,000	24
bifenazate, Acramite	G	>5,000	>2,000	12
carbaryl*, Sevin (CA)	G	500	850	12
carbofuran, Furadan (CA)	R-3	8	>3,000	48
chlorethoxyfos, Fortress (PY)	R	tech 1.8–4.8	12.5–18.5	48
chlorpyrifos*, Lorsban (OP)	R	92–276	2,000	12, 24
cryolite, Kryocide, Prokil (IO)	G	>5,000	—	12
cyfluthrin, Baythroid (PY)	R	500	>5,000	12
cyhalothrin-lambda, Karate (PY)	R-12	79	632	24
cypermethrin, Ammo (PY)	R	250	2,000	12
deltamethrin, Pounce	R-12	431	>2,000	12
diazinon (OP)	R-11	tech 300–400	3,600	12, 24
dicofol, Kelthane (CH)	G	570	2,000	12
diflubenzuron, Dimilin	R	>4,640	>10,000	12
dimethoate*, Cygon (OP)	R(NJ),G	tech 235	>400	48
disulfoton, Di-Syston (OP)	R-2,3	tech 4	10	48
emamectin, Proclaim (FB)	R	1,516	>2,000	48
endosulfan, Thiodan, Phaser (CH)	R(NJ),G	tech 160	359	48
esfenvalerate, Asana XL (PY)	R-12	458	>2,000	12
ethoprop, Mocap (OP)	R	61	2	48
fenamiphos, Nema-cur (OP)	R-1,10	10	>2,000	48
fenproparthrin, Danitol (PY)	R	66	>2,000	24
fipronil, Regent	R	336	382	0

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Table 8. Insecticide^{1,2} (continued)

Active Ingredient, Trade Name	Use Category ³	LD ₅₀ Values (mg/kg) ⁴		REI ⁵
		Oral	Dermal	(hours)
imidacloprid, Admire, Gaucho (NN)	G	tech 450	>5,000	12
indoxacarb, Avaunt (CA)	G	268	>5,000	12
insecticidal soap, M-Pede (SO)	G	16,900	—	12
lindane (CH)	R-5	88–125	1,000	12, 24
malathion, Cythion (OP)	G	tech 5,500	>2,000	12
metaldehyde, Deadline (OT)	G	630	—	12, 24
methamidophos, Monitor (OP)	R-2,11	tech 20	130	48
methomyl, Lannate (CA)	R-8,10	17	5,880	48
methoxychlor (CH)	G	6,000	—	12
methoxyfenozide, Intrepid	G	>5,000	>5,000	4
methyl parathion*, Metacide (OP)	R-2,8,10,11	6	50	48
oxamyl, Vydate L (CA)	R	37	2,960	48
oxydemeton-methyl*, Metasystox-R (OP)	R	tech 50	150	48
PBO (piperonyl butoxide), Incite (OT)	G	>7,500	—	12
permethrin, Ambush, Pounce (PY)	R-12	tech >4,000	>4,000	24
phorate*, Thimet (OP)	R-2,10,11	tech 2–4	20–30	48
phosmet, Imidan (OP)	R(NJ),G	tech 147–316	>4,640	24
pymetrozine, Fulfill (OT)	G	>5,000	>2,000	12
pyrethrins, Pyganic (BO)	G	1,500	>1,800	12
pyrethrum (BO)	G	1,500	>1,800	12
rotenone*, Rotenox, Noxfire (BO)	G	132–1,500	—	12, 24, 48
spinosad, SpinTor, Entrust (ML)	G	>5,000	>2,000	4
sulfur (IO)	G	>5,000	>5,000	12, 24, 48
tebufenozide, Confirm (PY)	G	>5,000	>5,000	4
tefluthrin, Force (PY)	R	1,213	>2,000	0
terbufos, Counter (OP)	R-1,2	tech 4.5	1.1	48
tetramethrin, Ammo	R-12	>5,000	>2,000	12
thiamethoxam, Actara, Platinum (NN)	G	>5,000	>2,000	12
thiodicarb, Larvin (CA)	G	66	>2,000	12
zeta-cypermethrin, Mustang (PY)	R-10,12	234	>2,000	12

Table 9. Nematicide¹

Active Ingredient, Trade Name	Use Category ³	LD ₅₀ Values (mg/kg) ⁴		REI ⁵
		Oral	Dermal	(hours)
chloropicrin	R-3,10	250	—	72
DCP, dichloropropene	R(NJ),G	300	333	72
ethoprop, Mocap	R-2	61.5	2.4	48
fenamiphos, Nemaicur	R-2	tech 3	200	48
metam-sodium, Vapam HL	G	1,891	>3,074	48
methyl bromide*, MC-2, Terr-O-Gas 67	R-8	See footnote 7		48
oxamyl, Vydate L	R	37	2,960	48

Table 10. Plant Growth Regulator¹

Active Ingredient, Trade Name	Use Category ³	LD ₅₀ Values (mg/kg) ⁴		REI ⁵
		Oral	Dermal	(hours)
BAP, Exilis	G	3,980	—	4
chlormequat chloride, Cycocel-Extra	G	883	>4,000	12
daminozide, B-Nine	G	>5,000	>5,000	24
dikegulac sodium, Atrimmec	G	31,000	>1,000	—
ethephon, Ethrel	G	4,229	—	48
flurprimidol, Cutless	G	709	—	—
gibberellic acid, GibGro, ProGibb	G	1,000–25,000	—	4
lactic acid, Propel	G	3,543	>2,000	48
maleic hydrazide, Royal MH-30	RG	>5,000	>5,000	12
mepiquat chloride, Pix	G	464	—	12
naphthaleneacetamide, Thin-it	G	1,690	2,000	48
l-naphthaleneacetic acid, Fruite	G	2,520	—	48
paclobutrazol, Bonzi	G	5,346	>1,000	12
Plant Extract 620, Agrispon	G	>20,000	—	—
prohexadione-calcium, Apogee	G	>5,000	>2,000	12
Trinexapac ethyl, PrimoMaxx	G	>5,050	2,020	0
uniconazole-P, Sumagic	G	2,020	>2,000	12

Footnotes to Tables

— = Data not available

* = Material covered under the Superfund Amendments and Reauthorization Act of 1986 (SARA) for storage notification.

¹ The Occupational Safety and Health Administration (OSHA) now requires growers to keep on file Material Safety Data Sheets (MSDS) for certain chemicals used during normal spray programs. These MSDS should be obtained from either your local pesticide dealer or directly from the chemical manufacturer. Some labels carry technical assistance phone numbers that you can call for further information. Call this number to request a MSDS from the manufacturer.

² Type class: BO = botanical, BT = bacterial, CA = carbamate, CH = chlorinated hydrocarbon, FB = fermentation by-product, IO = inorganic, ML = macrocyclic lactone, NN = neonicotinoid, OP = organic phosphate, OT = other, PY = pyrethroid, and SO = soap

³ Use category: R = restricted use and G = general use. Chemicals are designated as general or restricted use by state or federal agencies. Restricted use may not apply to all formulations or all uses of a formulation. Check the label to be sure. The designation "NJ" refers to a compound that is classified as restricted use in New Jersey. The number(s) after the R designation refer to the following reasons for being classified as a federal restricted use product:

1. acute oral toxicity
2. acute dermal toxicity
3. acute inhalation toxicity
4. corrosive to eyes
5. potential to cause tumors
6. potential to cause genetic mutations
7. potential to cause adverse reproductive effects
8. accident history
9. exposure hazard to workers
10. potential effects on wildlife
11. potential effects on birds
12. potential effects on fish and/or other aquatic species
13. potential for groundwater contamination
14. lack of data

⁴ LD₅₀ = milligrams of substance per kilogram of body weight of the test animal. The symbol > indicates the value is greater than the number listed. Formulations: LD₅₀ values given are for formulated material as you would purchase it; for example, 50WP, 4E, etc., unless otherwise noted. Source: *2001 Farm Chemicals Handbook*; information is listed as supplied by manufacturer.

⁵ REI (Restricted-entry interval): The EPA Worker Protection Standard now requires minimum 12-hour reentry times for all Category III (CAUTION) pesticides, 24-hour minimum reentry times for all Category II (WARNING) pesticides, and 48-hour minimum reentry times for all Category I (DANGER) pesticides. In New Jersey, the NJDEP Pesticide Control Program has designated 48-hour reentry times for some pesticides which EPA has assigned 12- or 24-hour reentry times. Chemicals with multiple designations are based on product and/or formulation differences.

⁶ Toxicity of *Bacillus thuringiensis* is listed as harmless to humans, animals, and useful insects. *Bacillus thuringiensis* is listed under several commercially available trade names such as Agree, Biobit, Cutlass, Crymax, DiPel, Javelin, Ketch, Lepinox, Match, Novodor, Prolong, Raven, and XenTari. *Bacillus thuringiensis* materials are marketed as several different subspecies such as *aizawai*, *kurstaki*, and *tenebrionis*. Different *Bacillus thuringiensis* subspecies may have different insect control properties. Please check labels for pest insects controlled before use.

⁷ Acute vapor toxicity, 200 ppm, extremely hazardous by vapor inhalation. Liquid can cause eye and skin burns.

⁸ Fixed coppers are listed under several commercially available trade names. Examples are: Basicop, Champ, Champion, Copper-Count-N, Cuprofix Disperss, Kocide, Super Cu, Tenn-Cop, Top Cop with Sulfur, Top Cop Tri-Basic, and Tri-Basic Copper Sulfate.

References

“Table D-6. Toxicity of Chemicals.” *Commercial Vegetable Production Recommendations*. 2004. The Pennsylvania State University. (Electronic version courtesy of Gerald M. Ghidui, Rutgers University.)

“Crop Protection Dictionary.” *Crop Protection Handbook*. 2003. Meister-Pro.

Pesticide Safety Fact Sheets are produced by the Pesticide Education Program in Penn State’s College of Agricultural Sciences. Topics covered in the series include

- pesticide laws and regulations
- handling chemical spills
- personal protective gear
- pesticides in the environment
- equipment care and cleaning
- pesticide toxicity and health effects

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