



COMMERCIAL VEGETABLE Weed, Insect, and Disease Control Guide: Beets, Carrots, Lettuce, Onions, Parsnips Radishes, Rutabagas, Turnips, Spinach

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Suggestions in this guide are based on current state and federal registrations and tolerances set by the Environmental Protection Agency (EPA). Directions given in this guide and on current container labels should be read, understood, and followed carefully in order to control pests and diseases effectively without causing excessive residues to remain on the crops. The following information is up to date at the time of this printing. Information regarding any changes during the 1983 season will be made available to all commercial growers.

This publication is for your information. The University of Minnesota and its officers or employees make no claims or representations that the chemicals discussed will or will not result in residues on agricultural commodities and assume no responsibility for results of their use.

State and Federal laws require that only certified applicators may use or supervise the application of certain pesticides with restricted uses. Information about certification is available from your county extension director.

RATES OF APPLICATION FOR INSECTICIDES AND FUNGICIDES

Sometimes small amounts of insecticides or fungicides are listed in terms of tablespoons and teaspoons. These always mean level measures—not rounded or heaping.

Recommendations may be given in terms of pounds or gallons of commercial preparation or as pounds of active ingredient per acre. "Pounds active ingredient" means the equivalent of 100-percent chemical. For example: 2 pounds of 50-percent methoxychlor wettable powder contains 1 pound of actual methoxychlor; 4 pounds of a 25-percent wettable powder contains 1 pound of active ingredient, and 20 pounds of a 5-percent dust contains 1 pound of active ingredient.

If you are preparing sprays that contain emulsifiable concentrates, read the label to determine how many pounds of active ingredient are in each gallon of concentrate. For example, 25-percent methoxychlor emulsifiable concentrate contains 2 pounds of active ingredient per gallon. If you wish to apply 1 pound of actual methoxychlor per acre, decide on the amount of liquid you want to apply per acre and add 1/2 gallon of 25-percent methoxychlor concentrate to the amount of water needed for 1 acre.

Most insecticides and fungicides can be mixed. Read the label instructions for specific combinations.

Table 1. Characteristics of Nematicides

Trade name	Active ingredients	Hazards to mammals†		Effective against		
		Oral	Dermal	Nematodes	Soil fungi	Weed seeds
Brozone Brom-O-Sol	methyl bromide (68.6%) chloropicrin (1.4%)	serious inhalation hazard		*	*	*
Chloropicrin Picfume Larvicide Chlor-O-Pic	trichloronitromethane (99%)	serious inhalation hazard		*	*	*
D-D Mixtures D-D Vidden D	1,3-dichloropropene-1,2-dichloropropane and related chlorinated hydrocarbons	moderate	low	*		

†Abbreviations used in tables: NTL—no time limitations, EC—emulsifiable concentrate, D—dust, G—granules, S—solution, and WP—wetttable powder. Dosages of insecticides are actual chemical per acre, with some exceptions.

Table 1. Characteristics of Nematicides (continued)

Trade name	Active ingredients	Hazards to mammals†		Effective against		
		Oral	Dermal	Nematodes	Soil fungi	Weed seeds
Dorlone	ethylene dibromide (18.9%) 1,3-dichloropropenes and related C ₃ hydrocarbons (79.9%)	moderate	moderate	*		
DowFume MC-2 Brom-O-Gas	methyl bromide (98%) and chloropicrin (2%)	serious inhalation hazard		*	*	*
DowFume MC-33 Terr-O-Gas	methyl bromide (67%) and chloropicrin (33%)	serious inhalation hazard		*	*	*
Ethylene Dibromide DowFume W-85 Soilbrom-85	1,2-dibromoethane	moderate	moderate	*		
Ethoprop (Mocap)	O-ethyl, S,S-dipropyl phosphorodithioate	high	high	*		
Telone	1,3-dichloropropene and related chlorinated hydrocarbons (100%)	moderate	moderate	*		
Vapam VPM	sodium methyl dithiocarbamate (32.7%)	low	moderate	*	*	*
Terr-O-Cide 15	1,2-dibromoethane (40%) and chloropicrin (15%) —or—	moderate	moderate	*	*	
Terr-O-Cide 30	1,2-dibromoethane (36%) and chloropicrin (30%)					
Terr-O-Cide 15-D	1,3-dichloropropene-1,2-dichloropropane and other halogenated C ₃ compounds (85%) and chloropicrin (15%) —or—	moderate	low	*		
Terr-O-Cide 30-D	1,3-dichloropropene-1,2-dichloropropane and other halogenated C ₃ compounds (70%) and chloropicrin (30%)					

†Most fumigants are vesicants which cause severe burns when in contact with skin or mucous membranes. Avoid direct contact and INHALATION of these materials.

Table 2. 1983 Herbicide, Insecticide, and Fungicide Suggestions
BEETS

Weeds	Chemical†	Pounds/acre active ingredient	Remarks and limitations
Annual weeds	pyrazon (Pyramin)	4	Apply after seeding before weeds have two leaves.
	cycloate (Ro-neet)	3 to 4	Apply before planting and incorporate immediately. Do not use muck or peat soils.
Insects	Chemical†		Remarks and limitations
Leaf miner	malathion 20 oz. (2 pt. 5 lb. EC)		7 days.
Cutworms	carbaryl (Sevin) 1 to 2 lb. (20 to 40 lb. 5% bait)		3 days (14 days for tops).
Diseases	Chemical†		Remarks
Seed rot, damping-off	Orthocide, Captan, Lesan, Flo-Pro, Arasan, Thiram		There are many different fungicide formulations for seed treatments made by several different companies. Read and follow all label instructions.
Fungal foliar disease Cercospora	Zineb 75 WP, Dithane Z-78, Tri-Basic Copper Sulfate, Top-Cop Tri-Basic		

†Abbreviations used in tables: NTL—no time limitations, EC—emulsifiable concentrate, D—dust, G—granules, S—solution, and WP—wetable powder. Dosages of insecticides are actual chemical per acre, with some exceptions.

CARROTS

Weeds	Chemical†	Pounds/acre active ingredient	Remarks and limitations
Annual weeds	stoddard solvent (Several trade names)	20 to 100 gal./acre	Apply postemergence to weeds not larger than 1 inch. Carrot roots should not be larger than ¼ inch in diameter. Crop injury may occur when temperature exceeds 75° F.
Annual broadleaves	linuron (Lorox)	¾ to 1½	Apply before crop emergence or after the crop is at least 3 inches tall. Use higher rate preemergence or when the weeds are over 2 inches tall. Do not exceed 40 PSI, mix with other pesticides or apply when temperatures exceed 85° F. Multiple applications may be made but do not exceed 4 lb./acre/year.
Annual grasses	trifluralin (Treflan)	½ to ¾	Apply before planting and incorporate into soil 2 to 3 inches. Do not use on muck or peat soils.

Insects	Chemical†	Remarks and limitations
Aster leafhoppers NOTE: Insecticide reduces aster yellow transmission through reduction of leaf-hopper numbers.	carbaryl (Sevin) 1 lb. (1¼ lb. 80% WP) methoxychlor 2 lb. (1 gal. 2 lb. EC) malathion 1 lb. (1½ pt. 5 lb. EC)	NTL. 14 days if tops are used; 7 days roots. 7 days.

Diseases	Chemical†	Remarks
Seed rot, damping-off	Orthocide, Arasan, Thiram	There are many different fungicide formulations for seed treatments made by different companies. Read and follow label instructions.
Fungal foliar diseases Alternaria and cercospora leaf spot	C-O-C-S Wettable, Zineb 75 WP, Manzate 200 Flowable, Maneb 80, Bravo 500, Dithane Z-78, Dithane M-45 Flowable, Maneb 80-W with Zinc, Dithane M-22 Special, Tri-Basic Copper Sulfate, Citcop 4E, Citcop 6E, Super CU, Super Tin 4L, Kocide Maneb, Copper-Count-N, Top-Cop Tri-Basic, Man	
Aster yellows		Control leafhoppers, which spread the disease. See carrot insects.
Soil fumigation, Rhizoctonia, pythium, fusarium	Terr-o-Cide 72-27	
Root knot nematode	Telone C-17, Telone II, Terr-o-Cide 15-D	

LETTUCE

Weeds	Chemical†	Pounds/acre active ingredient	Remarks and limitations
Annual grasses	benefin (Balan)	1 to 1½	Apply before planting and incorporate. Do not use on muck or peat soils.
Annual weeds	CDEC (Vegadex)	4	Apply after seeding before crop and weeds emerge.

Insects	Chemical†	Remarks and limitations
Leafhoppers	carbaryl (Sevin) 1 to 1½ lb. (1¼ to 2 lb. 80% WP)	3 days for head lettuce; 14 days for leaf lettuce.
	dimethoate (Cygon, DeFend, Dimex, Rebelate) ¼ lb. (½ pt. 4 lb. EC)	7 days for head lettuce; 14 days for leaf lettuce.
	‡ disulfoton (Di-Syston) 2 lb. (4 to 8 oz. 15% G per 1000 ft. of row)	60 days. Do not use on transplanted lettuce.
	malathion 1¼ lb. (1 qt. 5 lb. EC)	7 days for head lettuce; 14 days for leaf lettuce.
	methoxychlor 1½ to 2 lb. (3 to 4 lb. 50% WP)	14 days.
	‡ mevinphos (Phosdrin) ¼ lb. (1 pt. 2 lb. EC)	2 days.
Cutworms	trichlorofon (Dylox) 1 lb. (1 qt. 4 lb. EC)	28 days.
	carbaryl (Sevin) 1 to 2 lb. (20 to 40 lb. 5% bait)	3 days for lettuce; 14 days for leaf lettuce.

†Abbreviations used in tables: NTL—no time limitations, EC—emulsifiable concentrate, D—dust, G—granules, S—solution, and WP—wetable powder. Dosages of insecticides are actual chemical per acre, with some exceptions.

‡Restricted use compound.

LETTUCE (continued)

Insects	Chemical†	Remarks and limitations
Greenhouse pests: Aphids Fungus Gnats White Flies Mealy Bugs	malathion 15% aerosol 1 lb. per 50,000 cu. ft. ‡ parathion 10% aerosol 1 lb. per 50,000 cu. ft.	10 days. 21 days.
Diseases	Chemical†	Remarks
Seed rot, damping-off	Arasan, Thiram	There are several fungicide formulations for seed treatment made by several different companies. Read and follow all label instructions.
Fungal foliar diseases Downy mildew	Orthocide 50 Wettable, Phaltan 50 Wettable, C-O-C-S Wettable, Zineb 75 WP, Manzate D, Maneb 80, Folpet 50 WP, Dithane Z-78, Dithane M-22 Special, Maneb Special with Zinc, Dithane Flowable with Zinc, Citcop 4E, Citcop 6E, Man, Kocide 101, Kocide 606 Flowable, Kocide Maneb	
HEAD LETTUCE		
Fungal foliar diseases Botrytis gray mold Sclerotinia	Botran 75 W	

ONIONS

Weeds	Chemical†	Pounds/acre active ingredient	Remarks and limitations
SEEDED			
Annual grasses	CDA (Randox)	4 to 6	Apply after planting to onions up to the loop stage and weeds which have not emerged or are just emerging. Repeat applications may be made when onions are larger than the two true leaf stage. Do not use more than 4 lb./acre on mineral soils. Do not apply closer than 45 days before harvest.
	DCPA (Dacthal)	8	Apply after planting before the crop and weeds emerge. For use on mineral soils only.
Annual broadleaves	chlorpropham (Furloe Chloro IPC) oxyfluorfen (GOAL 2E)	4 to 6 ½ to ⅓	Same as CDA above. Do not apply until onions have two fully developed true leaves. Do not make more than three applications for a total of ¾ lb. active ingredient/acre. Do not apply within 60 days of harvest. For best postemergence weed control, weeds should have two to four leaves.
Annual weeds	CDA (Randox) + chlorpropham (Furloe Chloro IPC)	4 to 6 + 4 to 6	Applied same as for CDA alone. Frequently lower rates can be used than either chemical alone with better weed control than either alone.

Prevention of sprouting in storage	Chemical†	Remarks and limitations
	3 lb. maleic hydrazide (1 gal. MN 30)	Apply 2 weeks before harvest but when bulbs are mature and tops still show green. Use in 100 to 140 gallons water. Do not add wetting agent. If applied too early, may cause some breakdown in storage.

Insects	Chemical†	Remarks and limitations
Onion maggot	carbophenothion (Trithion) 2 lb. (8 lb. 25% WP) fensulfothion (Dasanit) 1 lb. for 18-inch row spacing. (6½ lb. 15% G) chlorpyrifos (Lorsban) 3.7 oz./1000 row ft. diazinon 1 lb. (2 lb. 50% WP) diazinon 2 to 4 lb. (4 to 8 lb. 50% WP or 14 to 28 lb. 14% G) fonofos (Dyfonate) 1 lb. (10 lb. 10% G) ethion 1 lb. (12½ lb. 8% G, 20 lb. 5% G)	Furrow treatment. Not for green onions. Furrow treatment. Dry bulb only. As furrow drench. Broadcast and incorporate into soil before planting. Furrow treatment for dry bulb onions only. Furrow treatment at planting time.

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‡Restricted use compound.

ONIONS (continued)

Insects	Chemical†	Remarks and limitations
Onion thrips, aster leafhopper	diazinon 1 lb. (2 lb. 50% WP) malathion 1 lb. (4 lb. 25% WP, 2 pt. 5 lb. EC) ‡ azinphosmethyl (Guthion) (1 lb. 50% WP)	10 days. 3 days. 28 days. Not more than 3 times per season.
Diseases	Chemical†	Remarks
Seed rot, damping-off	Orthocide, Captan, Thiram, Arasan, Flo-Pro	There are many fungicide formulations for seed treatment made by different companies. Read and follow all label instructions.
DRY ONIONS		
Fungal foliar diseases		
Alternaria (purple blotch)	Manzate 200, Zineb 75 WP, Dithane M-45, Dyrene 50 WP	
Botrytis	Manzate 200, Dithane M-45, Dyrene 50 WP	
Downy mildew	Manzate 200, Zineb 75 WP, Dithane M-45	
GREEN ONIONS		
Fungal foliar diseases		
Alternaria (purple blotch)	Zineb 75 WP, Captan 50 WP, Dyrene 50 WP	
Downy mildew	Zineb 75 WP, Captan 50 WP	
Botrytis	Dyrene 50 WP, Bravo 500	

PARSNIPS

Weeds	Chemical†	Pounds/acre active ingredient	Remarks and limitations
Annual weeds	stoddard solvent (Several trade names)	20 to 100 gal./acre	Apply before or after crop emergence. Weeds should be less than 1-inch tall and the parsnips less than five true leaves.
	linuron (Lorox)	1½	Apply after seeding before crop emergence. Crop should be planted a minimum of ½ -inch deep.
Insects	Chemical†	Remarks and limitations	
Aster leafhopper	carbaryl (Sevin) 1 lb. (1¼ 80 W) malathion 1 lb. (1½ pt. 5 lb. EC)	NTL. 7 days.	
Diseases	Chemical†	Remarks	
Root knot nematode	Terr-o-Cide 72-27, Telone C-17, Telone II		

RADISHES

Insects	Chemical†	Remarks and limitations
Cabbage maggot	diazinon 1 to 4 lb. (2 to 8 lb. 50% WP; 7½ to 28 lb. 14% G) chlorpyrifos (Lorsban) 3.3 oz. 15G/1,000 row ft. or 1 fluid oz. 4E/1,000 row ft. in 40 gal. water fonofos (Dyfonate) 2 lb. (20 lb. 10% G)	Row or broadcast treatment before or at planting time. 1 lb. row; 4 lb. broadcast. Broadcast, disk in before planting.
Flea beetles	carbaryl (Sevin) 1 lb. (1¼ lb. 80% WP) diazinon ½ lb. (1 lb. 50% WP, ½ to 1 pt. AG 500) malathion 1 lb. (1½ pt. 5 lb. EC) methoxychlor 1 lb. (2 lb. 50% WP)	3 days. 10 days. 7 days. 7 days.
Diseases	Chemical†	Remarks
Seed rot, damping-off	Captan, Arasan, Thiram	There are many fungicide formulations for seed treatment made by several different companies. Read and follow all label instructions.
Aphanomyces, rhizoctonia, fusarium wilt		Plant tolerant varieties such as Fancy Red, Far Red, and Feugo.

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‡Restricted use compound.



RUTABAGAS AND TURNIPS

Insects	Chemical†	Remarks and limitations
Cabbage maggot	chlorpyrifos (Lorsban) 4.6 to 9.2 oz. 15G/1,000 row ft. or 1.6 to 3.3 fluid oz. 4E/1,000 row ft.	Behind shoe and in front of press wheel. Use in 40 gal. of water per acre.
	diazinon 1 to 4 lb. (2 to 8 lb. 50% WP; 7½ to 28 lb. 14% G)	Row or broadcast treatment before or at planting time. 1 lb. row; 4 lb. broadcast, plus a drench treatment over the row when flies appear for second generation. Turnips only.
	fensulfthion (Dasanit) 1 to 2½ lb. (7 to 16 oz. 15G per 1,000 ft. of row) or 2 fl. oz. spray concentrate	Apply in 4 to 6 inch band prior to seeding. Incorporate granules into upper inch and plant in treated bands. Liquid formulation may be applied as a drench over the row about 4 weeks after planting or when flies appear. No more than 4 applications per season. 40 days.
Flea beetles	carbaryl (Sevin) 1 lb. (1¼ lb. 80% WP)	3 days.
	diazinon ½ lb. (1 lb. 50% WP, ½ to 1 pt. AG 500)	10 days, turnips only.
	malathion 1 lb. (1½ pt. 5 lb. EC)	3 days.
	methoxychlor 1 lb. (2 lb. 50% WP)	7 days.
Diseases	Chemical†	Remarks
Seed rot, damping-off	Captan, Flo-Pro, Arasan, Thiram	There are many fungicide formulations for seed treatment made by several different companies. Read and follow all label instructions. For turnips only.
Downy mildew	Dithane Z-78, Dithane Flowable with Zinc, Man	For turnips only.

SPINACH

Weeds	Chemical†	Pounds/acre active ingredient	Remarks and limitations
Annual weeds	cycloate (Ro-neet)	3 to 4	Apply before planting and incorporate. Do not use on muck or peat soils.
	CIPC (Furloe Chloro CIPC)	2	Apply after seeding before crop and weeds emerge.
	CDEC (Vegadex)	4	Apply after seeding before crop and weeds emerge. Do not use on peat or muck soils.
Insects	Chemical†	Remarks and limitations	
Leaf miner	azinphosmethyl (Guthion) ½ lb. (2 pt. 2 lb. EC)		14 days.
	diazinon ½ lb. (1 lb. 50% WP, 1 pt. AG 500)		10 days.
	dimethoate (Cygon, De-Fend, Rebelate) ¼ lb. (½ pt. 4 lb. EC)		14 days.
	malathion 20 oz. (2 pt. 5 lb. EC) or 2 lb. 25% WP per 100 gal. water		7 days.
Diseases	Chemical†	Remarks	
Seed rot, damping-off	Orthocide, Captan, Thiram, Arasan, Flo-Pro, Lesan 70 WP	There are many fungicide formulations for seed treatment made by several different companies. Read and follow all label instructions.	
Soil treatment			
Root rot, damping-off	Captan 50 WP		

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Do not use after 1983.

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