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Home Vegetable Garden: Disease and Insect Control

Michigan State University

Cooperative Extension Service

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Pathology

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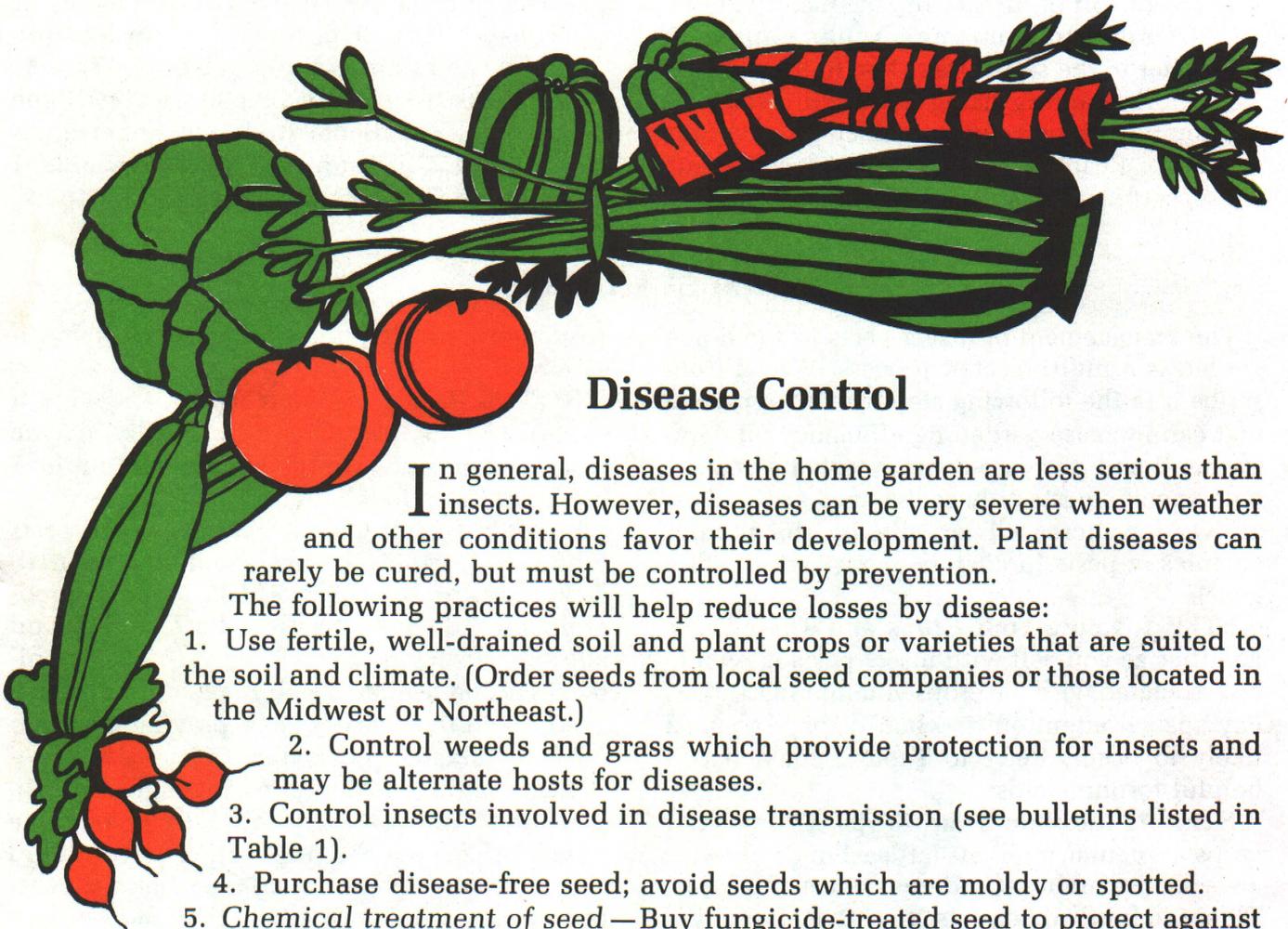
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Home Vegetable Garden

Disease and Insect Control

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EXTENSION BULLETIN E-760(b)



Disease Control

In general, diseases in the home garden are less serious than insects. However, diseases can be very severe when weather and other conditions favor their development. Plant diseases can rarely be cured, but must be controlled by prevention.

The following practices will help reduce losses by disease:

1. Use fertile, well-drained soil and plant crops or varieties that are suited to the soil and climate. (Order seeds from local seed companies or those located in the Midwest or Northeast.)
2. Control weeds and grass which provide protection for insects and may be alternate hosts for diseases.
3. Control insects involved in disease transmission (see bulletins listed in Table 1).
4. Purchase disease-free seed; avoid seeds which are moldy or spotted.
5. *Chemical treatment of seed* — Buy fungicide-treated seed to protect against decay and damping-off organisms. Do not treat seed that is already treated, and do not use treated seed for food. Treatment may be done by the gardener as follows: place a $\frac{1}{4}$ teaspoon per half pound of seed of *Thiram (Arasan red)* or *Captan 50* wettable powder in the package of seeds and shake, coating all the seeds with the dust. Sift the excess dust from the seed through a fine mesh screen.
6. Purchase disease-free plants; make sure they do not have swellings on the roots, cankers on the stems, or spots on the leaves.
7. Grow disease-resistant varieties such as those listed in Extension Bulletin E-760(a) "Variety Suggestions for the Home Vegetable Garden." Some of those varieties are highly resistant; others give partial protection.
8. Since most bacteria, fungi, and some home garden insects live in the soil from one growing season to the next, much of their damage can be avoided by relocating the garden or rotating the crops within the garden.

9. Closely related crops, such as melons and cucumbers or tomatoes, potatoes, peppers and eggplant should not follow each other, because they are usually damaged by the same pests.
10. Destroy or compost plants of each annual crop as soon as the harvest is completed.
11. To rid soil of disease organisms, it is often desirable to fumigate. Apply Vapam in water to the soil surface two to three weeks before planting using a watering can or a simple proportioner attached to a garden hose. Read label for correct dosages and specific application procedures.
12. Stay out of the garden when plants are wet to avoid spreading diseases. Water during the day and not at night.
13. At the first sign of disease, use a good fungicide for control. Read the label on the pesticide container to determine which crop disease it will control, how much to use, how and when to apply. Contact your County Extension Office if you do not know what disease is causing your problems or consult U.S. Department of Agriculture Home and Garden Bulletin No. 46, "Insects and Diseases of Vegetables in the Home Garden," available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Insect Control

The management of insect pests in the home garden is a multi-faceted process. We will describe it in the following step-by-step approach that can increase gardening efficiency (and enjoyment) and decrease control costs by dealing with specific pests only as the need arises. This allows for increased activity by the natural enemies of pests (predators, parasites or pathogens).

STEP 1. Know Your Crops and Their Pests.

Familiarize yourself with insect pests known to be associated with the crops you intend to grow. Pay special attention to when damage is most likely to occur. Refer to Table 1 for a list of helpful resource aids.

STEP 2. Monitor Your Crops. Check your crops at regular intervals (at least once or twice a week), preferably at different times of the day. This is helpful since pests are active at different times of the day (or night) according to their habits and environmental conditions. Look for wilting, missing foliage, damaged fruits, and the like; these are *possible* signs of insect activity. Determine what pests are present and how much damage they are doing. This process will, of course, be much easier if you have prepared in advance (Step 1). Don't assign guilt on the basis of presence alone, since many incidental and beneficial insects may occur in the home garden. Have questionable insects identified by an expert (See Table 1). Store insect specimens in a solution of 1 part isopropyl (rubbing) alcohol and 1 part water. This keeps the insect

specimen from deteriorating and aids identification.

STEP 3. Decide on Controls. First, decide if control is actually necessary; secondly, decide what type of control option(s) might be applicable. Control options include:

Biological control—natural enemies of pests found in the typical home garden include predators, parasites and pathogens. Common predators include lady beetles (both larvae and adults), lacewing larvae ("aphid-lions"), spiders, ground beetles (small to medium blackish beetles and their larvae), and praying mantids.

Most parasites go about their activity unnoticed. However, the following signs will tip you off to the presence and activity of some parasites: brownish, dried-up, empty, aphid skins ("aphid mummies"); larger insects, especially caterpillars, with small white eggs or larger white cocoons attached to their backs; or pest bodies stuffed full of grub-like parasite larvae. All these are signs of beneficial natural enemies at work. Protect them by protecting parasitized pests.

Insect pests also suffer the ravages of fatal diseases caused by various pathogens. The following signs will tip you off to the presence of pathogens: dark-brown, shriveled, mushy caterpillar corpses (viruses and bacteria); or, flies, such as root maggot adults, suspended by a thread of saliva from any object 2 or 3 feet off the ground, and the body bloated with white fungal spores (fungal disease). Do not remove

these individuals from the garden since they will provide inoculum to infect other pest individuals. (NOTE: these pathogens are host specific to insects and will not infect other animals.)

Mechanical control—several mechanical control techniques have proven effective in the home garden. Hand picking larger pests (especially hornworms and other caterpillars, and potato beetles) often provides effective control. Many small insects, like aphids, can be washed from the foliage with a forceful spray of water. Borers (for example, squash vine borer) can be killed in the stem with a needle or sharp knife; this can often be done with a minimum of damage to the plant. Barriers, such as soup cans sunk 1 inch into the soil around transplants, are an effective means of preventing damage by cutworms.

Cultural control—A considerable amount of insect control can be achieved through garden planning and maintenance. Some plant varieties may be resistant to insect damage. Check the package, or experiment with several varieties. Rotate your crops. Don't plant the same crops, or similar crops (like tomatoes-peppers or raddishes-turnips) in the same spot in the garden year after year. Corn rootworm can be effectively controlled by rotation since the eggs are laid in the fall and the larvae which hatch in the spring must have corn roots to feed upon. Adjusting planting time may control certain pests. For example, a late planting of summer squash will mature after squash vine borer is gone for the season. Trap crops can be useful. Plant a small area of highly susceptible crop "for the bugs". These areas can then be destroyed, sprayed, or allowed to be destroyed by the pests. Proper clean-up of crop residues after harvest helps to control many pests. Several pests, such as root maggots, cabbage aphids and European corn borer, have additional generations on, or overwinter in, crop residue and weeds.

Chemical controls—Recommended insecticides for the various crops are listed in detail in the following sections of this bulletin. Dust formulations are not as highly recommended as the sprayable formulations listed here, since

dusts are much more difficult to apply evenly and do not adhere as well to the plant foliage.

Some insecticides are actually naturally-occurring toxicants extracted from plants (rotenone and pyrethrum). *Bacillus thuringiensis* ("B.T."), marketed under the names Dipel® and Thuricide®, is a bacterial disease specific to caterpillars. For this reason, it is not toxic to predators, parasites or mammals, including man.

If you decide to use an insecticide, READ THE LABEL before purchasing, to be certain it is suitable for your needs, and USE WITH CAUTION, following all label instructions.

Insecticides available for use in the home garden are not highly toxic, and they are safe when used according to label instructions. Most accidents are the result of improper storage and handling. Store all insecticides out of the reach of children, preferably in a locked cabinet. Always store insecticides in their original containers so everyone knows what they are. Do not re-use containers for any other purpose, and destroy them promptly after they are empty.

When mixing and using insecticides, follow any precautions given on the label in regard to protective clothing. Mix small amounts of insecticides—it is better to mix two or three batches, rather than have surplus mixture. DO NOT pour left over insecticides into drains or sewers.

STEP 4. Apply the Selected Control—Put the selected control(s) into practice. Combinations of biological, cultural, mechanical and/or insecticide controls may be most effective.

STEP 5. Continue Monitoring—It is necessary to continue monitoring your garden, especially in regard to effectiveness of the controls and continued or additional pest activity. Additional decision making and controls might be necessary.

The success of this garden pest management program depends in great part on early detection of pest problems, followed by prompt action. In cases where insect pests are known to be severely damaging, it is often necessary to anticipate serious damage and begin a series of regular insecticide applications as "insurance". This is especially true in the case of root maggots, European corn borer in peppers, and squash vine borer.

TABLE 1.

Resource Aids for the Home Gardener.

	<i>Who/What</i>	<i>How to Find</i>
EXPERTS	Experienced gardeners	Check with neighbors, garden center or local garden club
	Extension agent	Consult the phone book for the county Cooperative Extension Service office nearest you.
EXTENSION BULLETINS	E528 European corn borer: controlling it on corn, peppers, potatoes, snap beans	Check with your county extension office
	E736 Corn rootworm	
	E959 Know your asparagus pests (50¢)	
	E965 Potato insect pests	
	E966 Snap bean insect pests	or write:
	E967 Sweetcorn insect pests	
	E968 Cole crop insect pests	MSU Bulletin Office P.O. Box 231 East Lansing, MI 48824
	E969 Cucumber, melon, squash and pumpkin insect pests	
E970 Celery and carrot insect pests		
E971 Tomato, eggplant and pepper insect pests	(Single copies, up to 10 different titles are free, except E959 as noted)	
E972 Lettuce and onion insect pests		
BOOKS and PERIODICALS	A wide range of information is available	Check at your local public library or bookstore

ALWAYS READ AND FOLLOW ALL LABEL DIRECTIONS WHEN USING A PESTICIDE

Liquid Measures:

3 tsp = 1 TBSP
 2 TBSP = 1 fluid ounce
 8 fluid ounces = 1 cup
 2 cups = 1 pint
 2 pints = 1 quart
 4 quarts = 1 gallon

Abbreviations:

D = Dust
 G = Granular
 WP = Wettable Powder
 EC = Emulsifiable Concentrate
 TBSP = Tablespoon
 tsp = Teaspoon
 Sq ft = Square Feet

Soil Insects

Insect	Insecticide	Remarks
MAGGOTS Onion Cabbage Seed-Corn	diazinon 5% G diazinon 25% EC diazinon 25% EC	PRE-PLANTING TREATMENT: apply 7 to 11 oz/500 Sq ft. Mix into upper 3 to 4 inches of soil. TRANSPLANT WATER: use 2 tsp 25% EC per gallon water; apply ½ to 1 cup solution per plant. POST-TRANSPLANT TREATMENT: 2 TBSP/gal. water; apply as spray over plants until soil is wet. Repeat in 10 days.
	⅓-inch long and creamy white colored.	NOTE: DO NOT apply diazinon to soil to be planted with eggplant, pumpkin or rutabaga. Diazinon lasts one year in the soil. If you handle treated soil, wear rubber gloves.
WHITE GRUBS "C" shaped, 1 to 1½ in. long, white and purple colored.	diazinon 25% EC, 10 TBSP/15 gal/1,000 sq. ft. diazinon 5% G, 7 to 14 ozs/500 sq. ft.	These insects are most serious in soil where sod (grass) has been growing. They will remain in the soil for 3 to 6 years if not properly controlled. Sprays should be applied in sufficient water to allow thorough coverage (1 to 2 gal). Granules should be applied as bought. Immediately after application, thoroughly mix the chemical into the top 4 to 5 inches of soil.
	and	READ THE LABEL.
WIREWORMS 1½ to 1¾ in. long. Dark brown in color.		NOTE: Treatment for white grubs is necessary when 2 or more per sq. ft. are seen as you till the soil.
	CUTWORMS	Sevin (carbaryl), 2 TBSP 50% WP; or Malathion, 2 tsp 50% EC/gal water.
	½ to 1½ in. long. Brown to black and mottled with yellow, brown or white.	Apply to foliage and soil around the base of the plants.
	NOTE: Soil treatments for cutworms are only necessary if you observe cutworms as you till the soil. Use Pre-plant or Post-plant treatment listed above.	CUTWORM CONTROL: Transplants can be protected from cutworms by placing metal collars around the plants. Press collars several inches down in the soil.

Diseases (bold print) and Aboveground Feeding Insects.

Crop	Insect Pest or Disease	Insecticide or Fungicide	Formulation to Buy	Amount of Formulation/ Gal. of Water	Days from Last Application to Harvest	When to Treat	
ASPARAGUS	Asparagus beetles	Sevin (carbaryl)	50% WP	2 TBSP	1	When beetles are first seen on spears and fern. READ LABEL.	
		or		25% EC	3 TBSP		1
		malathion	50% EC	2½ tsp	1		
		or		57% EC	2 tsp		1
			methoxychlor	25% EC	1 TBSP	7	
		Rust (fungus) Powdery red to black pustules on ferns.	maneb	80% WP	2 to 3 tsp	after harvest —ferns only	Apply when rust first seen, repeat at 7 to 10 day interval.
		or	Mancozeb (Dithane M-45 Manzate 200)	80% WP	2 to 3 tsp	after harvest —ferns only	
		or	Polyram	80% WP	2 to 3 tsp	after harvest —ferns only	
	BEANS	Aphids	malathion	50% EC	2 tsp	1	Begin treatment when aphids are first seen.
			or		57% EC	1½ tsp	
diazinon			25% EC	2 tsp	7	READ LABEL	
Mexican bean beetles and leafhoppers		Sevin (carbaryl)	50% WP	3 TBSP	0	Begin treatment when insects are first seen. Repeat as necessary.	
		or		25% EC	2 TBSP		0
		malathion	50% EC	2 tsp	1		
		or		57% EC	1½ tsp		1
		methoxychlor	50% EC	2 TBSP	3		3
		or		25% EC	3 TBSP	3	READ LABEL.
			diazinon	25% EC	2 tsp	7	
	Blights (bacteria) Leaves and pods —water soaked, spots, may become brown or black, sometimes with a yellow border.	Tribasic Copper Sulfate	53% WP	2 to 4 tsp	0	Apply treatment when spots are first seen, repeat at 7 to 10 day intervals.	
	or	Kocide 101	50% WP	2 to 4 tsp	0		
	Rust (fungus) Powdery red to black postules on undersides of leaves.	maneb	80% WP	2 to 3 tsp	4	Apply treatment when spots first appear, repeat at 7 to 10 day intervals.	
	or	Bravo 500	4 flowable	3 to 4 tsp	7		
	Anthrachnose (fungus) Red brown sunken spots on pods.			SAME AS FOR RUST			
	White and gray mold (fungi) Cotton white to gray mold on pods and leaves causing watery rot.	Bravo 500	4 flowable	3 to 4 tsp	7	Apply treatment when spots first appear, repeat at 7 to 10 day intervals.	
	or	Benlate	50% WP	1¼ tsp	14 (snap) 28 (lima)		
BEETS	White grubs, Wireworms Maggots	REFER TO SECTION ON SOIL INSECTS, PAGE 5.					

Diseases (bold print) and Aboveground Feeding Insects, cont.

Crop	Insect Pest or Disease	Insecticide or Fungicide	Formulation to Buy	Amount of Formulation/ Gal. of Water	Days from Last Application to Harvest	When to Treat
BEETS, cont.	Leaf spot (fungus)	Tribasic Copper Kocide 101	53% WP	2 to 4 tsp	0	Apply treatment when disease first seen. Repeat at 7 to 10 day intervals.
			50% WP	2 to 3 tsp	0	
COLE CROPS: CABBAGE BROCCOLI BRUSSEL SPROUTS	Aphids	malathion or diazinon	50% EC	2 tsp	7	Begin treating when aphids are first seen before leaves cup. Repeat as needed. READ LABEL
			57% EC	1½ tsp	(broccoli, 3)	
		diazinon	50% WP	1 TBSP	7-Cabbage and Brussel sprouts;	
			25% EC	2 tsp	5-Cauliflower and Broccoli	
	Cabbage worms	<i>Bacillus thuringiensis</i> ("B.T.") (Dipel or Thuricide)		Consult Label	(Exempt)	Thorough coverage is absolutely essential. Repeat after heavy rains.
		or Sevin (carbaryl)	50% WP	4 TBSP	3	Apply treatment when worms are very small and continue every 7 to 10 days as needed. READ LABEL.
			25% EC	2½ TBSP		
		or diazinon	50% WP	1 TBSP	Same as for Aphids, above	
			25% EC	1 TBSP		
		or malathion	50% EC	2 tsp		
			57% EC	1½ tsp		
	Cabbage maggot	REFER TO SECTION ON SOIL INSECTS, PAGE 5.				
	Blights (fungi) Brown to black spots on leaves and kurds (flowers).	maneb	80% WP	2 to 3 tsp	7	Apply treatment when disease first appears, repeat at 7 to 10 day intervals.
		or Bravo 500	4 flowable	3 to 4 tsp	0	
	Mildew (fungus) Leaves with yellow spots, sparse gray white mold on underside.	SAME AS FOR BLIGHTS.				
	Club root (fungus) Knot or wart-like growth on roots.	Terraclor	75% WP	3 tsp		Apply ½ cup solution to roots when transplanting.
CARROTS	White grubs, wireworms	REFER TO SECTION ON SOIL INSECTS, PAGE 5.				
	Blight and leaf spots (fungi) Leaves and stems—round tan spots with dark borders or irregular dark brown spots. Leaves curl and die.	Bravo 500	4 flowable	3 to 4 tsp	0	Apply treatment when disease first seen, repeat at 7 to 10 day intervals.
		or maneb	80% WP	2 to 3 tsp	7	
		or Mancozeb (Dithane M-45 Manzate 200)	80% WP	2 to 3 tsp	7	
		or Duter	47% WP	1 tsp	14	

Diseases (bold print) and Aboveground Feeding Insects, cont.

Crop	Insect Pest or Disease	Insecticide or Fungicide	Formulation to Buy	Amount of Formulation/ Gal. of Water	Days from Last Application to Harvest	When to Treat	
CURCUBITS: CUCUMBERS MELONS SQUASH PUMPKINS	Cucumber beetles	methoxychlor	50% WP	1¼ TBSP	1	Begin treatment when plants first break through soil, repeat at 5 day intervals. Do not use Sevin when blossoms are present.	
		or					
		malathion	50% EC	3½ tsp	1		
		or					
		Sevin (carbaryl)	50% WP	2 TBSP	0		
		or					
		diazinon	25% EC	1¼ TBSP	0	DO NOT USE diazinon on squash or pumpkin.	
			25% EC	2 tsp	7		
	Aphids	malathion	50% EC	2 tsp	1	Apply treatment when aphids first appear and before leaves curl. Repeat weekly.	
		or					
		diazinon (Do not use on squash and pumpkins.)	25% WP	1 tsp	7	(melons-3)	
	Squash bug (squash and pumpkins only)	Sevin (carbaryl)	50% WP	2 TBSP	0	Begin treatment when black bugs are first seen. Repeat as needed.	
			25% EC	1¼ TBSP	0		
	Squash vine borer	methoxychlor	50% WP	1¼ TBSP	1	Begin weekly applications as vines start to run, or when wasp-like adult moths are seen. If vine wilts, slit stem with knife and remove the borer; heap earth over stem joints to start new roots. Second planting will mature after borers are done feeding. Destroy vines after harvest.	
		or					
		Rotenone	D	apply liberally	0		
		or					
		Sevin (carbaryl)	50% WP	2 TBSP	0		
			25% EC	1¼ TBSP	0		
	Angular leaf spot (bacteria) Leaves—brown angular to square spots. Centers of spots drop out giving leaf a shot holed appearance. Water soaked to scabby spots on fruit.	Kocide 101	50% WP	2 to 4 tsp	0	Apply treatment when disease first seen, repeat at 7 to 10 day intervals.	
		or					
		Tribasic Copper Sulfate	53% WP	2 to 4 tsp	0		
	Other leaf spots (fungi) Round tan to brownish leaf spots often with darker borders. Fruit spots often sunken with concentric ring.	Bravo 500	4 flowable	3 to 4 tsp	0	Same as above.	
		or					
		maneb	80% WP	2 to 3 tsp	5	Same as above.	
		or					
		Mancozeb	80% WP	2 to 3 tsp	5		
	Powdery mildew (fungus) White powder on leaf surfaces. Leaves yellow and die.	Bravo 500	4 flowable	3 to 4 tsp	0	Apply treatment when disease is first seen. Repeat every 7 to 10 days.	
		or					
		Benlate	50% WP	1 tsp	0		

Diseases (bold print) and Aboveground Feeding Insects, cont.

Crop	Insect Pest or Disease	Insecticide or Fungicide	Formulation to Buy	Amount of Formulation/ Gal. of Water	Days from Last Application to Harvest	When to Treat
LETTUCE	Aphids	malathion	50% EC	2 tsp	14 (7-head)	Treat when aphids are first seen and repeat as needed.
			57% EC	1½ tsp	14 (7-head)	
	or					
	diazinon	50% WP	1 TBSP	10		
		25% EC	1 tsp	10		
	Cabbage worms	<i>Bacillus thuringiensis</i> ("B.T.") (Dipel or Thuricide)		Consult Label	(Exempt)	Apply B.T. treatment when worms are first seen and repeat as needed.
		or				
		malathion	50% EC	2 tsp	14 (7-head)	
			57% EC	1½ tsp	14 (7-head)	
		or				
		Sevin (carbaryl)	50% WP	4 TBSP	14	
			25% EC	2½ TBSP	14	
	Grasshoppers	malathion	50% EC	2 tsp	14 (7-head)	As needed.
			57% EC	1 tsp	14 (7-head)	
		or				
		Sevin (carbaryl)	50% WP	4 TBSP	14	
			25% EC	2½ TBSP	14	
	Downey mildew Leaves yellow, turn brown with sparse white mold on underside.	maneb	80% WP	2 to 3 tsp	7	Apply treatment when disease is first seen; repeat at 7 to 10 day intervals. NOTE: disease most severe in cool, wet weather.
ONION	Maggot	REFER TO SECTION ON SOIL INSECTS, PAGE 5.				
	Thrips	malathion	50% EC	2 tsp	3	Make treatment when elongate, brown streaks appear on foliage. Repeat at 10 day intervals, as necessary.
			57% EC	1 tsp	3	
		or				
		diazinon	25% EC	2 tsp	10	
	Downey mildew, leaf blights Leaves—irregular brown spots with gray-white mold.	maneb	80% WP	2 to 3 tsp	7	Apply treatment when disease first seen; repeat at 7 to 10 day intervals.
		or				
		Mancozeb (Dithane M-45 Manzate 200)	80% WP	2 to 3 tsp	7	
PEAS	Aphids	malathion	50% EC	2 tsp	3	Begin treating when aphids first appear and repeat weekly or as needed.
				57% EC	1½ tsp	
		or				
		diazinon	50% WP	1 TBSP	0	
			25% EC	1 tsp	0	
PEPPERS	Aphids	malathion	50% EC	2 tsp	3	Begin treating undersides of leaves for aphids in mid-June as needed.
			57% EC	1½ tsp	3	
		or				
	Aphids and corn borer	diazinon	25% EC	1 tsp	5	
				50% WP	½ TBSP	5
		plus				Add Sevin to either malathion or diazinon in early August and continue 5 to 7 day treatment until frost.
		Sevin (carbaryl)	50% WP	2 TBSP	0	

Diseases (bold print) and Aboveground Feeding Insects, cont.

Crop	Insect Pest or Disease	Insecticide or Fungicide	Formulation to Buy	Amount of Formulation/ Gal. of Water	Days From Last Application to Harvest	When to Treat		
PEPPERS, cont.	Leaf and fruit spots (bacteria-fungi) Round to irregular shaped brown to black spots on leaves and fruit.	Bravo 500	4 flowable	3 to 4 tsp	0	Apply treatments when disease first appears, repeat at 7 to 10 day intervals. Kocide 101 or Tribasic Copper Sulfate are important during wet weather to prevent bacterial diseases.		
		or maneb	80% WP	2 to 3 tsp	5			
		or Mancozeb (Dithane M-45 Manzate 200)	80% WP	2 to 3 tsp	5			
		plus Kocide 101	54% WP	2 to 4 tsp	0			
		or Tribasic Copper Sulfate	53% WP	2 to 4 tsp	0			
POTATOES	Aphids	diazinon	25% EC 50% WP	2 tsp 1 TBSP	35 35	Begin treatment to underside of leaves when aphid numbers 1 to 2 per leaflet and repeat as needed. READ LABEL.		
		or malathion	50% EC 57% EC	2 tsp 1½ tsp	0 0			
		Wireworms White grubs					REFER TO SECTION ON SOIL INSECTS, PAGE 5.	
		Flea beetles, Leafhoppers, Colorado potato beetles	Sevin (carbaryl) or diazinon	50% WP 25% EC 25% EC 50% WP	2 TBSP 1 TBSP 2 tsp 1 TBSP		0 0 35 35	Begin when insects first appear and continue as needed. READ LABEL.
	Late and early blight (fungi) Leaves—brown to black; round or irregular spots, often with a concentric ring pattern or with white mold growth (particularly on underside of leaf) around the border. Tubers with brown sunken spots.	Bravo 500	4 flowable	3 to 4 tsp	0	Apply treatment when plants are 6' high and repeat at 7 to 10 day intervals till harvest. Add Kocide 101 or Tribasic Copper Sulfate to spray late in growing season.		
		or maneb	80% WP	2 to 3 tsp	0			
		or Mancozeb (Dithane M-45 or Manzate 200)	80% WP	2 to 3 tsp	0			
		plus Kocide 101	50% WP	2 to 4 tsp	0			
		or Tribasic Copper Sulfate	53% WP	2 to 4 tsp	0			
RADISHES TURNIPS	Aphids	malathion	50% EC 57% EC	2 TBSP 1½ tsp	7 (turnip-3)	Apply treatments when aphids first appear and repeat as needed. READ LABEL.		
		or diazinon	50% WP 25% EC	1 TBSP 2 tsp	10 10			
		Maggots					REFER TO SECTION ON SOIL INSECTS, PAGE 5.	
	Flea beetles	Sevin (carbaryl)	50% WP 25% EC	2 TBSP 1¼ TBSP	3 (14 days if tops are eaten)	Begin treatments when small round holes first appear in leaves. Repeat as needed.		
		or diazinon	25% EC	1 TBSP	10			

Diseases (bold print) and Aboveground Feeding Insects, cont.

Crop	Insect Pest or Disease	Insecticide or Fungicide	Formulation to Buy	Amount of Formulation/ Gal. of Water	Days from Last Application to Harvest	When to Treat
RADISHES TURNIPS, cont.	Mildew (fungus) Yellow spots on leaves with sparse gray to white mold on underside.	zineb	75% WP	2 to 3 tsp	0 (7 days on turnips if tops used.)	Apply treatment when disease first seen. Repeat 7 to 10 day intervals.
		or Tribasic Copper Sulfate	53% WP	2 to 4 tsp	0	
	Leaf spot (fungus) Tan to dark brown round to irregular spots.	zineb	75% WP	2 to 3 tsp	0 (7 days on turnips if tops used.)	Same as above.
SPINACH	Aphids	malathion	50% EC	2 tsp	7	Begin treatments to foliage when aphids are seen. Repeat as needed.
		or	57% EC	1 tsp	7	
		diazinon	25% EC	2 tsp	10	
	Leafminer	diazinon	25% EC	2 tsp	10	Apply as soon as leaf mines are visible. <i>Remove and destroy infested foliage.</i>
Flea beetle		Sevin (carbaryl)	50% WP	2 TBSP	14	Treat when flea beetles, or small holes in leaves, are seen.
			25% EC	2 TBSP	14	
		or methoxychlor	50% WP	2 TBSP	14	
			25% EC	2 TBSP	14	
Downy mildew	Tribasic copper	53% WP	2 to 4 tsp	0	Apply treatments when disease first appears. Repeat at 7 to 10 day intervals. NOTE: most serious in cool, wet weather.	
SWEET CORN	Corn borer and Aphids	Sevin (carbaryl)	50% WP	3 TBSP	0	Begin treatments in mid-June and particularly from early August throughout harvest, at 5 day intervals.
		plus diazinon	25% EC	1 TBSP	1	
Corn earworm		Sevin (carbaryl)	50% WP	4 TBSP	0	Begin treatments to silks when silks first appear. Continue treatments every 2 to 3 days until silks dry up and turn brown.
			25% EC	2½ TBSP	0	
		or diazinon	25% EC	1 TBSP	1	
Flea beetles		Sevin (carbaryl)	50% WP	3 TBSP	0	Apply treatment when plants emerge as needed. Repeat 2 to 3 times at 5-day intervals if necessary.
			25% EC	2½ TBSP	0	
		or diazinon	25% EC	1 TBSP	1	

Diseases (bold print) and Aboveground Feeding Insects, cont.

Crop	Insect Pest or Disease	Insecticide or Fungicide	Formulation to Buy	Amount of Formulation/ Gal. of Water	Days from Last Application to Harvest	When to Treat				
TOMATOES	Cutworms	Sevin (carbaryl)	50% WP	4 TBSP	0	Apply to foliage when damage is first observed and repeat weekly for 2 or more weeks if necessary.				
			25% EC	2½ TBSP	0					
REFER TO SECTION ON SOIL INSECTS, PAGE 5.										
	Aphids	malathion	50% EC	2 tsp	1	Begin treatments to undersides of leaves when aphids are first seen. Repeat as needed.				
			57% EC	1½ tsp	1					
		or								
	Hornworms	<i>Bacillus thuringiensis</i> ("B.T.") (Dipel or Thuricide)		Follow the label		Adequate control can be had by handpicking caterpillars when damage first appears. Otherwise, apply insecticide as needed.				
		or								
	Hornworms, Fruit worms	Sevin (carbaryl)	50% WP	3 TBSP	0					
			25% EC	2 TBSP	0					
	Leaf blights and fruit spots (bacteria, fungi) Tan to black round or irregular spots on leaves, often with concentric rings. On fruit, spots raised and scabby or sunken with concentric rings.	Bravo 500	4 flowable	3 to 4 tsp	0	Apply treatment after transplanting or when plants are 6' tall, repeat at 7 to 10 day intervals. Kocide 101 or Tribasic Copper Sulfate added to protect against bacterial diseases.				
							or			
							maneb	80% WP	2 to 3 tsp	5
							Mancozeb (Dithane M-45 or Manzate 200)	80% WP	2 to 3 tsp	5
Kocide 101	50% WP	2 to 4 tsp	0							
or										
Tribasic Copper Sulfate	53% WP	2 to 4 tsp	0							

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