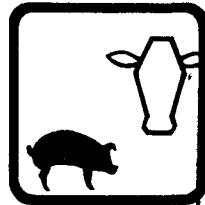


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PLANT PATHOLOGY FACT SHEET  
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## Fungicides for the Home Garden

Fungicides are chemicals that control fungus diseases. Similarly, bactericides control bacterial diseases, and nematicides control nematodes. Fungicides may be very specific and control only a few fungi, or general and control a wide range of fungi. Fungicides do not kill insects or weeds, and they do not alleviate plant nutrient deficiencies.

No one fungicide will control all diseases. Thus in the catalog of diverse fungicides, each is capable of preventing only certain diseases.

### Selecting Fungicides

Obtain an expert's advice on your plant disease problem. Check with your county agricultural agent, the University of Minnesota Agricultural Extension Service, someone who sells pesticides, or another knowledgeable person to see if a fungicide is available for your needs.

When you select a fungicide to control disease safely, be sure to answer the following questions: (1) Has the cause of the disease been identified? (2) Is it a serious plant disease? (3) Are nonchemical control measures available? (4) How toxic are the suggested chemicals to humans and the environment? (5) Will the chemical leave a toxic residue? (6) Are there any special health hazards to the applicator?

### Read the Label

After buying the proper fungicide and before using it, read everything on the label. When the container states "more detailed information is available inside," open the container and read everything on the label. This is the best source of information on how to use that product. The label generally lists the plants on which the material can be used safely, the dosage required, and precautions to follow while handling the fungicide. Pay particular attention to these items on the label:

1. warnings such as POISON, DANGER, KEEP OUT OF REACH OF CHILDREN;
2. specific directions on use, dosage, time, and methods of application;
3. crops that can be treated;
4. how to mix it; and
5. where and how to store or dispose of any leftover material.

Instructions on when the chemical cannot be used on food producing plants also will be listed on the label. If it states, "no later than 14 days before harvest," do not pick the fruit or vegetable until at least 14 days after the last spray application. This is to ensure that chemical residues will not be on the food when consumed.

### Handling Fungicides

Follow certain procedures when handling fungicides (or insecticides and herbicides) to use them properly and safely. Most fungicides are poisonous to humans and animals as well as to micro-organisms causing plant disease. Others are not as poisonous, but they all should be handled as potentially harmful chemicals.

### Fungicide handling hints:

1. Wear protective clothing (rubber gloves, apron, and face mask) when the label requires them.
2. Don't inhale the dust when measuring or mixing.
3. Don't smoke when mixing or applying fungicides.
4. After equipment and fungicides are safely stored, wash yourself thoroughly with soap and water.
5. If you accidentally spill any fungicides on exposed skin, wash immediately.

### Fungicide Formulations

Fungicides are formulated as wettable powders, dusts, emulsifiable concentrates, granules, and aerosols.

**Wettable powders**—Most fungicides are formulated as wettable powders. They are easily wetted and disperse well in water. They also contain a wetting agent that allows for uniform spread and distribution of the fungicide on the plants. Since wettable powders do not form a solution, agitate the mixture frequently.

**Emulsifiable concentrates**—These are liquid fungicides with the active ingredient dissolved in a solvent. When added to water the emulsifiable materials form a milky mixture that is a suspension of active ingredient plus emulsified solvent in water.

**Dusts**—These are fungicides that have been ground into fine dust particles. They usually contain from 4 to 10 percent active ingredient. The fungicide is applied in the form of a dust.

**Flowables**—These are closely related to wettable powders. A flowable contains technical fungicide and flowable material, both of which have been ground to very fine dimensions and suspended in a small amount of liquid.

**Aerosols**—The fungicide is stored in a container under pressure. A propellant forces the mixture into the air as tiny droplets that are dispersed in the air and on the plants. Aerosols are used mostly in greenhouses.

### Applying Fungicides

Various types of sprayers are available, but the hand compression sprayer is inexpensive and suitable for general lawn and garden use. It is not suitable for spraying trees more than 10 feet tall. Powerful sprayers are needed to spray larger trees, and it may be wise to hire someone to do this work. Whatever type of sprayer you use, follow the label instructions for the proper dosage of fungicide. Do not exceed this amount to "do a better job." Wash out the sprayer after each use, and let it dry thoroughly so it does not rust.

Do not use a garden hose sprayer for applying wettable powder fungicides. Do not use a weed sprayer for any other purpose, no matter how thoroughly you try to clean it.

Most fungicides are protectants that prevent diseases from starting or spreading. They do not cure diseased plants. Apply fungicides early enough to prevent diseases from starting or to halt the further spread of existing diseases. Apply sprays uniformly in a fine mist just until the spray begins to run off the plant surfaces.

### Shelf Life of Fungicides

If fungicides are stored under dry, above-freezing conditions with the container properly closed, they will retain their effectiveness for two years. Purchase only the amount of fungicides that can be used readily in a couple of growing seasons, thus eliminating the need for long term storage. Listed below are a few hints that may indicate the ineffectiveness of a fungicide kept under storage.

Formulation	Symptoms of Ineffectiveness
Emulsifiable Concentrates	Milky formulation does not occur when water is added or if separation layer is noted.
Wettable Powder	The fungicide will not suspend in water, but rather lumps together. Reaction same as wettable powder.
Dusts	Generally quite effective unless can opening is damaged or obstructed in some way.
Aerosols	

### Fungicide Storage and Disposal

Fungicides should be stored in the original package with the label preserved. The label will (or should) indicate how long that material can be stored, so write the purchase date on the package. Keep fungicides in a locked cabinet where only responsible persons have access to them. The cabinet should be high enough so children cannot get into it if you forget to lock

it. Keep fungicides dry and away from stored weed killers whose fumes may contaminate the fungicide. Follow the label instructions for disposal. Never re-use pesticide containers for any purpose.

Chemicals used in plant disease control practices are listed by common name and trade name followed by a few examples of ornamental and vegetable crops. This indicates that the fungicide is registered for use on those crops. In most cases, many of the specific fungicides can be used on several additional crops. This information can be obtained by CAREFULLY READING THE LABEL to determine fungicide use on other crops.

### Small Volume Mixing

Directions for mixing fungicides usually are given in terms of pounds and ounces or quarts and pints per 100 gallons. The home gardener seldom has a need for such volumes of spray. The convenient method of determining smaller amounts of fungicides is simply to break pounds and quarts into ounces and grams or milliliters; then convert these back to units such as teaspoons, a measuring unit commonly available to the home gardener. When measuring by teaspoon, the material should be lightly compacted and then leveled off (to the rim of the spoon).

### Useful Conversion Units

1 fl oz = 29.6 ml
1 tsp = 5 ml = 0.17 fl oz
1 tbsps = 3 tsp = 15 ml = ½ fl oz
1 c = 16 tbsps = 8 fl oz = 236.6 ml
1 qt = 2 pts = 32 fl oz = 946 ml = .946 liters
1 gal = 4 qts = 8 pts = 16 c = 128 fl oz = 3,785.3 ml = 3.78 liters
1 liter = 1.06 qt = 2.11 pts
1 oz = 28.35 grams
1 lb = 16 oz = 454 grams

Trade Name	Common Name	Host and Disease	Trade Name	Common Name	Host and Disease
Benlate	benomyl	Rose, chrysanthemums, geraniums, beans, melons, cucumbers, turf. Control of various soil and foliar fungi.	Agri-Strep	streptomycin	Chrysanthemums, philodendrons, peppers, tomatoes, potatoes. Control of bacterial diseases.
Karathane	capryl	Roses, lilacs, shrubs, cucumbers, squash, pumpkins. Control of powdery mildew.	Dusting sulfur	sulfur	Aster, daffodils, iris, cucumber, melons. Control of powdery mildew.
Mildex			Wettable sulfur		
Arathane			Arasan	thiram-seed treatment	Fungicide used to coat seed and thus protect it from various seed rot fungi.
Captan	captan	Roses, chrysanthemums, begonia, beans, carrots, cucumbers, turf. Control of various soil and foliage fungi and seed treatment.	Thiram		
Orthocide 50			Dithane Z-78	zineb	Chrysanthemums, delphiniums, geraniums, beets, carrots. Control of various foliage diseases.
Stauffer Captan 50			Zineb		
Bordeaux mixture	copper	Begonia, tulips, glads, potatoes, cucumbers, tomatoes. Control of many fungal and bacterial diseases.	Parzate		
Tribasic copper sulfate			Dexon	dexon	Bedding plants, outdoor flowers—control of various soil-borne fungi. Beets, peas, spinach—as seed treatment or drench.
Botran	dicloran	Chrysanthemums, geraniums, roses, lettuce, beans. Control of Botrytis and other foliar fungi.	Dyrene	dyrene	Glads, cucumbers, onions, squash, turf. Control of various foliar fungi.
Phaltan	folpet	Asters, chrysanthemums, zinnias, cucumbers, onions, tomatoes. Control of various foliar fungi.	Difolatan	captafol	Cucumber, potatoes, onions.
Ortho Rose & Garden			Daconil 2787	chlorothalonil	Rose, begonia, geranium, beans, carrots, squash, turf. Control of various foliar fungi.
Dithane M-45	maneb	Peony, dahlia, geranium, sweet corn, squash, potatoes, turf. Control of various foliar fungi.	Bravo		
Fore			Termil		
Manzate			Funginex	Triforine	Rose disease control.
Terraclor	PCNB	Begonia, snapdragon, bedding plants, potatoes, beans, cabbage. Control of soil-borne Rhizoctonia. Preplant soil application.	Chipco 26019	Iprodione	Turf disease control.
Lawn Disease Preventer			Actidione	Cycloheximide	Turf disease control.
Vapam	SMDC	Oak, elm. Soil sterilant.	Tersan SP	Chloroneb	Turf disease control.
V.P.M.					

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