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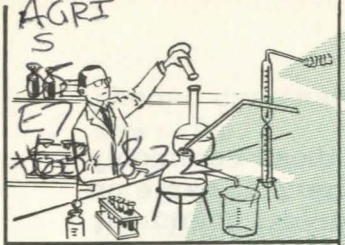

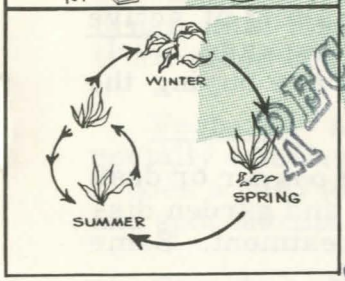


# PLANT DISEASES

EC 63-1832

*JOHN E. WEIHING*
*Extension Plant Pathologist*

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# facts about

## FUNGICIDAL CHEMICALS

1. Most chemicals used for plant disease control are for the control of fungus diseases and, hence, are called "fungicides."

2. Essentially, all of the fungicides are protectant type chemicals. They do not kill out existing infection but protect the plant against infection.

3. No one fungicide can be used for control of all diseases. A fungicide may control a number of different diseases, however.

4. It is necessary to cover the plant thoroughly with the fungicide in order to obtain satisfactory control. Better coverage of the plant can be obtained by sprays than by dusts.

5. Fungicide applications should start before the disease occurs because the fungicide will protect against a disease but not cure it. Once a disease has become established, it is difficult to check.

6. A wetting agent should be added to the spray solution so that it will not run off the plant as droplets but will spread and thoroughly wet the foliage. If a commercial wetting agent is not available, use one teaspoonful of household detergent per gallon of water.

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## THE FUNGICIDES

The following chemicals are among those commonly sold as fungicides. Rarely is the commercial name on the can or package the same as the fungicidal chemical. The fungicide(s) is listed under the heading of active ingredients which will be found on the package label. It is here where you look to see if you are buying the right product.

Captan - A cream colored wettable powder or dust. Used for a variety of ornamental fruit and garden diseases and also extensively as a seed treatment. Some trade names: Orthocide, Captan 50-W.

Copper - There are a number of different copper containing fungicides - Bordeaux mixture (made up of copper sulfate, lime and water), basic copper sulfate, copper oxides, copper carbonate, copper Naphthenate and copper dusts. These compounds are blue wettable powders or dusts used for ornamental fruit and garden diseases.

The copper compounds are among the oldest employed fungicides. They have a broad disease control spectrum. Unfortunately, they are quite caustic to spray equipment and also tend to injure or retard plant growth under cool, moist conditions. In recent years many new synthesized fungicides have been replacing copper because they are easier to handle and cause less plant damage.

Cycloheximide - A white, wettable powder or tablet. Controls certain lawn diseases, cherry leaf spot and is particularly good for control of rust and mildew diseases. Sold as Acti-dione and Actispray.

Dichlone - A yellow, wettable powder which is used for control of some fruit and ornamental diseases but is more commonly used as a seed treatment.

Dinitro - The dinitro's are yellow to brown wettable powders used specifically to control mildew diseases for which they are superior. Karathane (Dintro - 1-methyl heptyl phenyl crotonate) and Mildex (Dinitro capryl

phenyl crotonate) are two of the more common mildewcides.

Dodine - A white wettable powder which has given excellent control of a number of fruit, vegetable and ornamental diseases. It is commonly sold under the trade name of Cyprex.

Ferbam - A black, wettable powder or dust. Especially effective for the control of cedar apple rust. It does a good job of controlling a number of leaf blight and spot diseases.

Glyodin - A liquid fungicide for control of apple scab and cherry leaf spot. Sold as Crag Fruit Fungicide 341.

Maneb - A white wettable powder or dust. Used primarily for control of tomato and potato diseases but has much value as a general fungicide. Commonly sold as Manzate, Manzate 75, Dithane M22.

Mercury-inorganic - Mercurous chloride and mercuric chloride are two compounds that look much like sugar or table salt. They are extremely poisonous and caustic but excellent fungicides for controlling melting-out and brown patch in turfs. They are commonly sold under the trade names of Calo-clor and Calo-cur.

Mercury-organic - The most common organic mercury spray fungicides are the phenyl mercuries which are commonly sold under the trade names of PMAS and Puratized Agricultural Spray. The latter is used frequently in orchards as an eradicant in some of the early season applications. PMAS is commonly used for the control of turf diseases such as melting-out and brown patch. Both may be used to control many of the leaf diseases of deciduous and evergreen trees. Both are colorless liquids.

There are several other organic mercuries such as Ceresan and Panogen which are used primarily as cereal seed treatments. However, in recent years Panogen has been used extensively as a turf fungicide.

Nabam - An amber, water soluble liquid. Usually Nabam is mixed in the spray tank at the rate of 2 quarts plus 1 lb. of zinc sulfate and 100 gal. water. This results in the formation of Zineb (see below). Nabam is sold commercially as Dithane D-14 and Parzate Liquid Fungicide.

Phaltan - A white wettable powder or dust that is used for a variety of ornamental fruit, flower and garden diseases. It can control powdery mildew diseases as well as many of the leaf spot diseases. It is commonly sold as Ortho Phaltan.

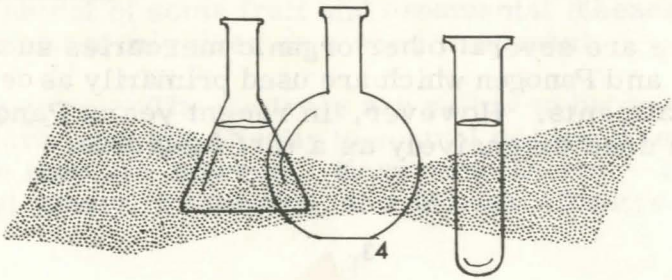
Sulfur - Sulfur and compounds of sulfur have been used extensively as fungicides since 1850. Liquid-lime sulfur and dry-lime sulfur are used as dormant sprays on fruit trees. Wettable sulfurs are commonly used for control of fruit tree diseases. Sulfur dusts control most rust and mildew diseases.

Thiram - A pink powder which is widely used as a seed treatment but is also a good lawn fungicide. Commonly sold as Arasan, Tersan 75, and numerous other commercial names.

Zineb - A tan wettable powder. A general fungicide which has been receiving wide usage in recent years. Commonly sold as Parzate and Dithane Z-78.

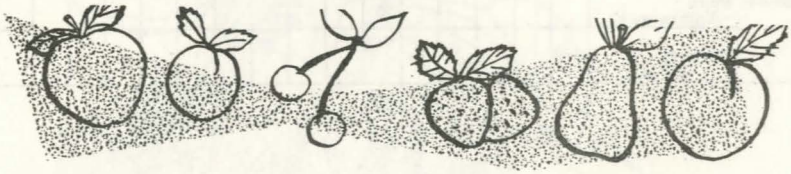
Ziram - A white, wettable powder having properties similar to Zineb and Maneb. It is used primarily as a spray or dust for control of foliage diseases of vegetables and ornamentals. It is particularly effective in the control of tomato anthracnose. It is commonly sold under the name Zerlate.

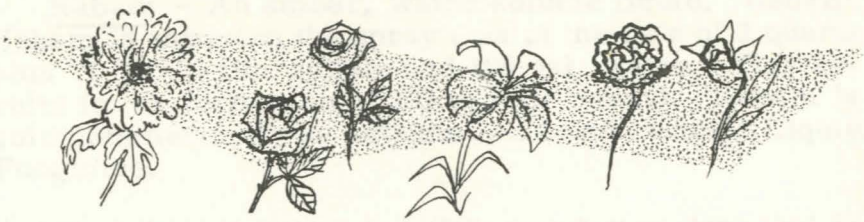
Following is a listing of the more common diseases of fruits, flowers and vegetables. Those chemicals that may be used for their control are checked (X).



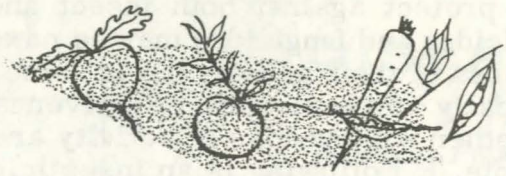
| FRUIT DISEASES | Captan | Copper | Cycloheximide | Dichlone | Dinitro | Dodine | Ferbam | Glyodin | Maneb | Mercury-Inorganic | Mercury-Organic | Nabam | Phaltan | Sulfur | Thiram | Zineb | Ziram |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Apple-Cedar apple rust | | | X | | | | X | | | | | | | X | | X | |
| Black rot | X | | | | | | X | X | | | | | | X | | | |
| Scab | X | | | | | X | X | X | | | X | | | X | | | |
| Apricot-Scab | X | | | | | | | | | | | | | X | | | |
| Brown rot | X | | | | | | | | | | | | | | | | |
| Cherry-Leaf Spot | X | X | X | | | X | X | X | | | | | | X | | | |
| Powdery mildew | | | X | | X | | | | | | | | | | | | |
| Brown rot | X | | | | | X | | | | | | | | | | | |
| Grape-Downey mildew | | X | | | | | | | | | | | | X | | | |
| Powdery mildew | | | | | X | | | | | | | | | X* | | | |
| Peach-Leaf curl | | X | | | | | | | | | | | | X | | | |
| Brown rot | X | | | X | | X | | | | | | | | X | | | |
| Scab | X | | | | | | | | | | | | | X | | | |
| Pear-Scab | X | | | X | | | | | | | | | | X | | | |
| Plum-Brown rot | X | | | X | | | | | | | | | | X | | | |
| Raspberry-Anthracnose | X | | | | | | X | | | | | | | X* | | | |
| Cane blight | X | | | | | | X | | | | | | | X* | | | |
| Strawberry-Leaf spot | X | X | | | | | X | | | | | | | | | | |
| Fruit rots | X | | | | | | | | | | | | | | | | |

*Concentrated for dormant spray

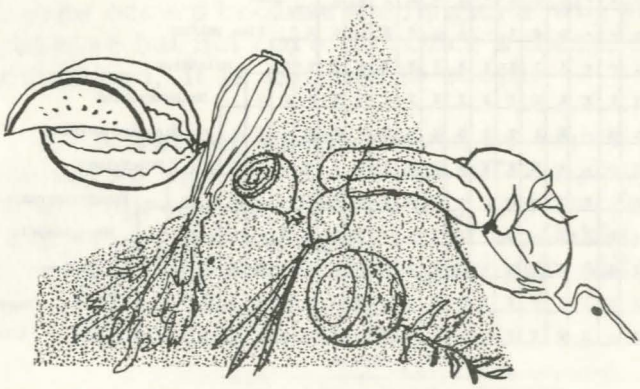




| FLOWER DISEASES | Captan | Copper | Cycloheximide | Dichlone | Dinitro | Ferbam | Glyodin | Maneb | Mercury-Inorganic | Mercury-Organic | Nabam | Phaltan | Sulfur | Thiram | Zineb | Ziram |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aster-Leaf spot | | X | | | | X | | | | | | | | | X | |
| Rust | | | X | | | X | | | | | | | | | X | |
| Carnation-Blight | X | | | | | | | | | | | | | | X | |
| Bud rot | X | | | | | | | | | | | | | | X | |
| Leaf spot | X | X | X | | | | | | | | | | | | X | |
| Rust | | | | | | X | | | | | | | X | | X | |
| Chrysanthemum-Leaf spot | X | | | | | | | | | | | | | | X | |
| Powdery mildew | | | | | X | | | | | | | X | X | | | |
| Dahlia-Powdery mildew | | | | | X | | | | | | | X | X | | | |
| Delphinium-Powdery Mildew | | | | | X | | | | | | | X | X | | | |
| Hollyhock-Rust | | | X | | | X | | | | | | | X | | X | |
| Iris-Leaf spot | X | X | | | | | | | | | | | | | X | |
| Lily-Grey mold | X | | | | | X | | | | | | | | | X | |
| Peony-Botrytis blight | | X | | | | X | | | | | | X | | | X | |
| Phlox-Leaf spot | X | | | | X | X | | | | | | X | | | | |
| Powdery mildew | | | | | | | | | | | | X | X | | | |
| Rose-Black spot | X | X | | X | | X | | X | | | | X | | | X | |
| Powdery mildew | | | X | | X | | | | | | | X | X | | | |
| Rust | | | X | | | X | | | | | | | X | | | |
| Snapdragon-Rust | | | X | | | X | | | | | | | X | | X | |
| Sweet Peas - Anthracnose | | | | | | X | | | | | | | | | | |
| Powdery mildew | | | | | X | | | | | | | X | X | | | |



| VEGETABLE DISEASES | Captan | Copper | Cyclohexiimide | Dichlone | Dinitro | Dodine | Ferbam | Glyodin | Maneb | Mercury-Inorganic | Mercury-Organic | Nabam | Phalton | Sulfur | Thiram | Zineb | Ziram |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Beet-Leaf spot | | X | | | | | | | X | | | X | | | | | X |
| Cantelope-Anthracnose | X | | | | | | | | X | | | | | | | | X |
| & Cucumber Downey mildew | | X | | | | | | | X | | | | | | | | |
| Scab | X | | | | | | | | | | | | | | | | |
| Carrot-Leaf spot | | | | | | | | | X | | | X | | | | | X |
| Celery-Blight | | X | | | | | | | X | | | X | | | | | X |
| Eggplant-Blight & Fruit rot | | | | | | | | | X | | | X | | | | | X |
| Onion-Purple blotch | | | | | | | | | X | | | | | | | | X |
| Pea-Powdery mildew | | | | | X | | | | | | | | | X | | | |
| Potato-Early blight | | | | | | | | | X | | | | | | | | X |
| Late blight | | X | | | | | | | X | | | X | | | | | X |
| Rhubarb-Leaf spot | | X | | | | | | | X | | | | | | | | X |
| Tomato-Leaf spot | | X | | | | | | | X | | | | | | | | X |
| Late blight | | X | | | | | | | X | | | X | | | | | X |
| Anthracnose | | X | | | | | | | X | | | | | | | | X |
| Watermelon-Anthracnose | | X | | | | | | | X | | | | | | | | X |



Many times you may wish to mix an insecticide and fungicide to protect against both insect and disease. Many insecticides and fungicides may be mixed together without any loss of their activity but in some cases they react chemically and lose their effectiveness. Those that mix together without loss of activity are spoken of as "compatible." Following is an insecticide -compatibility chart.

' Fungicide-Insecticide Compatibility Chart

' Use this chart as you would use a mileage chart,
' e.g., if you want to know if bordeaux mixture and
' malathion may be safely used together, select the
- - - - - - -'column headed "bordeaux mixture" and
'read down until you get to the line
'marked "malation", etc.

| | Aldrin | Aramite (Endrin, Heptachlor) | BHC (Lindane) | Bordeaux Mixture | Captan | Carbamates (Zineb, Maneb, Nabam, Ziram, Fermate, Thiram) | Chlordane | Coppers | Cryolite | DDT & DDD (TDE) | Demeton | Dieldrin | Dinitros (Summer) | Dinitros (Dormant) | EPN (metacide) | Genite (ovex) | Glyodin | Karathane, Mildex | Lead arsenate | Lime | Lime sulfur | Malathion | Methyoxychlor | Nicotine sulfate | Parathion | Phenyl mercuries | Streptomycin sulfat | Sulfurs | Toxaphenes | Quinones |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aramite (Endrin, Heptachlor) | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BHC (Lindane) | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bordeaux Mixture | X | - | o | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Captan | X | o | X | - | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Carbamates (Zineb, Maneb, Nabam, Ziram, Fermate, Thiram) | X | X | X | o | X | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chlordane | X | X | X | o | X | X | | | | | | | | | | | | | | | | | | | | | | | | |
| Coppers | X | o | X | O | o | o | X | | | | | | | | | | | | | | | | | | | | | | | |
| Cryolite | X | o | X | - | o | X | X | X | | | | | | | | | | | | | | | | | | | | | | |
| DDT & DDD (TDE) | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| Demeton | X | X | X | o | X | X | X | o | o | X | | | | | | | | | | | | | | | | | | | | |
| Dieldrin | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | | |
| Dinitros (Summer) | X | - | X | o | - | X | X | o | o | X | X | X | | | | | | | | | | | | | | | | | | |
| Dinitros (Dormant) | X | - | X | o | - | X | X | o | o | X | X | X | o | | | | | | | | | | | | | | | | | |
| EPN (metacide) | X | O | X | o | X | X | X | X | X | X | X | X | o | o | | | | | | | | | | | | | | | | |
| Genite (ovex) | X | X | X | X | X | X | X | o | o | X | X | X | X | X | X | | | | | | | | | | | | | | | |
| Glyodin | X | X | X | X | X | X | o | X | o | X | X | X | X | o | X | X | | | | | | | | | | | | | | |
| Karathane, Mildex | X | o | X | o | X | X | X | o | o | X | X | X | - | - | X | o | X | | | | | | | | | | | | | |
| Lead arsenate | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | |
| Lime | X | o | o | O | - | o | o | X | - | o | o | X | - | o | o | X | X | o | X | | | | | | | | | | | |
| Lime sulfur | X | - | o | - | - | X | o | - | - | o | o | X | - | o | o | X | X | o | o | X | | | | | | | | | | |
| Malathion | X | X | X | - | X | X | X | o | o | X | X | X | X | X | X | X | X | o | X | o | o | | | | | | | | | |
| Methyoxychlor | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | o | o | X | | | | | | | | |
| Nicotine sulfate | X | X | o | X | o | X | o | X | - | X | X | X | o | o | X | X | X | o | X | X | - | X | X | | | | | | | |
| Parathion | X | X | X | o | X | X | X | o | o | X | O | X | X | X | X | X | X | X | X | o | o | X | X | X | | | | | | |
| Phenyl mercuries | X | X | X | o | X | X | X | - | X | X | o | X | o | o | o | X | X | o | X | X | - | o | X | X | o | | | | | |
| Streptomycin sulfat | X | | - | X | X | X | - | X | X | X | | X | | | | | - | X | X | X | X | | | | X | X | | | | |
| Sulfurs | X | X | X | X | X | X | X | X | X | X | X | X | X | o | X | X | X | X | X | X | X | X | X | X | X | X | | | | |
| Toxaphenes | X | X | X | o | X | X | X | X | X | X | X | X | X | X | X | X | o | X | X | o | o | X | X | X | X | X | | X | X | |
| Quinones | X | X | X | o | X | X | X | o | X | X | X | X | - | - | X | X | X | o | X | o | o | X | X | o | X | o | | X | X | |

Key to Symbols

X - May be safely combined

\- May not be combined

o - Physically compatible

O - Not necessary in combinatio

____

____ - Unknown