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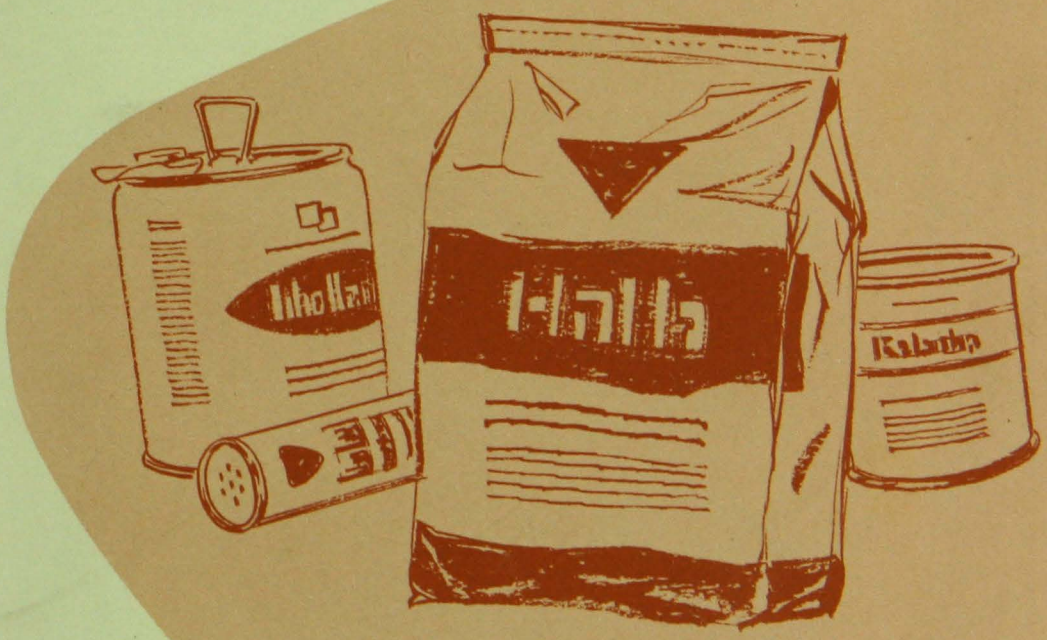
FUNGICIDES

Bactericides & Nematocides



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FUNGICIDES

Bactericides & Nematocides

HERBERT G. JOHNSON and EARL K. WADE

INTRODUCTION

The extensive array of agricultural chemicals available today makes possible a greater degree of pest control than ever before, but the great number of chemicals has created the new problem of providing sufficient information to make their use effective and economical. The necessary information is available; however, it is scattered through many publications. This publication was proposed and written to supply information normally needed by retail store operators in providing their customers with proper fungicide materials, and for agricultural extension personnel and other specialists in agriculture who are called upon to supply specific information on fungicides.

MATERIAL INCLUDED

The fungicides, bactericides, and nematocides included in this publication were selected on the basis of clearance, use, and availability in the North-Central States.

HOW TO USE THIS PUBLICATION

This publication is designed to aid the person looking for information about a specific fungicide or about a fungicide for a particular disease. The alphabetical list gives information on specific fungicides, while several sections of the publication list fungicides for specific uses, such as rust control, strawberry diseases, or turf diseases. Common or generic names of chemicals are used whenever possible. A common or generic name is usually a short name that represents the chemical contained in a material. The use of these names, which are accepted by institutional and industrial personnel, makes possible the impartial naming of a chemical in a concise term rather than using a long, complicated formula or a list of trade names. The alphabetical list is cross-indexed by common names and trade names. Omissions are unintentional.

SAFE USE OF CHEMICALS

Chemicals differ in relative degree of hazard to users, and many chemicals have peculiarities that require precautions in handling. Read and follow all label directions, for they give necessary information for safe use of each chemical. If a certain drug is suggested as an antidote, obtain it before use. Store chemicals out of reach of children, irresponsible people, and pets. Some individuals handle dangerous materials with little or no respect for the risks they take, which may result in severe consequences at any time. Safe use as described on the label is based on extensive tests; however, a few individuals may be especially sensitive to certain chemicals. Everyone should be alert to recognize such situations and help the individuals in trouble.

TOLERANCES, RESIDUES, AND APPROVED USES OF CHEMICALS

Federal regulations administered by the Food and Drug Administration set maximum tolerances in terms of parts per million of actual chemical that a food may contain and be legally transported in interstate commerce. The U.S. Department of Agriculture registers the rates, methods, and times of application of chemicals on specific crops, which will ensure that legal tolerances will not be exceeded in or on the product when it reaches the market. Approved uses of chemicals are given on current registered package labels and in many current pest control guides.

Tolerances establish safe residue levels, and are compared with laboratory analyses of foods and feeds to determine whether legal residue limits have been exceeded. Approved use recommendations are most important to individuals who are applying the chemicals to crops.

Information on accepted uses of chemicals by the U.S. Department of Agriculture is available to companies who manufacture and distribute

The authors are, respectively, extension plant pathologists at the University of Minnesota and the University of Wisconsin.

chemicals. This information is useful in preparing acceptable labeling. The Department publishes a "Summary of Registered Agricultural Pesticide Chemical Uses" compiled as a reference for research agencies, agricultural advisors, regulatory officials, and registrants of pesticide products. This summary is not a list of recommendations, but is a compilation of general use patterns of registered pesticides. It lists uses by chemical; showing crops, residue tolerances, if any, maximum acceptable dosage, and other pertinent limitations or directions. This publication is kept up-to-date by continuous issue of revisions as changes occur in tolerances and approved uses. Agricultural Extension Service personnel and others who write recommendations for use of agricultural chemicals are among the major users of this summary. Individuals who need information from this source may contact the extension plant pathologists of their states.

SEED TREATMENT FUNGICIDES

Using fungicides on seed is one of the most efficient and economical forms of chemical plant disease control. Increases in plant population frequently result from proper seed treatment. Yield increases are less frequently found. However, the averages of yields obtained from long-term trials indicate that benefits from seed treatment can be reflected in yield increases in certain years. Seed treatments frequently cause a tenfold return for money invested and hundredfold returns are not uncommon. Good seed treatment materials, properly applied, are recommended on practically all crop seed by the agricultural experiment stations of the North-Central Region.

Seed treatment materials may be divided into two groups on the basis of chemicals involved and recommended uses:

A. Organic mercury seed treatment materials—These materials are used primarily for seed treatment of cereal grains and flax, but other crop seeds, bulbs, corms, or tubers may be treated. In all cases label directions regarding crop and rate of application must be followed carefully since some seed is easily injured by mercury-containing chemicals and all seed can be injured with amounts in excess of recommendations. These fungicides control many types of seedborne and soilborne disease-causing pathogens.

B. Other organic seed protectant fungicides (nonmercury)—These fungicides are recommended for general use as seed treatments when protection from organisms in the soil and some of those on the surface of the seed is desired. They are relatively safe to handle, although sensitive and allergic individuals may suffer skin irritation or other forms of discomfort from continuous exposure. Some of these materials can be used at high rates, as in pelletizing treatments. Such treatments should be used only if they are recommended.

SOIL TREATMENT FUNGICIDES

Fungicides are applied to soil to control soilborne disease organisms in some situations. Complete control of a plant disease is often not obtained or expected by this procedure, but the results may be very satisfactory. Although disease-causing organisms may not be killed, their action will often be suppressed. Useful treatments are usually very specific in terms of the fungicide, the plant, and the disease organism involved.

Costs are relatively high on a per-acre basis; however, the treatments may be very economical on high value crops. The potential value of the crop and the cost of the treatment should be calculated before full-scale treatments are made. Whenever possible, trial tests should be made on a small scale before a major portion of a crop is treated. Toxicity to the crop and effectiveness of the fungicide often varies with different soils and other growing conditions.

Time of application of the fungicide to the soil depends on such soil conditions as moisture and temperature, and on effect of the fungicide on the crop. Some materials must be applied under proper conditions and in a proper period of time before the crop is planted. Following the application of such fungicides the soil must be tilled to a depth no greater than the effective penetration of the chemical; otherwise, the desired effect is lost.

Fungicides that can be safely applied to the soil at planting time have several advantages:

1. Planting need not be delayed until the soil warms up sufficiently for the fungicide to be effective, and for the chemical to disappear before planting.
2. Less soil tillage is necessary.
3. The chemical is often present during the growth of the crop to act as a barrier against infection.

4. Savings in cost of material can often be made by applying the fungicide in bands or in planting furrows rather than in a broadcast application.

Most fungicides applied with the crop have a relatively short effective life in the soil; they are intended mostly for protection of the plant during early stages of growth. Application is usually in the planting furrow or around individual plants. These chemicals may be mixed in the soil of seed beds or flats before planting seed or they may be applied as drenches immediately after seeding or at a later time.

A few fungicides are very persistent in the soil; one of these is PCNB. Applications made before or during planting are often still effective at the end of the season. Such fungicides usually do not diffuse through the soil; thorough mixing is essential for maximum effectiveness. Although broadcast treatments are necessary for closely planted and valuable crops, band treatments may be used in wide-row plantings to reduce cost of material. Some type of rotary tillage is usually necessary for adequate mixing. Furrow treatments are used when protection is needed primarily at the base of the plant.

SOIL FUMIGANTS

Soil fumigants are chemicals that are mixed with the soil or injected into it to control plant pests. For our purpose the chemicals are usually applied to control diseases caused by nematodes and fungi. Certain chemicals also control many soil insects and weeds. On a small scale the chemical is often applied to the soil and then covered to confine the gases for a specified time. On a large scale the soil surface may be packed following treatment or a water seal may be applied where feasible. These chemicals are applied several days or weeks before planting to permit the chemical to be effective and allow it to disappear before planting. Late summer or early fall treatment is necessary where crops will be planted early the next spring. Label directions are usually quite specific on condition of soil and temperature necessary for maximum effectiveness of the fumigant.

FORMULATIONS OF FUNGICIDES

Wettable Powders—a large percentage of fungicides are formulated as wettable powders; this is the form most commonly used for spray mixes. Modern wettable powders are easily wetted and disperse well in water. A wetting agent is usually present in most wettable powder formulations, but the addition of a spreader-sticker is sometimes desirable, especially on plants with glossy or waxy leaves. Agitation is generally necessary in the spray tank to keep a uniform suspension.

Dusts—These formulations usually contain from 4 to 10 percent active ingredient. As their name indicates, they are usually applied in dry form as dusts.

Emulsifiable Concentrates—These are liquids in which the active ingredient is dissolved in a solvent. The fungicide and the solvent often will not mix with water, so an emulsifying agent is included. When these emulsifiable materials are added to water, a milky mixture is formed which is a suspension of active ingredient and emulsified solvent in the water. Fungicides are not commonly formulated as emulsifiable concentrates.

Granules—These are formulations of fungicides with inert materials formed into particles about the size of coarse sugar. The percentage of active ingredient is usually low as in the case of dusts. Granules have the advantage that they can be metered out in dry form more easily and accurately than dusts or wettable powders. This is important for such applications as furrow treatments. Some degree of volatility or ability to diffuse is necessary for granule formulations to be effective. Fungicides are not often formulated in this way.

Solutions—True solutions are formulations in which the active ingredient or a combination of active ingredient and solvent is dissolved in water. Solutions have the advantage of requiring no agitation after the formulation is added to water. However, practically all fungicide chemicals are relatively insoluble in water. When these chemicals have a high degree of solubility they may be very effective in controlling the plant pathogen, but they are generally too toxic to the plant.

Suspensions or Slurries—These are formulations in which a dry form of the active ingredient is mixed with a liquid. Such formulations usually have a high percentage of active ingredient similar to wettable powders. They are mixed with water for final use and require agitation.

METHODS OF APPLICATION OF FUNGICIDES

Seed Treatment—Fungicides applied to seed may be formulated as dusts, wettable powders, solutions, or suspensions. The formulation and method of application should give uniformity of coverage to seed and a minimum of danger and irritation to the operator. Seed may be treated in batches with simple equipment or continuously with special machines.

Spraying—The greatest amount of fungicide used is applied in the form of spray to leaves, fruit, and stems of plants. Wettable powders are most commonly used for preparing sprays, although emulsions or solutions may be used in some cases.

Dusting—Dusts are applied to leaves, fruits, and stems of plants as an alternative to spraying.

For garden use many people prefer dusting from the standpoint of convenience. A duster can be filled easily and used without the trouble of mixing sprays and cleaning out the sprayer after each use. However, a sprayer generally gives a better application.

For field applications, many people prefer sprays for maximum coverage of plants; others prefer dusts because the machinery is lighter and can be used under more adverse ground conditions. Dusting equipment is usually lower in cost than sprayers, but dust is more expensive than spray material on a per-acre basis. Sprayers can be used in higher wind velocities than dusters, but dusters have the advantage of requiring no water. Sprays generally do not bother the operator as much as dusts.

Drenching—Fungicides are sometimes made up with water at about the same concentration as for spraying and applied to the soil surface either before or after plants emerge. This method is used to control damping-off, root rots, or infections at the ground line.

Furrow Treatments—Fungicides may be applied either as dusts or with water to the furrow at planting time. Such treatment is for control of diseases that occur at the base of the plant. Special equipment must be built or purchased for such application.

Planter or Hopper Box Treatment—Certain fungicides, applied as dusts, are added to the seed and mixed in the planter box. They control seed-and soil-borne diseases. No special equipment is needed for such application and risk of treating excess seed is eliminated.

Soil Fumigation—Application of certain materials to the soil can control fungi and nematodes. Such materials usually produce a gas that distributes itself through the soil. Some impervious cover which confines the gas to the soil for a limited period of time is usually required; in some cases a water seal is sufficient. Such treatments are usually restricted to small areas and high-value crops.

Dips—Fungicides are sometimes made up in concentrations similar to those for spraying and are used for dipping plants or propagative parts before they are planted.

Fungicide Paints—Fungicides are occasionally mixed with water, alcohol, or other carriers and applied as a paint on a wound surface. For example, Bordeaux mixture can be made up to paint-like consistency by mixing a prepared Bordeaux mixture powder with linseed oil for use in painting tree wounds. This is sometimes recommended for use on pruning cuts to control fireblight of apples and pears.

SUGGESTED FUNGICIDES FOR RETAIL, SMALL PACKAGE LINE

The following list is suggested on the basis of plant diseases controlled, and potential volume of sales. No one fungicide will control all plant diseases, but a few fungicides will control a great many diseases. For additional materials that may be needed, check the section "Fungicides, Bactericides, and Nematocides Grouped By General Uses." Check current labels and pest control recommendations for permissible use of fungicides on specific crops.

Foliage Fungicides:

captan—for many diseases of fruits including apple, stone fruit, strawberry, raspberry, and pear. A good general fungicide for ornamental diseases. Does not control powdery mildews or rusts.

maneb—for control of many vegetable diseases. Controls most foliage diseases of potato, tomato, and cucumber. A good multipurpose fungicide for ornamental diseases. Does not control powdery mildew.

zineb—same uses as listed for maneb. This fungicide is less likely to cause injury on young, tender plants than maneb, but it does not control quite as wide a range of diseases.

ferbam—for control of diseases of brambles, plum, and cherry. Controls apple rust and many other true rust diseases. A good multipurpose fungicide for diseases of ornamentals. Does not control powdery mildew.

Fixed Copper Fungicides—multipurpose fungicides, replaced by organic fungicides for many purposes. Give some control of bacterial diseases and recommended for this purpose.

Fungicides for Control of Powdery Mildew—cycloheximide (Acti-dione P.M.), dinocap, folpet, and sulfur.

Seed Protectant Fungicides—captan, thiram, dichlone, and chloranil.

Soil Fungicides:

Vapam—a general purpose liquid preplanting soil fumigant applied as a soil drench or by injection.

Methyl Bromide—a general purpose highly volatile liquid sold in pressurized containers, for preplanting soil fumigation.

PCNB—a long residual fungicide for soil treatment for control of certain plant diseases such as: *Rhizoctonia* and *Sclerotinia* diseases, clubroot of cabbage and related plants, and potato scab.

Dexon—a fungicide for seed and soil treatment for control of *Pythium, Phytophthora,* and *Aphanomyces* diseases and others. Often applied to soil in combination with PCNB and other fungicides.

captan—protects against damping-off due to *Pythium* and similar organisms in the soil.

Morton Soil Drench—liquid fungicide used as a soil drench for control of damping-off and other diseases.

CONVERSION FACTORS:

(All volume measurements are level)

1 tablespoonful (tbsp.) equals:
- 3 teaspoonfuls (tsp.)
- ½ fluid ounce (fl. oz.)
- 15 cubic centimeters (c.c.) } 1 cc. = 1 ml.
- 15 milliliters (ml.) }

16 tablespoonfuls equal 1 cupful; 2 cupfuls equal 1 pint (pt.).

1 pint equals 16 fluid ounces or 473 cubic centimeters; dry measure is approximately 16-percent larger than liquid measure volume.

1 ounce equals 28.3 grams; 1 fluid ounce equals 29.6 cubic centimeters or 2 tablespoons.

1 pound equals 16 ounces or 453.49 grams.

1 acre equals 43,560 square feet or 160 square rods.

100 gallons per acre equals 2.5 gallons per 1,000 square feet.

Table of Conversion: From pounds of material per 100 gallons of spray to level tablespoonfuls of material to make 1 gallon of spray.

	Pounds per 100 gallons of spray						
	½	1	1½	2	4	6	8
Material	Level tablespoonfuls per gallon of spray						
captan 50% WP	⅜	¾	1⅛	1½	3	4½	6
chloranil 96% WP	½	1	1½	2	4	6	8
copper sulfate (snow)	⅙	⅓	½	⅔	1⅓	2	2⅔
dichlone 50% WP	⅓	⅔	1	1⅓	2⅔	4	5⅓
dinocap 25% WP	⅓	⅔	1				
dodine 65% WP	½	1	1½	2	4		
Dyrene 50% WP	⅓	⅔	1	1⅓	2⅔	4	
ferbam 76% WP	⅝	1¼	1¾	2½	5		
fixed copper 50%	¼	½	¾	1	2	3	
folpet 50% WP	½	1	1½	2	4		
maneb 80% WP	¼	½	¾	1	2	3	4
PCNB 75% WP	½	1	1½	2	4	6	8
spray lime	½	1	1½	2	4	6	8
sulfur	¼	½	¾	1	2	3	
thiram 75% WP	⅜	¾	1⅛	1½	3	4½	6
zineb 75% WP	⅓	⅔	1	1⅓	2⅔	4	5⅓

FUNGICIDES, BACTERICIDES, AND NEMATOCIDES GROUPED BY GENERAL USES

The following headings indicate types of fungicides and their general uses. *No attempt has been made to include all uses and all materials in the following lists, but enough are given to suggest chemicals for many of the most common uses. The suggestions for chemical uses given here and in the alphabetical list must not be interpreted as specific recommendations for use. Check current labels and pest control guides for that information.*

Bactericides
- Bordeaux Mixture
- fixed copper fungicides*
- streptomycin formulations

Cherry Leaf Spot Fungicides
- cycloheximide
- ferbam
- dodine
- Glyodin
- Glyoxide

Clubroot Fungicides
- corrosive sublimate
- PCNB (common name)

*Common names are not capitalized

Disinfectants for Tools, Machines, Wood, etc.
Cuprinol
formaldehyde
hypochlorite (sodium or calcium)
phenol compounds
quaternary ammonium compounds
Reimer's Solution

Early Blight of Potatoes and Tomatoes Fungicides
Copper-zinc-chromate
folcid (potatoes only)
maneb
maneb plus zinc
nabam plus zinc sulfate
Polyram (potatoes only)
zinc ion maneb
zineb
ziram

Eradicant Fungicides
dinitro materials
dodine
mercury fungicides—organic

Late Blight of Potatoes and Tomatoes Fungicides
Bordeaux Mixture
copper-zinc-chromate
fixed copper
folcid (potatoes only)
maneb
maneb plus zinc
nabam plus zinc sulfate
Polyram (potatoes only)
zinc ion maneb
zineb

Mercury Fungicides—Inorganic
Calo-Clor
Calocure
Calogreen
calomel
corrosive sublimate
Velsicol 2-1

Mercury Fungicides for Fruit Tree Spraying and Ornamental Trees—Organic
Orchard Brand Mercury Spray
Ortho LM Apple Spray
Phix
PMAS (common name)
Puratized Agricultural Spray
Puratized Apple Spray
Tag 331

Mold Inhibitors
Naptriphene
sodium o-phenylphenate

Nematocides
chloropicrin
DBCP (common name)
D-D
Dorlone
ethylene dibromide
methyl bromide
Mylone
Telone
Vapam
Vidden D
Vorlex
VPM

Potato Seed-Piece Fungicides
captan
maneb
Semesan Bel S
zineb

Powdery Mildew Fungicides
cyclohexamide
dinocap
folpet
sulfur

Raspberry Disease Fungicides
captan
dinitro materials (delayed dormant application only)
ferbam
lime sulfur (delayed dormant application only)

Rhizoctonia Disease Fungicide
PCNB (common name)

Rose Fungicides, Black Leaf Spot
captan
cycloheximide
ferbam
folpet
maneb
zineb

Rust Fungicides
cycloheximide
ferbam
maneb
sulfur
zineb

Scab Fungicides, Apple and Pear
captan
dodine
Glyodin
Glyoxide
mercury fungicides—organic
Niacide A (apples only)

Niacide M (apples only)
Thylate (apples only)

Scab Fungicide, Potato
PCNB (common name)

Seed Treatment Fungicides, Organic (nonmercury)
captan
chloranil
Dexon
dichlone
thiram

Seed Treatment Fungicides—Organic Mercury
Ceresan L
Ceresan M
Ceresan M-DB
Chipcote 25
Chipcote 75
Emmi
Mema
Mist-o-matic Disinfectant (Gustafson)
Ortho LM Seed Protectant
Panogen 15 Liquid Seed Disinfectant
Panogen 42 Liquid Seed Disinfectant
Panogen PX
Semesan
Setrete

Soil Drench Fungicides
Bedrench
captan
corrosive sublimate
Dexon
dicloran
ferbam
Morton Soil Drench
Natriphene
PCNB (common name)
Semesan
thiram
zineb

Soil Fungicides and Fumigants, Preplant Only
chloropicrin
D-D
ethylene dibromide
formaldehyde
methyl bromide
Mylone
Trizone
Vapam
VC-13
Vorlex
VPM

Soil Fungicides for Growing Plants
captan
Dexon
PCNB (common name)
thiram

Spreaders and Stickers
duPont Spreader-Sticker
Filmfast
Nu-Film
Ortho Spreader-Sticker
Plyac Spreader-Sticker
Spread-Rite
Superior Spreader
Triton B-1956

Sticker for Pelletizing Seed Treatments
methyl cellulose

Strawberry Disease Fungicides
captan
copper-zinc-chromate
dodine
Dyrene
fixed copper
folpet
thiram
zineb

Tree Wound Dressings
asphalt dressings (barrier type—not fungicidal)
Bordeaux Paint
orange shellac (barrier type—not fungicidal)

Turf Disease Fungicides
Auragreen
Caddy
Cadminate
Cad-trete
Calo-Clor
Calocure
Calogreen
calomel
captan
corrosive sublimate
cycloheximide
dinocap
Dyrene
folpet
Kromad
maneb
Ortho Lawn and Turf Fungicide
Panogen Turf Fungicide
PCNB (common name)
PMAS
Tersan OM
Tersan 75
Thimer
Velsicol 2-1
zineb
zinc ion maneb

White Pine Blister Rust Fungicide
cycloheximide (Actidione BR)

Wood Preservatives
Cellu-conc
copper naphthenate
copper sulfate
creosote
pentachlorophenol
zinc naphthenate

ALPHABETICAL LIST OF FUNGICIDES, BACTERICIDES, AND NEMATOCIDES

The following list includes common names and many trade names of fungicides, bactericides, and nematocides that have demonstrated value in controlling diseases in the North-Central States. Generally, the trade names included are available in the North-Central States or on a national basis. Common names are not capitalized. Future revisions will include changes, additions, and deletions that are judged to be proper. Suggestions for such changes should be addressed to the authors.

Acti-dione **Upjohn**

The term cycloheximide is the generic name for the chemical Beta [2-(3,5-dimethyl-2-Oxocyclohexyl)-2-hydroxy-ethyl] glutarimide. An antibiotic which controls many fungus diseases. See Actidione formulations below for specific uses.

Acti-dione BR Concentrate **Upjohn**

4 percent cycloheximide.

A fungicide for use in preparing solutions for treatment of white pine blister rust cankers. Used as spray or paint.

Acti-dione BR Spray **Upjohn**

0.018 percent cycloheximide.

Fungicide in pressurized can for spraying white pine blister rust cankers.

Acti-dione Ferrated **Upjohn**

2.26 percent cycloheximide plus 54.74 percent ferrous sulfate.

A turf fungicide used as spray.

Acti-dione PM Flower Fungicide **Upjohn**

0.027 percent cycloheximide.

Fungicide for control of powdery mildew of rose and other ornamentals. Used as a spray.

Acti-dione RZ **Upjohn**

1.3 percent cycloheximide plus 75 percent pentachloronitrobenzene.

Fungicide for turf diseases (*Helminthosporium* leaf spot and crown rot, brown patch, leaf rust, powdery mildew, dollar spot), and azalea petal blight.

Actispray **Upjohn**

7.7 percent cycloheximide.

Fungicide in tablet form for control of cherry leaf spot and cedar-apple rust on juniper. Used as a spray.

Agri-mycin 17 **Pfizer**

21.3 percent streptomycin sulfate.

See streptomycin formulations.

Agri-strep Type A **Merck**

37 percent streptomycin sulfate.

See streptomycin formulations.

Agri-strep Type D **Merck**

21.2 percent streptomycin sulfate.

See streptomycin formulations.

Androc-PCP **Androc Chemical Co.**

See pentachlorophenol.

Auragreen **Mallinckrodt**

Malachite green, auramine, and crystal violet.

Turf fungicide spray.

basic copper fungicides

See fixed copper.

Bedrench **Niagara**

11.5 percent ethylene dibromide, 81 percent allyl alcohol.

Soil drench applied to plant beds to control weed seeds, nematodes, and some soil fungi.

bichloride of mercury

See corrosive sublimate.

bluestone, blue vitriol

See copper sulfate.

Bordeaux Mixture

A mixture of copper sulfate (instant powder, blue vitriol) and spray (hydrated) lime in water. First figure of the Bordeaux formula is copper sulfate in pounds, the second figure is spray lime in pounds, and the third figure is water in gallons. Examples: 4-4-50, 4-2-50, 3-4-100. Home-prepared Bordeaux spray using fresh spray lime is superior to prepared Bordeaux powder mixtures such as Acme Bordeaux Mixture, Copper Hydro Bordo, etc.

Bordeaux mixture can be used for dormant, delayed dormant, and foliage applications on certain fruits, flowers and ornamentals, trees, and vegetables for control of fungus and bacterial diseases.

Mixing instructions: Add hydrated lime to cold

water in the amount of one-half to three-fourths of the total volume desired for the final spray. Mix thoroughly. Add dissolved copper sulfate and mix thoroughly. Add cold water to bring up to final volume. White flakes often form in the mixture. If these flakes cause clogging, they may be strained out. Use Bordeaux mixture immediately after it is made.

Bordeaux Paint

Commercially prepared Bordeaux mixture powder mixed with raw linseed oil to form a thick paste is used as a tree wound dressing.

Botran 50 Percent WP, 8 Percent Dust **Upjohn**

2,6-dichloro-4-nitroaniline.

Soil and foliar fungicide for control of *Botrytis, Stromatinia,* and *Rhizoctonia* on various ornamental plants.

Bromex Soil Fungicide **Morton**

See methyl bromide.

Brozone **Dow**

6.8 percent methyl bromide, 1.4 percent chloropicrin.

A liquid nematocide for soil fumigation to control plant parasitic nematodes.

See methyl bromide.

Caddy **Cleary**

20.1 percent cadmium chloride.

Liquid turf spray fungicide for control of dollar spot and other diseases.

Cadminate **Mallinckrodt**

60 percent cadmium succinate.

Wettable powder turf spray for control of dollar spot.

Cad-trete **Cleary**

75 percent thiram, 8.3 percent cadmium chloride hydrate.

Wettable powder turf fungicide used as a spray for control of brown patch, dollar spot, and certain other turf diseases.

Calo-Clor **Mallinckrodt**

60 percent calomel plus 30 percent corrosive sublimate.

A soluble powder used as a spray to control turf diseases including: brown patch, dollar spot, snow mold, fairy rings, and toadstools.

Calocure **Mallinckrodt**

30 percent calomel plus 15 percent corrosive sublimate.

Same uses as Calo-Clor.

Calogreen **Mallinckrodt**

85 percent mercurous chloride.

A turf spray fungicide, also used as a mercury seed treatment.

See Calomel.

Calomel

Mercurous chloride.

A soluble powder used in seed and corm treatments to disinfect the surface; also used as a soil drench and as a turf fungicide.

See Calogreen.

Captan

N-trichloromethylmercapto-4-cyclohexene-1,2-dicarboximide.

5, 7½, and 10 percent dusts and 50 percent WP.

Used as dust and spray for fungus diseases on fruit, ornamentals, turf, vegetables; used as soil treatment on plant beds. 75 percent WP formulation used as seed protectant to treat vegetable, flower, and cereal seeds. Also mixed with insecticides for use as seed treatments.

See Orthocide and Stauffer Captan.

Cellu-conc **Darworth**

1.5 percent copper 8 hydroxyquinoline.

Wood preservative for picking boxes, baskets, crates, etc.

Ceresan L **duPont**

2.8 percent methyl mercury 2, 3-dihydroxy propyl mercaptide and 0.62 percent methyl mercury acetate.

A liquid mercury seed treatment for use on small grains, cotton, flax, and safflower. Replaces Ceresan 75, 100, and 200.

Ceresan M **duPont**

7.7 percent ethyl mercury p-toluene, sulfonanilide.

An organic mercury powder used to treat seed of small grain, sorghum, millet, flax, cotton, and seed of some other crops.

See Ceresan M-DB.

Ceresan M-DB **duPont**

Active ingredient same as Ceresan M but is a special formulation for mixing with seed directly in the drill box. Contains 1.93 percent active chemical.

Chipcote 25 **Chipman**

5.41 percent methyl mercury nitrile.

Liquid seed disinfectant for small grain for use in slurry treaters.

Chipcote 75 **Chipman**

1.85 percent methyl mercury nitrile.

Liquid seed disinfectant for small grain for use in mist-type and ready-mix treaters.

chloranil

Tetrachloro-para-benzoquinone.

Used mainly as a seed treatment (protectant) for vegetable and flower seeds. Also used as a foliage spray or dust. Examples: Spergon Seed Protectant (96 percent); Spergon SL Seed Protectant (95 percent); Spergon Wettable (48 percent).

chloropicrin

99 percent trichloronitromethane (tear gas).

A liquid soil fumigant effective against weed and grass seeds, nematodes, soil insects such as wireworms and grubs, and most soilborne disease organisms. One of the few soil treatment chemicals that will effectively control *Verticillium* and *Fusarium* wilt fungi in the soil. Must be injected into the soil. Examples: Larvacide, Picfume.

COCS **Niagara**

See fixed copper.

Cop-o-zinc **Tennessee**

See fixed copper.

copper naphthenate

Liquid wood preservative. Examples: Cuprinol Brown Stain No. 70 (15 percent), Cuprinol Green No. 14 (20 percent). Brush or dip.

copper sulfate (blue vitriol, bluestone)

A blue crystalline chemical sold as Instant Grade Powder, Snow, and small and large crystals. Contains 25 percent metallic copper. Dissolves in water.

Used to make Bordeaux mixture and as a disinfectant for vegetable storage areas, wooden crates, etc. Potato growers use it as a strong copper spray just before harvest to help prevent tubers from becoming infected with the late blight fungus.

copper sulfate, monohydrated

Contains approximately 35 percent metallic copper; used in dusts with lime. Not used to prepare home-mixed Bordeaux mixture.

copper-zinc-chromate

Wettable spray powder and dust for control of fungus leaf spot diseases of vegetables, especially late blight of potatoes.

See Miller 658 Fungicide.

Corona 53 **Pittsburgh Plate Glass**

See fixed copper.

Corosul S **Corona**

95 percent sulfur.

See wettable sulfur.

corrosive sublimate

Mercuric chloride or bichloride of mercury; available as white powder or as large blue tablets, 7.3 grains each. Used as seed treatment or soil drench for certain vegetable and flower seeds when dissolved in water and diluted 1:1,000 to 1:3,000. One 7.3-grain tablet per pint of water or 1 ounce per 7½ gallons of water makes a 1:1,000 solution. *A deadly poison—use with care and caution.*

Highly corrosive to metals.

Creosote

Wood preservative.

Cuprinol Brown Stain No. 70, Cuprinol Green No. 14. **Darworth**

See copper naphthenate.

Cuprinol Clear No. 22 **Darworth**

See zinc naphthenate.

cycloheximide

See Acti-dione and Actispray.

Cyprex 65-W **American Cyanamid**

See dodine.

DBCP (common name)

1,2-dibromo-3-chloropropane. Nematocide. Can be applied to many established plants; sold as solution, emulsifiable concentrate, and granules. Some trade names: Edco Nemadrench 70E (67.2 percent), Fumazone 70E (67.2 percent), Miller 10 percent Nemagon Granules (9.5 percent), Miller Nemagon E. C. #2 (67.2 percent), Nemagon (trade name of Shell), Ortho Nemagon 45 Soil Fumigant (43.5 percent), Stauffer Nemagon 8.6-E (68.1 percent).

D-D **Shell**

1, 3-dichloropropene, 1, 2-dichloropropane and other related chlorinated hydrocarbons; a nematocide for soil fumigation. Example: Shell D-D Soil Fumigant.

Dexon **Chemagro**

p-dimethylaminobenzenediazo sodium sulfonate. 70 percent WP or 5 percent granular. A yellow-brown powder used as a seed and soil treatment for the control of damping-off and root-rotting fungi of the genera *Pythium, Aphanomyces,* and *Phytophthora.* Used on many flowering and other ornamental plants, and on certain vegetable, field, forage, and fruit crops.

dichlone

2, 3-dichloro-1, 4-naphthoquinone.

Yellow powder used as seed treatment (protectant), foliage spray, or dust. Early season use for apple scab and peach and cherry brown rot control.

Sold as Phygon Seed Protectant (50 percent), Phygon XL 50W.

dicloran

2, 6-dichloro-4-nitroaniline.

Soil and foliar fungicide for control of *Botrytis, Stromatinia,* and *Rhizoctonia* on various ornamental plants.

See Botran.

Difolatan — **California Chemical**

See folcid.

dinitro materials

Eradicant fungicides. For delayed dormant applications, use only 19-to 22-percent materials such as Elgetol.

Examples: Elgetol, DN 289.

dinocap

Dinitro (1-methylheptyl) phenyl crotonate and related dinitro derivatives. For control of powdery mildew.

See Karathane Liquid Concentrate and Karathane WD.

disinfectants

Chemicals which actually kill micro-organisms (bacteria and fungi) upon contact. Used as dips, sprays, soil drenches, seed treatments, etc. to eliminate disease-producing organisms from warehouses, bins, crates, machinery, tools, surface of seeds, tubers, corms, plant wounds, and cankers.

Examples: Various mercury compounds, copper sulfate solution, formaldehyde, calcium and sodium hypochlorite, quaternary ammonium compounds.

Dithane D-14 — **Rohm and Haas**

See nabam.

Dithane M-22 — **Rohm and Haas**

See maneb.

Dithane M-22 Special — **Rohm and Haas**

See maneb plus zinc.

Dithane M-45 — **Rohm and Haas**

80 percent WP.

Coordination product of zinc ion and manganese ethylene bisdithiocarbamate, making a spray similar to maneb, but with added zinc ion.

Appears to be at least equal to maneb as a potato fungicide. Apparently less chance of phytotoxic injury on certain plants.

Dithane Z-78 — **Rohm and Haas**

See zineb.

DN 289 — **Dow**

Dinitro-sec-butylphenol, triethanolamine salt 36 percent. An eradicant fungicide.

See dinitro materials.

dodine

n-dodecylguanidine acetate 65 percent WP, also dust formulations. Sold as Cyprex.

A very effective apple scab fungicide; also used to control cherry leaf spot, pear scab, leaf scorch and leaf spot of strawberry, and anthracnose of walnut and sycamore.

Dorlone — **Dow**

78 percent mixed dichloropropenes, 18.9 percent ethylene dibromide.

A liquid nematocide for use in fumigating soils for the control of plant parasitic nematodes.

Dow Methyl Bromide — **Dow**

See methyl bromide.

Dowfume MC-2 — **Dow**

See methyl bromide.

Dowfume W-85 — **Dow**

See ethylene dibromide.

duPont Spreader-Sticker — **duPont**

See spreaders and stickers.

Durawood Clear No. 85 — **Darworth**

See zinc naphthenate.

dusting sulfur

Very finely divided elemental sulfur with a small amount of inert material (talc, pyrophilite, etc.) often added. A good grade of dusting sulfur should pass through a 325-mesh or finer screen.

Used to control foliage diseases, especially powdery mildew.

See sulfur.

Dyrene — **Chemagro**

50 percent 2, 4-dichloro-6-0-chloroanilino-5-triazine.

A wettable powder for spraying ornamentals, turf, certain vegetables such as celery, cucurbits, onions, potatoes, and tomatoes; also certain fruits such as strawberries, cane fruits, and cranberries.

Edco MBX Soil Fumigant — **Edco**

See methyl bromide.

Elcide 73 — **Elanco Division, Eli Lilly**

12 percent sodium ethyl mercuri thiosalicylate.

A liquid fungicide used as a dip or soak treatment for gladiolus corms prior to planting. Not phytotoxic to most gladiolus varieties. Corms may be treated as long as a week prior to planting. *Fusarium* is principal disease organism controlled.

Elegetol — **Niagara**

19 percent sodium dinitro-ortho-cresylate.

See dinitro materials.

Emmi **Velsicol**

10.34 percent n-ethylmercuri-1,2,3,6-tetrahydro-3, 6-methano 3, 4, 5, 6, 7-hexachlorophthalimide.

A liquid fungicide for seed treatment of wheat, oats, barley, and rye to control seed surface-borne smut spores and other disease organisms. Also a very effective chemical for soak treatment of gladiolus corms for control of scab and *Fusarium* yellows or corm rot.

ethylene dibromide (EDB)

Nematocide. Example: Dowfume W-85.

ferbam

Ferric dimethyl dithiocarbamate. 76 percent WP common formulation.

A black fungicide powder used as foliage spray, dust, and soil drench. Effective against several leaf spot diseases including rust, but not late blight of potato and tomato.

Examples: Fermate, Orchard Brand Ferbam, Ortho Ferbam, and Stauffer Ferbam.

Fermate **duPont**

See ferbam.

Filmfast **Allied Chemical**

See spreaders and stickers.

fixed copper

Neutral, insoluble forms of copper compounds. Normally used alone as spray or dust on foliage disease of vegetables, flowers, ornamentals, and trees.

Spray powder formulations normally 45 to 53 percent actual copper, dusts 5 to 7 percent actual copper.

Sold as COCS, Triangle Brand Basic Copper Sulfate, Corona 53, Tribasic Copper Sulfate, Ortho Copper 53, and 530 Spray Copper. Also formulated with zinc and chromium (Miller 568 Copper-zinc-chromate, Tennessee Cop-o-zinc).

On some crops the addition of spray lime is recommended as a safener when using fixed copper fungicides.

folcid

N-(1,1,2-tetrachloroethylsulfenyl)cis-Δ-4-cyclohexene-1, 2, -dicarboximide (trade name: Difolatan).

An 80-percent WP fungicide registered for use on potatoes for early and late blight control.

folpet

N-(Trichloromethylthio) phthalimide.

A wettable powder and dust for foliage disease of fruits, flowers, turf, and ornamentals. Besides several leaf spots, will give fair control of powdery mildew on roses and other flowers and ornamentals.

Formulated as 50 and 75 percent WP and 5 to 7 percent dusts. Sold as: Phaltan 50 W, Stauffer Folpet (Phaltan), Ortho Rose and Garden Fungicide (75 percent).

formaldehyde

37-percent solution of formalin in water and methanol.

Used as disinfectant for seed and soil, and for disinfecting burlap bags, bins, equipment, etc. For smut control on onions.

Fumazone 70E **Dow**

See DBCP.

fused bentonite sulfur

Fungicide. Sulfur fused with bentonite to form wettable sulfur for use as spray material.

See sulfur.

Glyodin **Union Carbide**

2-heptadecyl glyoxalidine acetate.

Liquid fungicide used as spray on fruit trees for control of scab and summer diseases of apple, cherry leaf spot, and certain flower foliage diseases.

Glyoxide **Pittsburgh Plate Glass**

70 percent 2-heptadecylimidazoline.

Wettable powder with the same uses as Glyodin.

Hyamine **Castle, Hopkins, Rohm and Haas**

Disinfectant.

See quaternary ammonium compounds.

hydrated lime

See spray lime.

hypochlorite

Salt of sodium or calcium. Commonly used as household bleach. A disinfectant for tools.

See disinfectants.

Karathane Liquid Concentrate **Rohm and Haas**

37 percent dinitro (1-methylheptyl) phenyl crotonate and 11 percent related dinitro derivatives.

Emulsifiable liquid used as spray for control of powdery mildew on flowers, ornamentals, fruits, and vegetables.

Karathane WD **Rohm and Haas**

22.5 percent dinitro (1-methylheptyl) phenyl crotonate and 2½ percent related dinitro derivatives.

Wettable yellow powder used as spray for control of powdery mildew on flowers, ornamentals, fruits, and vegetables. Also used as ¾ to 1 percent dusts.

Kolker Methyl Bromide — **Kolker**

See methyl bromide.

Kolofog — **Niagara**

See wettable sulfur.

Kromad — **Mallinckrodt**

5 percent cadmium sebacate, 5 percent potassium chromate, 1 percent malachite green, 0.5 percent auramine, 16 percent thiram.

A broad-spectrum turf fungicide.

Larvacide — **Morton**

See chloropicrin.

lime sulfur

See liquid lime sulfur.

liquid lime sulfur

26-to-30-percent solution of calcium polysulfides.

Used mainly as a dormant and delayed-dormant spray on fruits and ornamentals for control of several fungus diseases.

Example: Orthorix Spray.

Magnetic Sulfur — **Stauffer**

See wettable sulfur.

maneb

Manganese ethylene bisdithiocarbamate. A wettable powder fungicide used as foliage spray and dust to control late and early blight of potato and tomato and other leaf spots of potato, tomato, onion, celery, sugar beets, cucurbits, flowers, turf, and others.

Examples: (80 percent WP) Dithane M-22, Manzate. Also formulated as 5 to 10 percent dusts.

maneb plus zinc

80-percent maneb formulation containing zinc. Described as superior to regular maneb under certain conditions.

Examples: Dithane M-22 Special and Manzate D.

Manzate — **duPont**

See maneb.

Manzate D — **duPont**

See Maneb plus zinc.

Mema — **Chipman**

11.4 percent methoxy ethyl mercury acetate. A red liquid used to treat small grain seed.

mercuric chloride

See corrosive sublimate.

Methocel — **Dow**

See methyl cellulose.

methyl bromide

Soil fumigant sold as a liquid in pressurized containers. Controls fungi, nematodes, insects, and annual weeds. Some trade names: Edco MBX Soil Fumigant (26 percent MB); Bromex (15 percent MB); Brozone; Pestmaster Methyl Bromide; Dow Methyl Bromide (100 percent MB); Dowfume MC-2, Kolker Methyl Bromide, Nemaster, Niagara Bed-Fume, Pano-brome C1, Pestmaster Soil Chloro-Fume, Pano-brome C1, Pestmaster Soil Fumigant-1, (98 percent MB, 2 percent Chloropicrin). Also used to fumigate warehouses, grain bins, and other storages.

methyl cellulose

Powder or fiber; used as a sticker in seed treatment and for pelletizing seed. Trade name: Methocel.

Mico-Fume — **Miller**

See Mylone.

Miller 658 Fungicide — **Miller**

95 percent copper-zinc-chromate. (29.6 percent copper; 20.4 percent zinc; 9.7 percent chromium.)

See copper-zinc-chromate.

Morton Soil Drench — **Morton**

2.2 percent cyano (methylmercuri) guanidine. Liquid fungicide used as a soil drench, foliage spray, and dip for the control of damping-off and other diseases.

Mylone — **Union Carbide**

3,5-dimethyltetrahydro-1,3,5, 2H thiadiazine-2-thione. Dry powder soil fumigant. Another trade name: Micro-Fume 25D (25.5 percent).

nabam

Disodium ethylene bisdithiocarbamate. Liquid fungicide; forms zineb fungicide for control of certain plant diseases when combined with zinc sulfate in proper proportions. Generally used as a foliage spray.

Some trade names: (22 percent) Dithane D-14, Niagara Nabam Solution, Ortho Nabam Liquid Fungicide, Parzate Liquid Nabam Fungicide.

Natriphene — **Natriphene**

100 percent sodium orthophenylphenate. Drench, used for the control of damping-off of ornamentals. Used as dip or spray, retards mold development on wooden crates, boxes, warehouse walls. Also see sodium o-phenylphenate.

NDK — **Androc Chemical Company**

See pentachlorophenol.

Nemadrench — **Edco**

See DBCP.

Nemagon — **Shell**

See DBCP.

Nemaster — **Michigan Chemical**

Methyl bromide 68.6 percent, chloropicrin 1.4 percent.

See methyl bromide.

Niacide A — **Niagara**

Fungicide, apple spray. 35 percent ferbam; 24 percent manganous dimethyldithiocarbamate; 6.2 percent thiram; 1.2 percent manganous benzothiazylmercaptide; 1.1 percent 2,2-dithiobisbenzothiazole.

Niacide M — **Niagara**

Fungicide, apple spray. 48 percent manganous dimethyldithiocarbamate; 12.4 percent thiram; 2.4 percent manganous benzothiazylmercaptide; 2,2'-dithiobisbenzothiazole.

Niagara Bed-Fume — **Niagara**

See methyl bromide.

Nu-Film — **Miller**

See spreaders and stickers.

Orchard Brand Mercury Spray — **General Chemical**

10 percent phenyl mercury acetate.
Fungicide.

Orchard Brand Zineb — **General Chemical**

See zineb.

Orchard Brand Ziram — **General Chemical**

See ziram.

Orthocide — **California Chemical**

Captan fungicide.
50 percent WP, Orthocide Garden Fungicide.
See captan.

Orthocide Seed Protectant — **California Chemical**

See captan.

Ortho Copper 53 — **California Chemical**

See fixed copper.

Ortho Lawn and Turf Fungicide — **California Chemical**

Turf spray fungicide; wettable powder. 60 percent folpet, 5 percent cadmium carbonate, 10 percent thiram.

Ortho Nabam Liquid Fungicide — **California Chemical**

See nabam.

Ortho LM Apple Spray — **California Chemical**

Liquid apple spray fungicide. 10.2 methyl mercury 8-hydroxyquinolinate.

Ortho LM Seed Protectant, 2.25 percent

Ortho LM Seed Protectant, Concentrate 7.5 percent — **California Chemical**

Methyl mercury 8-hydroxyquinolinate.
Organic mercury seed treatment fungicide.

Orthorix Spray — **California Chemical**

See liquid lime sulfur.

Ortho Spreader-Sticker — **California Chemical**

See spreaders and stickers.

Ortho Streptomycin Spray — **California Chemical**

Antibiotic; 21 percent streptomycin sulfate.
See streptomycin formulations.

Ortho Zineb Wettable — **California Chemical**

See zineb.

Ortho Ziram — **California Chemical**

See ziram.

Pano-Brome C1 — **Morton**

See methyl bromide.

Panogen 15 Liquid Seed Disinfectant — **Morton**

2.2 percent cyano (methylmercuri) guanidine.
Organic mercury seed treatment fungicide.

Panogen 42 Liquid Seed Disinfectant — **Morton**

6.3 percent cyano (methylmercuri) guanidine.
Organic mercury seed treatment fungicide.

Panogen PX — **Morton**

0.9 percent cyano (methylmercuri) guanidine.
Organic mercury seed treatment for fungicide application.

Panogen Turf Fungicide — **Morton**

Turf spray fungicide; liquid.
2.2 percent cyano (methylmercuri) guanidine.

Panoram — **Morton**

See thiram.

Parzate C — **duPont**

See zineb.

Parzate Liquid Nabam — **duPont**

See nabam.

PCNB (common name)

Penta chloro nitro benzene.

Fungicide used primarily for soil treatment for control of certain disease-causing fungi such as: *Rhizoctonia, Sclerotinia, Botrytis, Plasmodiophora* (clubroot disease), *Streptomyces* (common potato scab), and others. Gives full season control of certain diseases because of long residual effect. Available as 75-percent wettable powder; 10-20-and 40-percent dusts;

and 25-percent emulsifiable concentrate. Trade name: Terraclor.

penta chloro nitro benzene

See PCNB.

pentachlorophenol

Wood preservative, 5-to 10-percent solution, brush or dip. Some trade names: Androc-PCP, Miller PCP-10, NDK-Androc, Pentox. Also sold as a concentrate.

Pestmaster Methyl Bromide — **Michigan Chemical**

See methyl bromide.

Pestmaster Soil Fumigant-1 — **Michigan Chemical**

See methyl bromide.

Phaltan — **California Chemical**

See folpet.

phenol compounds

See disinfectants.

Phix — **Chemley**

22 percent phenyl mercury acetate.

Organic mercury spray fungicide. Wettable powder.

Phygon — **Naugatuck**

See dichlone.

Phytomycin — **Olin Mathieson**

20 percent streptomycin nitrate.

antibiotic

See streptomycin formulations.

Picfume — **Dow**

99 percent chloropicrin.

See chloropicrin.

Plyac — **General Chemical**

See spreaders and stickers.

PMAS — **Cleary**

Organic mercury fungicide.

10 percent phenyl mercury acetate.

Polyram — **Niagara**

Ethylenebis dithiocarbamate zinc and dithiobis (thiocarbonyl) iminoethylene bisdithiocarbamate zinc.

An 80 percent WP registered for use on potatoes for the control of early and late blight. Its range of effectiveness as a foliar fungicide appears to be similar to that of maneb.

Puratized Agricultural Spray — **Niagara**

Organic mercury fungicide.

Phenylmercury triethanol ammonium lactate (7.5 percent).

Puratized Apple Spray — **Niagara**

Organic mercury fungicide.

Phenylmercury monoethanol ammonium lactate (11.5 percent).

quaternary ammonium compounds

Example: Hyamine.

See disinfectants.

Reimer's Solution

See wound and tool disinfectant.

Semesan — **duPont**

30 percent hydroxymercurichlorophenol.

Organic mercury fungicide. A pink wettable powder used as a seed treatment for certain vegetables and flowers, as a bulb and tuber dip, and as a soil drench to control seedling blight and damping-off.

Semesan Bel S — **duPont**

12.5 percent hydroxymercurinitrophenol, 3.8 percent hydroxymercurichlorophenol.

Organic mercury fungicide. A pink wettable powder used as a dip and spray treatment for whole and cut seed pieces of white potatoes and for sweet potatoes.

Setrete — **Cleary**

7 percent phenyl mercuric ammonium acetate.

Organic mercury seed treatment fungicide.

Sol Cop 10 — **Gillette**

A liquid copper fungicide containing 10 percent copper. Registered for use on cucumbers to control angular leaf spot, and on carrots for control of *Alternaria* and *Cercospora* leaf spots.

Sodium o-phenylphenate

97 percent WP; 2- to 40-percent solutions.

Postharvest dip, rinse, or spray treatment for several fruits and vegetables to inhibit mold growth. Also used to treat containers, warehouse walls, etc.

Spray Cop 530 — **Allied Chemical**

See fixed copper.

Spergon — **Naugatuck**

Organic fungicide used as seed treatment and spray.

See chloranil.

spray lime

A special grade of freshly made finely divided calcium hydroxide; used in making Bordeaux mixture, as a dust diluent, and as a safener in certain sprays. It must be fresh and un-

carbonated to be effective. Sometimes called hydrated lime.

spreaders and stickers

Spreaders are materials that reduce the surface tension of sprays causing the sprays to spread out evenly over plant surfaces. This is especially important when spraying plants with waxy coverings, such as onions, gladiolus, and iris. Stickers improve the adhesive properties of sprays and increase the retention on plant surfaces especially during rains.

Spreaders and stickers are usually sold as single materials that provide both spreading and sticking properties to sprays. Some trade names of spreader-stickers are duPont Spreader-Sticker, Nu-Film, Ortho Spreader-Sticker, Plyac Spreader-Sticker, Spread-Rite, Triton B-1956, Castle Superior Spreader, and Filmfast.

Spread-Rite — **Sherwin-Williams**

See spreaders and stickers.

Stauffer Captan — **Stauffer**

See captan.

Stauffer Folpet — **Stauffer**

See folpet.

Stauffer-Thiram — **Stauffer**

See thiram.

Stauffer Zineb — **Stauffer**

See zineb.

sticker for seed treatment and pelletizing

See methyl cellulose.

streptomycin formulations

Antibiotic materials that control some bacterial and fungus diseases. Some trade names are Agrimycin 17, Agri-Strep Type A, Agri-Strep Type D, Ortho Streptomycin Spray, and Phytomycin.

sulfur

A general fungicide. One of the few that controls powdery mildew. Largely replaced by organic fungicides for general plant disease control. May cause injury to plants if applied at temperatures above 80°F. or within 2 weeks of an oil spray. See: dusting sulfur, fused bentonite sulfur, sulfur pastes, and wettable sulfur.

sulfur paste

Fungicide. Paste-type wettable sulfur. Usually 70 percent sulfur. A trade name: Magnetic "70."

See sulfur.

Superior Spreader — **Castle**

See spreaders and stickers.

Tag Fungicide — **California Chemical**

Organic mercury fungicide.

10 percent phenylmercuric acetate.

TC-90 — **Tennessee Corporation**

A new liquid copper fungicide for control of angular leaf spot and powdery mildew of cucumbers. A 48-percent liquid containing 4-percent copper.

Telone — **Dow**

100 percent chlorinated, C3, hydrocarbons. Nematocide.

Terraclor — **Olin Mathieson**

See PCNB.

Tersan OM — **duPont**

45 percent thiram, 10 percent hydroxymercurichlorophenol.

A broad-spectrum turf spray fungicide.

Tersan 75 — **duPont**

Turf fungicide.

See thiram.

Thimer — **Cleary**

75 percent thiram, 3 percent phenyl mercury acetate.

Turf spray fungicide. Wettable powder.

thiram

Tetramethyl thiuram disulfide.

A pink, red, or blue-green powder (or pink pellets) used as a seed and bulb treatment on vegetables, flowers, grasses, legumes, soybeans, sorghum, and corn. Used to control certain turf diseases and as a soil drench. Used as a spray fungicide on apples and strawberries. Seed treatment materials often formulated in combination with insecticides.

Seed treatment materials: Arasan, Panoram, Stauffer Thiram.

Turf Fungicide: Tersan 75.

Spray Fungicide: Thylate.

Thylate — **duPont**

A 65-percent thiram spray fungicide for control of certain leaf spot diseases. Wettable powder.

See thiram.

Triangle Brand Basic Copper Sulfate — **Phelps Dodge**

See fixed copper.

Tribasic Copper Sulfate — **Tennessee**

See fixed copper.

Triton B-1956 — **Rohm and Haas**

See spreader-stickers.

Trizone **Dow**

61 percent methyl bromide, 31 percent chloropicrin, 8 percent 3-bromopropene.

Soil fumigant.

Vapam **Stauffer**

32.7 percent sodium N-methyl dithiocarbamate dihydrate.

A liquid preplanting soil fumigant applied as a soil drench or by injection to kill certain fungi, bacteria, nematodes, weed seeds, and insects. Also used to kill roots between adjacent trees to prevent fungus transmission through root grafts.

VC-13 **Pennsylvania Salt**

75 percent neutral ester of phosphorothioic acid.

A dark liquid used as a soil drench to control nematodes. It is safe to use around some living plants. For control of onion maggot as a soil treatment.

Velsicol 2-1 **Velsicol**

60 percent calomel plus 30 percent corrosive sublimate.

A wettable powder used as a turf spray to control brown patch, dollar spot, snow mold, fairy rings, and toadstools.

Vidden D **Dow**

Liquid nematocide.

1, 3-dichloropropene, 1, 2-dichloropropane and other related compounds.

Vorlex **Morton**

80 percent chlorinated C_3 hydrocarbons including dichloropropenes and dichloropropane and related chlorinated hydrocarbons, 20 percent methyl isothiocyanate.

A liquid soil fumigant for the control of fungi, weeds, nematodes, and soil insects.

VPM **duPont**

32.7 percent sodium N-methyl dithiocarbamate dihydrate.

A liquid preplanting soil fumigant applied as a soil drench or by injection to kill certain fungi, bacteria, nematodes, weed seeds, and insects.

wettable sulfur

Fungicide: finely ground sulfur with a wetting agent. Can be used as dust or spray.

Examples: Corosul S, Kolofog, and Magnetic.

See sulfur.

wound and tool disinfectant

⅛ ounce of cyanide of mercury plus ⅛ ounce of corrosive sublimate in 2 quarts of water.

Used when fire blight cankers are removed near the end of the growing season.

Also called Reimer's Solution.

Zerlate **duPont**

See ziram.

zinc ion maneb

See Dithane M-45.

zinc naphthenate

Liquid wood preservative: brush or dip.

Examples: Durawood Clear No. 85. (10 percent). Cuprinol Clear No. 22 (20 percent).

zinc sulfate

A white powder or crystals used with nabam to form zineb. Sold under a variety of trade names.

zineb

Zinc ethylenebis dithiocarbamate.

A wettable powder or dust for the control of fruit, vegetable, flower, and turf diseases.

See nabam for liquid mix.

Examples: Dithane Z-78, Ortho Zineb Wettable, Parzate C, Stauffer Zineb, Orchard Brand Zineb.

ziram

Zinc dimethyl dithiocarbamate.

Wettable powder or dust for the control of vegetable and fruit diseases.

Examples: Ortho Ziram, Orchard Brand Ziram, Zerlate.


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