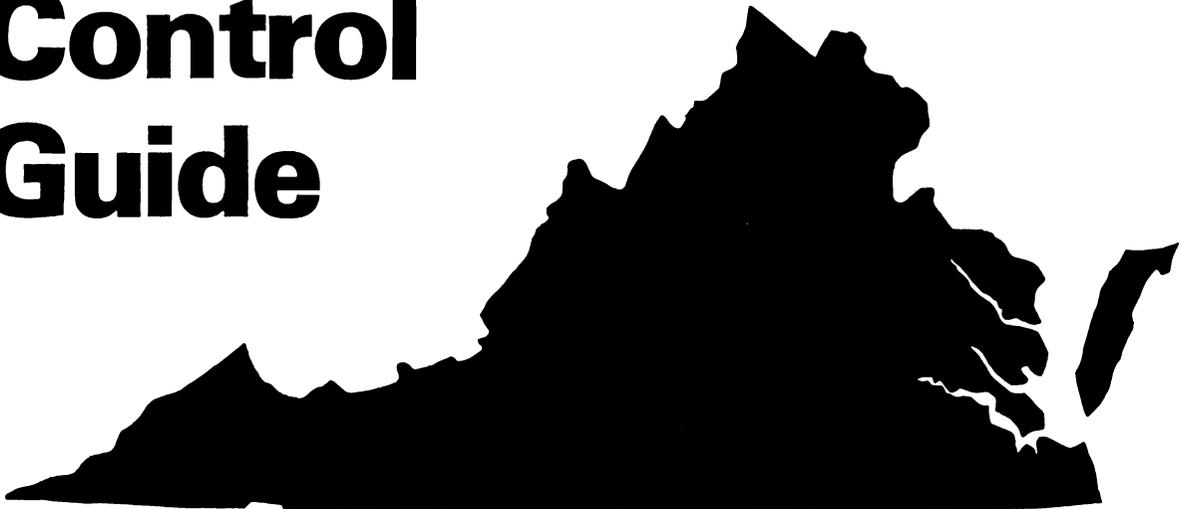


CONTROL SERIES 2  
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**1976  
Virginia  
Plant  
Disease  
Control  
Guide**



EXTENSION DIVISION • VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

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## PURPOSE OF THE GUIDE

The VIRGINIA PLANT DISEASE CONTROL GUIDE is intended to serve as a ready reference to disease control measures for extension agents, growers, custom spray applicators, processors, chemical company representatives and dealers. The programs and chemicals contained in the guide are those that perform most efficiently in Virginia. Where trade names are used, no discrimination is intended and no endorsement by the Cooperative Extension Service is implied.

Recommendations contained herein have been compiled by the authors listed above, and, unless otherwise indicated, apply on a state-wide basis. The guide is revised annually and portions will be printed separately and distributed as spray schedules and information leaflets.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. W. E. Skelton, Dean, Extension Division, Cooperative Extension Service, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061.

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## THE NEW FEDERAL PESTICIDE LAW

On October 21, 1972, the President signed the Federal Environmental Pesticide Control Act of 1972. This law, for the first time, stipulates that farmers and other pesticide applicators are responsible to use only EPA registered pesticides according to the label. "Under the current law, penalties may be levied against a purchaser who misuses pesticides." Penalties now in effect are - "Farmers and other private applicators can be fined up to \$1,000.00 or given 30 days in prison or both upon criminal conviction for a knowing violation of the law."

Also, pesticide salesmen, dealers, commercial applicators and University personnel have a responsibility to use or recommend only EPA registered pesticides according to the label.

Criminal penalties now in effect for a "commercial applicator, wholesaler, dealer, retailer, or other distributor, who knowingly violates the law is liable to a \$5,000.00 civil or \$25,000.00 criminal fine or one year in prison or both."

The EPA's total enforcement program now has a staff of nearly 1,500, roughly five times the staff level when EPA began in December 1970.

In general, the major provision of the 1972 law is - "The use of any registered pesticide in a manner inconsistent with labeling instructions is prohibited, effective immediately. Label directions and precautions on all pesticide products registered for sale are designed to prevent injury to man and environment."

## PROCEDURES THAT ASSURE LEGAL RECOMMENDATIONS FROM VIRGINIA TECH

The College of Agriculture and Life Sciences, Virginia Polytechnic Institute and State University has established the following procedures to assure that only legal and effective pesticides are recommended by the Cooperative Extension Service in Virginia.

*Procedures for Review and Approval of Recommendations for the Use of Fungicides, Bactericides, Viricides, Nematicides, Herbicides, Insecticides, Acaricides, and Adjuvants.*

Areas of Responsibility

The Department of Plant Pathology and Physiology is responsible for the coordination and oversight of research and extension programs for developing and releasing information on the proper use of fungicides, bactericides, viricides, nematicides, herbicides, and adjuvants in the control of plant diseases and unwanted vegetation.

Specific Procedures for Development of Recommendation

The procedures used by the Department of Plant Pathology and Physiology for the development of specific recommendations involving use of the above listed pesticides have been designed to comply with the University policy statement outlined in Research Division Memorandums 69-3-13. All pesticide recommendations are developed in the following sequence.

1. All recommendations for weed and plant disease are prepared by research and extension specialists.
2. Each petition for a pesticide recommendation contains (i) a description of the proposed pest control practice, (ii) references to research data in support of the recommendation, and (iii) evidence that an approved Environmental Protection Agency label has been issued for the candidate chemical and that the proposed recommendation is in conformity with the label description.
3. The above listed information is then submitted to the Extension Project Leader for review by the appropriate departmental researchers and Extension Specialists.
4. When the faculty member certifies efficacy of the recommendation, the Extension Project Leader then indicates his approval by signing a copy of Extension Form 42. He then attaches this form to the recommendation and submits it to the Department Head for his review and approval.

5. Upon approval by the Department Head, the recommendation is then forwarded to the Coordinator of the Virginia Tech Chemical, Drug, and Pesticide Unit for final review for conformity to regulations promulgated by (a) the Environmental Protection Agency and the Virginia Department of Agriculture, and (b) is in agreement with policies established by Virginia Tech.
6. After clearance by the Coordinator, the recommendation is then printed and distributed by the department for use by all Extension Specialists and county personnel.

This procedure provides adequate check points to assure that a recommended pesticide is legal and effective. Research is generally conducted for two years or more on each compound before it becomes a candidate for recommendation. Therefore, when a new pesticide received EPA label it usually can be recommended from Virginia Tech within a day's time. Even though a compound has received EPA label registration it will not be recommended unless research proves that it is effective under Virginia conditions.

Trade and brand names are used only for the purpose of information and the Virginia Cooperative Extension Service does not guarantee nor warrant the standard of the product, nor does it imply approval of the product to the exclusion of others which may also be suitable.

#### KEYS TO PROPER USE OF PESTICIDES

1. Read the label on each pesticide container before each use. Follow instructions to the letter; heed all cautions and warnings, and note precautions about residues.
2. Keep pesticides in the containers in which you bought them. Put them where children or animals cannot get to them, preferably under lock and away from food, feed, seed, or other material that may become harmful if contaminated.
3. Dispose of empty containers in the manner specified on the label.

SEE YOUR DOCTOR IF SYMPTOMS OF ILLNESS OCCUR DURING OR AFTER USE OF PESTICIDES.

TABLE OF WEIGHTS, MEASURES, AND DILUTIONS  
Approximate Rates of Application Equivalents  
(U. S. Measures)

1 ounce per square foot = 2,722.5 pounds per acre  
 1 ounce per square yard = 302.5 pounds per acre  
 1 ounce per 100 square feet = 27.2 pounds per acre  
 1 pound per 100 square feet = 435.6 pounds per acre  
 1 pound per 1,000 square feet = 43.6 pounds per acre  
 1 pound per acre = 1/3 ounce per 1,000 square feet  
 5 gallons per acre = 1 pint per 1,000 square feet  
 100 gallons per acre = 2.5 gallons per 1,000 square feet  
 100 gallons per acre = 1 quart per 100 square feet  
 100 gallons per acre = 2.5 pounds per 1,000 square feet.

## Units of Measure

A teaspoonful (tsp.) or tablespoonful (tbs.), throughout this book refers to a level, standard measuring teaspoon or tablespoon.

80 drops = 1 teaspoonful (tsp.) or approximately 1/6 fluid ounce (fl. oz.)

1 tablespoonful (tbs.) = 3 teaspoonfuls (tsp.) = 15 milliliters (ml.) or cubic centimeters (cc.) = 1/2 fluid ounce (fl. oz.)

1 pint (pt.) = 16 fl. ozs. (Note: 1 pint or quart dry measure is about 16 per cent larger than 1 pint or quart liquid measure.)

1 U. S. gallon = 4 quarts (qts.) = 8 pints (pts.) = 3,785.3 ml. or cc. = 231 cubic inches = 8.3358 lbs. water capacity.

1 liter = 1,000 ml. or cc. = approximately 1 qt., 1 fl. oz. (or 1.08 qts.)

1 pound (lb.) = 16 ozs. = 453.59 grams (gms.)

1 kilogram = 1,000 gms. = approximately 2 lbs. 2 ozs.

1 ounce (oz.) = 28.35 gms.

1 fluid ounce (fl. oz.) = 2 tbs. = approximately 29.6 ml. or cc.

1 bushel of soil = 1.25 cu. ft.

1 mile = 5,280 ft. = 320 rods (rds.) = 1,609.35 meters

1 acre = 43,560 sq. ft. = 160 sq. rds. = 0.404 hectare

10 millimeters (mm.) = 1 centimeter (cm.) = 0.3937 inches

100 centimeters = 1 meter (m.) = 39.37 inches

1 cupful = 16 tbs. = 8 fl. ozs. = 236.6 cc. = 1/2 pint.

## Metric and English Equivalents

## A. Metric System

1 kilogram (kg.) = 1,000 grams (g.) = 2.2 pounds

1 gram (g.) = 1,000 milligrams (mg.) = 0.035 ounce avoirdupois

1 milligram (mg.) = 1,000 micrograms (ug.)

1 liter (l.) = 1,000 milliliters (ml.) = 1.058 fluid quarts

1 milliliter (ml.) = 0.034 fluid ounce

1 milliliter of water weighs 1 gram

1 liter of water weighs 1 kilogram

1 micron = 1/1,000 millimeter

## B. English System

1 gallon = 4 quarts

1 quart = 2 pints = 0.95 liter

1 pint = 16 fluid ounces

1 fluid ounce = 29.6 milliliters

1 pound = 16 ounces avoirdupois = 453.6 grams

1 ounce avoirdupois = 28.35 grams

1 pint of water weighs 1 pound

1 part per million (p.p.m.) = 1 mg. per liter  
 = 1 mg. per kg.  
 = 0.0001 per cent  
 = 0.013 oz. by weight in 100 gallons

1 per cent = 10,000 p.p.m. = 10 g. per liter  
 = 1.29 oz. by weight per gallon  
 = 8 lbs. per 100 gals.

1 gal. water weight 8.337 lbs.

*To change temperature in degrees Centigrade to temperature in degrees Fahrenheit's*

*Multiply Centigrade temperature by 9/5 and add 32°. Example: 30°C. = 30 x 9/5 + 32 = 86°F.*

COMMONLY USED NAME	TOXICITY TO HUMANS	COMMONLY USED NAME	TOXICITY TO HUMANS
Agrimycin	Low	Mercury compounds: inorganic salts; except calomel	Very high
Actidione PM	Low	Mertect	Low
Allyl alcohol	High	Methyl bromide	Very high
Benlate (benomy1)	Low	Mocap	Very high
Binapacryl	Low	Nemacide (VC-13)	Very high
Bravo (Daconil 2787)	Low	Nemacur	Very high
Bromosan	Medium	Nemagon	High
Brozone	Very high	Orthocide	Low
Botran	Low	PCNB (Terraclor)	Low
Cadmium	Very high	Pentachlorophenol	Medium
Captan	Low	Phaltan (Folpet)	Low
Carbon disulfide	Very high	Phenyl mercuric acetate	Very high
Chloropicrin	Very high	Phygon	Low
Cleary 3336	Medium	Polyram	Low
Chloropropene (mixed)	High	Quaternary ammonium compounds	Medium
Copper compounds	Low	Soilbrom	Medium
Dasanit	Very high	Soilfume	Medium
Dikar	Low	Sperlox	Low
DD-Miture	High	Terrazole (ethazol)	Low
Dexon	Low	Terraclor	Low
Dichlone	Low	Thiram	Low
Difolatan	Medium	Terr-O-Cide	High
DiSystem	Very high	Terr-O-Gas	High
Dodine (cyprex)	Low	Truban (ethazol)	Low
Dowfume MC-2	Very high	Tobaz	Low
Dowfume MC-33	Very high	Vapam	High
Du-Ter	Medium	Vitavax (carboxin)	Low
Dyrene	Low	Vorlex	High
Ethylene dibromide	Medium	Vidden D	Medium
Ferbam	Low	Zineb	Low
Fore	Low	Ziram	Low
Formaldehyde	Very high		
Fumazone	Medium		
Fungo	Low		
Furadan	Very high		
Hypochlorites	Medium		
Karathane	Low		
Koban	Low		
Lime sulfur	Low		
Maneb	Low		

## HOW TO COLLECT AND PACKAGE PLANT DISEASE SPECIMENS

The accurate diagnosis of specific plant diseases depends upon several factors. The specimen must arrive at the plant disease clinic in a fresh condition, but just as important, it must also be representative of the symptoms expressed in the field, lawn or yard. Also, the complete description of the area, its history of cultural or chemical practices, and other facts pertinent to the disease occurrence must be supplied in order to facilitate complete diagnosis of the cause.

In the event that air pollution damage is suspected, the possible source(s) and the pollutant should be noted. Particular reference should be made as to geographic location and the distance of the source in relation to the damaged area. When specimens arrive in a crushed, wilted condition, or if they are in advanced stages of decay, diagnosis is often difficult. If non-representative or incomplete specimens (roots, stems, leaves, and soil) are accompanied by insufficient information, accurate diagnosis becomes impossible. After reading the suggestions for proper collection of plant disease specimens as listed below, the specimen should be mailed to:

The Plant Clinic  
 Department of Plant Pathology and Physiology  
 Room 106 Price Hall  
 Virginia Polytechnic Institute and State University  
 Blacksburg, Virginia 24061

## A. Collecting Specimens

1. Collect the whole diseased plant if possible including roots and at least one quart of moist soil. Dig (don't pull) plants with a shovel or trowel.
2. Collect more than one plant if they are showing various stages of decline. COMPLETELY DEAD OR DRY PLANT MATERIAL IS OF NO VALUE. When possible, include healthy plants or plant parts for comparison.
3. If the plant is too large or if removal is not warranted, specimens should be removed from areas of active symptom development, soil and roots should also be collected if a root problem is suspected.

## B. Packaging Plant Specimens

1. Immediately after digging small plants place the moist root ball in a plastic bag and tie the top around the stem just above the soil line. This will prevent the soil from drying during transit. Enclose the tops of the plants in a ventilated plastic bag. Do not wet the tops before packaging.
2. When distinct spots on the leaves are the only symptoms include several leaves wrapped between dry strips of cardboard or in a thin magazine. Do not wrap leaves in wet paper towels. However, enclose a wet paper towel in the plastic sack.
3. Specimens should be packaged in a sturdy container to prevent damage in transit. Avoid exposure to high temperatures. Whenever possible avoid weekend layovers in the post office.
4. Samples collected for insect identification should be sent to the Insect Identification Lab, 312 Price Hall, Virginia Polytechnic Institute and State University.
5. Soil samples for mineral analysis should be sent to the Soil Testing Laboratory, Smyth Hall, Virginia Polytechnic Institute and State University.
6. Samples sent in for variety identification, fertilizer recommendations, pruning instructions, planting, or watering should be sent to the Extension Horticulturist, Virginia Polytechnic Institute and State University.

## TURFGRASS

H. B. Couch, Professor, Plant Pathology  
W. W. Osborne, Extension Specialist, Plant Pathology

DISEASE	TURFGRASS	CHEMICAL <sup>1/</sup>	RATE 1000 SQ. FT. <sup>2/</sup>	SEASON & INTERVAL OF APPLICATION
FAIRY RINGS	All turfgrasses	Methyl bromide fumigation OR Prolonged water soaking of soil		Consult Extension Agent, Agriculture for procedures
FUSARIUM BLIGHT <sup>3/</sup> ( <i>F. roseum</i> )	Bentgrasses Bluegrasses esp. Merion Kentucky Fescues Ryegrasses	Fungo 50 WP 50% OR Tersan 1991 WP 50% OR Spot Kleen WP 70%	6 oz. 6 oz. 6 oz.	Bentgrasses & Fescues April - September 1 application only Bluegrasses July - August 1 application only
HELMINTHOSPORIUM DISEASES		<i>Select from this list for control of any of the Helminthosporium diseases</i>		
(a) Melting-Out ( <i>H. vagans</i> )	Kentucky Bluegrass Ryegrasses Tall fescue	Acti-dione--Thiram  OR	2-4 oz.	April - June 7-14 days
(b) Zonate Eyespot ( <i>H. giganteum</i> )	Bentgrasses Bluegrasses Bermudagrass Fescues Ryegrasses	Captan WP 50%  OR Daconil 2787 WP 75%	4-6 oz.  4 oz.	July - August 7-14 days
(c) Helminthosporium Leaf Spot ( <i>H. sorokinianum</i> )	Bentgrasses Bluegrasses, Fescues Ryegrasses	OR Dyrene WP 50%	4-6 oz.	July - August 5-7 days
(d) Red Leaf Spot ( <i>H. erythrospilum</i> )	Bentgrasses	OR Fore WP 80%	4 oz.	April - August 5-7 days
(e) Helminthosporium Blight ( <i>H. dictyoides</i> )	Fescues Ryegrasses	OR Zineb WP 75%	2-4 oz.	April - June 5-7 days
(f) Brown Blight ( <i>H. siccans</i> )	Ryegrasses Fescues			April - June 7-14 days
(g) Leaf Blotch ( <i>H. cynodontis</i> )	Bermudagrass			April - June 7-14 days

<sup>1/</sup> Denotes either chemical, coined name of the material, or representative trade name.

<sup>2/</sup> Except where indicated, all materials should be applied in 4-5 gal. water per 1000 square feet. Lower rates are to be used in preventive programs; higher rates are to be used in corrective programs.

<sup>3/</sup> Apply fungicides for Fusarium blight control in 10 gallons of water per 1000 square feet.

# Turfgrass

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DISEASE	TURFGRASS	CHEMICAL	RATE 1000 SQ. FT.	SEASON & INTERVAL OF APPLICATION
PYTHIUM BLIGHT <sup>4/</sup> ( <i>P. aphanidermatum</i> and <i>P. ultimum</i> )	Bentgrasses Bluegrasses Ryegrass Bermudagrasses Fescues Zoysia	Koban WP 35% OR Terrazole WP 35% OR Tersan SP WP 65% OR Zineb WP 75%	4 oz. 4 oz. 4 oz. 2-4 oz.	July - September 5-7 days
RHIZOCTONIA BROWN PATCH ( <i>Rhizoctonia solani</i> )	Bentgrasses Bluegrasses Bermudagrass Fescues Ryegrasses St. Augustinegrass Zoysia	Acti-dione--Thiram OR Daconil 2787 WP 75% OR Dyrene WP 50% OR Fore WP 80%	2-4 oz. 4 oz. 4-6 oz. 4 oz.	July - August 5-7 days
RUST ( <i>Puccinia graminis</i> f. <i>sp. agrostis</i> ) ( <i>Puccinia coronata</i> ) ( <i>Puccinia zoysae</i> )	Bluegrasses esp. Merion Kentucky Ryegrass, Manhattan Zoysia	Acti-dione--Thiram OR Acti-dione TGF OR Zineb WP 75%	2-4 oz. 2 oz. 2-4 oz.	July - August 7-14 days
STRIPE SMUT <sup>4/</sup> ( <i>Ustilago striiformis</i> )	Bentgrasses Bluegrasses esp. Merion Kentucky Meadow Fescue Red Top Ryegrass	Fungo 50 WP 50% OR Tersan 1991 WP 50% OR Spot Kleen WP 70%	6 oz. 6 oz. 5 oz.	1 application in October or early spring before grass growth begins
SCLEROTINIA DOLLAR SPOT ( <i>S. homoeocarpa</i> )	Bentgrasses Bluegrasses Bermudagrass Ryegrasses Fescues Zoysia	Acti-dione--Thiram OR Bromosan WP 66.7% OR Cleary 3336 WP 50% OR Daconil 2787 WP 75% OR Dyrene WP 50% OR Fungo 50 WP 50% OR Spot Kleen WP 70% OR Tersan 1991 WP 50%	2-4 oz. 4 oz. 2 oz. 2-4 oz. 2 oz. 1 oz. 1 1/2 oz. 1 oz.	Late June - October 5-10 days 3 applications only 3 applications only 5-10 days 5-10 days 5 applications only 4 applications only 5 applications only
SNOW MOLDS Fusarium Patch ( <i>F. nivale</i> ) Typhula Blight ( <i>T. itoana</i> )	Bentgrasses Bluegrasses Bermudagrass Ryegrasses Fescues Zoysia	Dyrene WP 50% OR Tersan SP WP 65%	4-6 oz. 6-9 oz.	Fall to Spring 6 weeks

<sup>4/</sup> Apply fungicides for control of Pythium blight and stripe smut in 10 gallons of water per 1000 square feet.

DISEASE	TURFGRASS	CHEMICAL	RATE 1000 SQ. FT.	SEASON & INTERVAL OF APPLICATION
NEMATODES				Mix 1 pint of (Nemagon 12.1 EC or Fumazone 86E) with 10 to 15 gallons of water and drench 1000 sq. ft. of turf. Water turf immediately after application to insure penetration of nematicide into soil and to prevent toxic effects. Treat turf in spring and/or in fall when soil temperature is above 55°F. Aerifying turf before nematicide application improves results. This treatment is for professional use only. Do not graze treated areas. Do not feed clippings to livestock. Do not apply to newly seeded areas. <u>Bentgrass</u> : Use 3/4 pint of chemical. CAREFULLY FOLLOW MANUFACTURERS' INSTRUCTIONS.
				Apply Mocap (5 lbs. of 10% granule) or Nematicur (3 lbs. of 15% granule) uniformly on established turfgrass--immediately apply 1/2 inch water to the turf. Do not use in newly seeded areas. For use only by professional turfmen--do not apply on home lawns. Do not apply more than twice per year. Birds and other wildlife may be killed in treated areas. Mocap - approved for use on Bermuda, Zoysia, St. Augustine, and Centipede grass. <u>Nematicur</u> - approved for use on Bermuda, Centipede, bluegrass and bentgrass. CAREFULLY FOLLOW MANUFACTURERS' INSTRUCTIONS.

VOLUME MEASURE CONVERSION TABLE FOR USE IN PREPARING SMALL QUANTITIES OF FUNGICIDE SPRAY<sup>5/</sup>

FUNGICIDE	WEIGHT	TABLESPOONS	OR	CUPS
Actidione PM	1 oz.	4		1/4
	2 oz.	8		1/2
	3 oz.	12		3/4
Acti-dione TGF	1 oz.	3		1/4
Acti-dione--Thiram	4 oz.	22		1 1/3
Benomyl WP 50% (Benlate or Tersan 1991)	2 oz.	11		3/4
	4 oz.	22		1 1/3
Captan Captan 50W	4 oz.	15		1
	6 oz.	23		1 1/2
Orthocide 50W	2 oz.	6		1/3
	4 oz.	12		3/4
	6 oz.	18		1 1/8
Daconil 2787 WP 75%	2 oz.	11		3/4
	4 oz.	22		1 1/3
Dyrene WP 50%	4 oz.	19		1 1/4
	6 oz.	28		1 3/4
Spot Kleen	1 1/2 oz.	3		
	5 oz.	15		2/3
	6 oz.	18		3/4
Fore WP 80%	4 oz.	14		1
	6 oz.	21		1 1/3
Koban	4 oz.	17		1 1/8
Terraclor WP 75%	2 1/4 oz.	8		1/2
	4 1/2 oz.	15		3 1/2
Zineb Dithane Z-78	2 oz.	9		1/2
	4 oz.	18		1 1/8

<sup>5/</sup> The bulk density of fungicidal formulations varies somewhat. Obviously, the type of diluent used, whether or not the package is fluffed up or allowed to settle, will influence the weight per volume. For this reason, volume measurements are not as accurate as weight measurements. They should be used for preparing small quantities of fungicide spray--and then only if a scale is not available.

# NEMATODE CONTROL

*W. W. Osborne*  
*Professor and Extension Specialist, Plant Pathology*

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"DESPITE THE USE OF BILLIONS OF POUNDS OF PESTICIDES ON MILLIONS OF ACRES OF CROP-  
LAND, DAMAGE TO WILDLIFE HAS BEEN RELATIVELY INSIGNIFICANT AND IN THE VAST MAJORITY  
OF CASES, UNDETECTABLE."

--A SYMPOSIUM ON PEST CONTROL AND WILDLIFE RELATIONSHIPS--NATIONAL ACADEMY OF  
SCIENCES--NATIONAL RESEARCH COUNCIL

# Nematodes

## INTRODUCTION

Plant parasitic nematodes are minute worms that feed on plant roots, stems, leaves, buds and flowers. There are over 60 nematode genera containing over 2,000 species which are parasitic on plants. Nematodes seldom kill plants; however, they are capable of greatly curtailing plant growth, quality and yield.

This nematode control guide outlines the latest recommendations for the control of plant parasitic nematodes in Virginia. These recommendations are based on investigations carried out by Research and Extension divisions of Virginia Polytechnic Institute and State University. Recommended chemicals have been registered and labeled for use by the United States Department of Agriculture.

Additional information on chemical aspects of plant parasitic nematodes and their control may be obtained from your local Cooperative Extension Agent, Agriculture or the author - W. Wyatt Osborne, Extension Specialist, Plant Pathology, and Professor of Plant Pathology, Department of Plant Pathology and Physiology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061.

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NEMATODE ASSAY AND CONTROL SERVICE: Nematode control by chemicals, crop rotation, or resistant varieties depends upon a positive identification of nematode species involved in each nematode disease situation. For this reason, the Plant Disease Clinic in the Plant Pathology and Physiology Department at Virginia Polytechnic Institute and State University provides a Nematode Assay Service to aid in nematode identification and control recommendations. Contact your County Cooperative Extension Service Office for information on methods of collecting and handling plant and soil samples for nematode assay.

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## CHEMICAL APPLICATION PROCEDURES

(1) NON-FUMIGANT NEMATOCIDES: Non-fumigant type nematocides, such as Mocap, Furadan, Nemacur, Vydate and others do not turn into a gas and move through soils as do soil fumigants. They must be incorporated into soil to protect the plant roots. Granular non-fumigant nematocides do not require a waiting period between chemical application and transplanting or seeding a crop. Also, soil temperature is not a limited factor when applying non-fumigant type nematocides.

(2) SOIL FUMIGANTS: Fumigation of soil in the fall should not be attempted if the soil contains undecomposed crop residues. Fumigants will not adequately penetrate and kill nematodes in undecomposed crop debris. Spring treatment with soil fumigants generally produces the best results in Virginia.

Follow these simple steps when applying soil fumigants: (A) Work crop remains into soil so they are well decomposed before treatment. (B) Deep tillage to a depth of 12 inches or more is essential, break up all clods and loosen soil thoroughly. (C) At time of treatment, the soil should be in good seedbed condition, with a temperature between 50°F and 80°F at the five-inch level and with adequate moisture for good seed germination. (D) Use a fertilizer containing at least 30% of the nitrogen in the nitrate form to avoid nitrogen deficiency. (E) Soil fumigants used for field application should be injected to a depth of 8 inches. (F) CONSULT LABEL FOR ADDITIONAL INFORMATION.

## PEANUTS

NEMATODES CONTROLLED	NEMATOCIDE AND FORMULATION	APPLICATION RATE PER ACRE (12" BAND) <sup>1/</sup>	RELATIVE CHEMICAL EFFEC-TIVENESS <sup>2/</sup>	METHODS AND TIME OF CHEMICAL APPLICATION	PRECAUTIONS AND REMARKS
NORTHERN ROOT-KNOT	Mocap 10G	30 lbs. --	Excellent	Apply at time of planting	Mocap - No restriction on feeding vines.
PEANUT ROOT-KNOT	Furadan 10G	25 lbs. --	Excellent	Apply on a 12-inch wide band with a granular application centered over the row and incorporate 4 inches deep for nematode control	
STING	Temik 10G	30 lbs. --	Excellent		
ROOT-LESION	Temik 10G	20 lbs. --	Good		
	Nemacur 15G	10 lbs. --	Good		
	Dasanit 15G	25 lbs. --	Poor		

NEMATODES CONTROLLED	NEMATICIDE AND FORMULATION	APPLICATION RATE PER ACRE (12" Band) <sup>1/</sup> (OVERALL)	RELATIVE CHEMICAL EFFEC-TIVENESS	METHODS AND TIME OF CHEMICAL APPLICATION	PRECAUTIONS AND REMARKS	
NORTHERN ROOT-KNOT PEANUT ROOT-KNOT STING ROOT-LESION (CONT'D.)	Terr-o-cide 15*	3 Gal.	--	Excellent	Apply at time of planting Soil Fumigants - inject 6 to 8" deep in the center of the row at time of planting. *(Terr-o-cide 15 controls nematodes and fungi which cause early pod rot).	Furadan - Do not feed treated forage to dairy animals or animals being finished for slaughter. Temik - Do not make more than one application at planting time per crop. Do not harvest any nuts within 90 days of application. Do not plant any crops not on the label in treated soil within 100 days of last application. Do not use in home gardens. Do not allow livestock to graze or hogs to root in treated fields. Do not feed peanut hay or vines to livestock.
	Nemagon 12.1 EC	3 Qt.	--	Excellent		
	Fumazone 86 E	3 Qt.	--	Excellent		
	Soilbrom 40	2 Gal.	--	Excellent		
	Oxy BBC 12 E	3 Qt.	--	Excellent		
	Soilbrom 90 EC	.75 Gal.	1.5 Gal.	Excellent	Apply preplant	
	Soilbrom 85	1 Gal.	3 Gal.	Excellent	Soil Fumigants - Row or overall treatment inject 6 to 8" deep and seal.	
	Dowfume W 85	1 Gal.	3 Gal.	Excellent	(Chemicals with * control nematodes and early pod rotting fungi)	
	Terr-o-cide 30*	5 Gal.		Excellent		
	Terr-o-cide 15D*	8 Gal.	16 Gal.	Good		
	Telone C*	5 Gal.		Good		
	Terr-o-cide 30D*	8 Gal.	16 Gal.	Good		

ADDITIONAL METHODS OF (OVERALL) FUMIGANT APPLICATION:

1. DBCP (Nemagon or Fumazone) and EDB (Dowfume, Soilbrom) may be applied using the plowsole method. Apply the fumigant with a gravity flow applicator when deep plowing land prior to planting. Allow one outlet to apply the fumigant into each furrow just before soil is turned. In this way the "lead" fumigant outlet will apply the fumigant into the "lead" furrow. Do not apply in last open "trailing" plow furrow as evaporation will occur before equipment makes another round. Follow plow immediately with a disk and drag to seal the soil surface. Use (overall) fumigant rates listed above.

2. DBCP (Nemagon 12.1 EC or Fumazone 86 E) tank mixed with herbicides for (overall) broadcast preplant application, and disk into soil. The Emulsifiable Concentrate can be mixed with herbicides such as Balan or Vernam, sprayed on the soil surface and IMMEDIATELY disked into soil as deep as possible. Use 8 quarts DBCP per acre of formulations listed above.

THIS APPLICATION METHOD DOES NOT PLACE THE FUMIGANT AS DEEP AS THE INJECTION APPLICATION METHOD AND THEREFORE, IS NOT AS EFFECTIVE. SOME FARMERS WITH LOW NEMATODE POPULATIONS USE THIS METHOD FOR CONVENIENCE. HOWEVER, OUR RESEARCH SHOWS THIS METHOD IS RELATIVELY INEFFECTIVE WHERE NEMATODES ARE A PROBLEM.

(TRADE AND BRAND NAMES are used only for the purpose of information and the Virginia Cooperative Extension Service does not guarantee nor warrant the standard of the product, nor does it imply approval of the product to the exclusion of others which may also be suitable.)

Nemacur - Do not feed treated vines or hay. Do not hog down treated peanut field. Do not replant treated areas with food crop not specified on this label within 12 months after last application. Do not graze cover crops during the 12 month period following chemical application. They must be plowed under. Dasanit - Do not feed hay or vines to livestock. Do not apply more than 7.0 pounds actual per acre per crop year where subsequent treatments as an insecticide are to be made. Terr-o-cide, Soilbrom, Dowfume, Telone, Fumazone, Nemagon, Oxy BBC Formulations - Do not feed, sell or introduce into commerce hay or hulls taken from treated soil. Forage crops grown on treated soil should not be used as feed for dairy animals or animals being finished for slaughter until 2 years after row treatment or 3 years after overall treatment.

<sup>1/</sup> Research shows that a 12 inch wide band is effective and the most economical for nematode control.  
<sup>2/</sup> Chemical effectiveness is determined in research plots in Virginia. This rating is based on recommended rates and application methods.  
<sup>3/</sup> Chemical designated with \* are soil fumigant nematicides plus the fungicide chloropicrin for early phase pod rot control  
Residue Tolerance (ppm) = Mocap- 0.02; Furadan- 0.1 peanuts, 1.0 hulls; Dasanit- 5.0 hulls, 0.05 nuts; Nemagon, Fumazone, OXY--50; Terr-o-cide, Dowfume, Soilbrome--25; Temik- 0.05 Kernals, 0.5 hulls

# Nematodes

SOYBEANS					
NEMATODES CONTROLLED	NEMATICIDE AND FORMULATION	APPLICATION RATE PER ACRE 12" BAND OVER ROW	RELATIVE CHEMICAL EFFEC-TIVENESS	METHOD AND TIME OF CHEMICAL APPLICATION	PRECAUTIONS AND REMARKS
NORTHERN ROOT-KNOT PEANUT ROOT-KNOT SOUTHERN ROOT-KNOT SOYBEAN CYST STING STUBBY-ROOT ROOT-LESION SPIRAL LANCE	MOCAP 10% NEMACUR 15%  FUMAZONE 86E OXY BBC 12E NEMAGON 12.EC	20 lbs. 10 lbs.  1 gal. 1 gal. 1 gal.	Excellent Excellent  Excellent Excellent Excellent	Apply at time of planting on a 12" wide band over the row and incorporate in soil surface.  Apply at time of planting 8" deep using a single colter or chisel in front and 1" to the side of the planter sword.	MOCAP - Residue Tolerance .02 on beans, forage, hay <u>Treated crop can be fed to livestock</u> NEMACUR - Do not feed or graze soybean vines. Do not replant treated areas with any food crop not specified on the label within 12 months after last application. Any cover crops that are planted during the 12 month period must be plowed under and not grazed FUMAZONE, OXY BBC, NEMAGON - Do not graze treated areas or feed plant remains (forage or hay) to meat or dairy animals. Do not sell such plant parts or otherwise introduce them into commerce.

Residue Tolerance P.P.M.

THINK! IS THIS THE PROPER DOSAGE?

READ! WHAT DOES THE LABEL SAY?

TOBACCO  
(Field Treatments)

NEMA- TODES CON- TROLLED	NON-FUMIGANT NEMATICIDE AND FORMULATION	BROADCAST APPLICATION RATE PER ACRE	RELATIVE CHEMICAL EFFECTIVENESS AGAINST			METHODS OF CHEMICAL APPLICATION	MINI- MUM WAIT- ING PERIOD (DAYS)	PRECAUTIONS AND REMARKS
			OSBORNES CYST	SOUTHERN ROOT-KNOT	ROOT LESION			
(LISTED IN COLUMN III)	MOCAP (10G)	60 lbs.	Excellent	Excellent	Excellent	Incorporate Broadcast and Bed Rows	None	<u>MOCAP only is recommended for control of the Osborne's cyst nematode. Granular non-fumigant nematocides must be applied uniformly, incorporated by cross disking and then shape beds. <u>FURADAN</u> - excessive rates will produce plant injury. (Flue-cured only) <u>VYDATE</u> - excessive rates in transplant water will cause plant abnormality early in the season. <u>READ AND FOLLOW LABELS OF ALL MATERIALS.</u></u>
	MOCAP PLUS (15G)	60 lbs.	Excellent	Excellent	Excellent	Incorporate Broadcast and Bed Rows	None	
	MOCAP (EC-6)	5 qts.	Excellent	Excellent	Excellent	Incorporate Broadcast and Bed Rows	None	
	FURADAN (10G)	60 lbs.	--	Excellent	Good	Incorporate Broadcast and Bed Rows	None	
	*DASANIT (15G)	65 lbs.	Poor	Fair	Poor	Incorporate Broadcast and Bed Rows	None	
	DASANIT (E-6)	4 qts.	Poor	Fair	Poor	Incorporate Broadcast and Bed Rows	None	
	DASANIT (7.5) + DISYSTON (7.5)	54 lbs.	Poor	Poor	--	Incorporate Broadcast and Bed Rows	None	
	VYDATE L	2 Gals.	--	Good	Good	Rotary tilled 6" deep in an 18" band	None	
VYDATE L	1 1/4-2 pts.	--	Good	Good	Placed in transplant- ing water	None		
<hr/>								
	<u>FUMIGANT NEMATICIDE AND FORMULATION</u>							
	D-D	20 Gal.	Good	Good	Good	inject 8" deep with	21	*Terr-o-cide 15, Terr-o-cide 15D, Terr-o-cide 30 and Telone C are combinations of soil fumigant nematicides plus the fungicide chloropicrin.
	VIDDEN-D	20 Gal.	Good	Good	Good	Broadcast equipment	21	
	*TERR-O-CIDE 15	12 Gal.	Poor	Good	Poor	same	21	
	*TERR-O-CIDE 15D	20 Gal.	Good	Good	Good	same	21	
	*TERR-O-CIDE 30	15 Gal.	Poor	Good	Poor	same	21	
	*TELONE C	16 Gal.	Good	Good	Good	same	21	
	SOILBROM 85	4.5 Gal.	Poor	Excellent	Poor	same	21	
	DOWFUME - W 85	4.5 Gal.	Poor	Excellent	Poor	same	21	
	TELONE	16 Gal.	Good	Good	Good	same	21	
	SOILBROM 40	16 Gal.	Poor	Good	Poor	same	21	

\*Dasanit - Do not apply this product with a knapsack or similar equipment that is placed on the users body.

USE CHEMICALS SAFELY--FOLLOW LABEL DIRECTIONS

# Nematodes

## TOBACCO (PLANT BED TREATMENT)

NEMATODES CONTROLLED	NEMATICIDES AND FORMULATION	APPLICATION RATE/100 SQUARE YDS.	REMARKS
Effective against all nematodes and most soil borne diseases of Tobacco	DOWFUME MC-2	9 lbs.	Prepare seedbed as you would for seeding. You must use an air tight cover. Treat at soil temperature above 50°F. (For soil temperature less than 50°F, consult Virginia Polytechnic Institute and State University Extension mimeograph MR-241 "Rapid seedbed treatment with methyl bromide"). Expose to fumigation for 24-48 hours. Aerate for 2 days before seeding.
	BROM-O-GAS	9 lbs.	
	BROZONE	10 lbs.	Inject chemical to a depth of 5 to 8 inches below soil surface. Use an air tight cover. Do not treat soil if temperature is below 45°F at the five inch level. Expose to fumigation for 24-48 hours. Aerate for 2 days before seeding.
	VORLEX	4 qts.	Inject or incorporate chemical to a depth of 5 inches and cover with plastic immediately. Treatment should be at least 4 weeks before seeding. Remove cover at least one week prior to seeding and work soil lightly. Aerate by cultivating and delay planting 7 days for each 23 pounds active used per acre.
	VAPAM	1.5 gal.	Inject chemical to a depth of 5 inches at rate of 1.5 gal. in 40 gal. water per 100 square yards. Cover area immediately with plastic. After removing plastic--cultivate soil lightly and wait 7-14 days prior to planting in treated area.
	DOWFUME MC-33	7.23 lbs.	Prepare seedbed as you would for seeding, crop residues should be worked into soil and allowed time to decompose before treating. Soil temperature should be between 50°F and 80°F at the 5 inch level. Treated soil must be sealed immediately after application by rolling or cultipacking and covered immediately with gas tight plastic. Aerate 7-14 days prior to planting.

## COTTON

NEMATODES CONTROLLED	NEMATICIDES	APPLICATION RATE/ACRE (36" ROWS)	RESIDUE TOLERANCE (ppm) IN SEED	REMARKS
ROOT-KNOT LANCE	NEMAGON 12.1 EC	.75 gal.	25	<u>Apply at time of planting with a single shank per row.</u> Chemical should be injected to a depth of 8 inches. Place chisel in front of and one inch to side of the planter sword.
	FUMAZONE 86E	.75 gal.	25	
	OXY BBC 12E	.75 gal.	25	

## VEGETABLE CROPS

### SWEET POTATO

NEMATODES CONTROLLED	NEMATICIDES	APPLICATION RATE PER ACRE (36" ROW) (OVERALL)	RESIDUE TOLERANCE (PPM)	NUMBER OF FEET ONE PINT PER CHISEL WILL TREAT	REMARKS
ROOT-KNOT LANCE SPIRAL RENIFORM STING	MOCAP (10% granular)	30 lbs. --	.02	---	<u>Apply chemical 14 days prior to transplanting.</u> Make application in a band 16 inches wide on the row 2 to 3 weeks before planting. Mix Mocap with top 4 to 6 inches of soil right after application.

SWEET POTATO (CONT'D.)

NEMATODES CONTROLLED	NEMATICIDES	APPLICATION RATE PER ACRE (36" ROW) (OVERALL)	RESIDUE TOLERANCE (PPM)	NUMBER OF FEET ONE PINT PER CHISEL WILL TREAT	REMARKS
ROOT-KNOT LANCE SPIRAL RENIFORM STING	VIDDEN-D	13.2 gal. 20 gal.	None established	272	<u>Apply chemical 14 days prior to transplanting. Row Treatment:</u> Use 2 chisels spaced 12 inches apart per row. <u>Apply chemical to a depth of 10 inches. Overall treatment:</u> Space chisels 12 inches apart and inject chemical 10 inches deep.
	D-D	13.2 gal. 20 gal.	None established	272	
	TELONE	10.6 gal. 16 gal.	None established	340	
	DOWFUME W-85	3.0 gal. 4.5 gal.	50	1,210	
	SOILBROME 85	3.0 gal. 4.5 gal.	50	1,210	

IRISH POTATO, PEPPER AND EGPLANT

NEMATODES CONTROLLED	NEMATICIDES	APPLICATION RATE PER ACRE (36" ROW) (OVERALL)	RESIDUE TOLERANCE (PPM)	NUMBER OF FEET ONE PINT PER CHISEL WILL TREAT	REMARKS
ROOT-KNOT STING ROOT- LESION SPIRAL	D-D	6.6 gal. 20 gal.	None established	272	<u>Apply chemical 14 days prior to planting. Row treatment:</u> Use one chisel centered in the row. <u>Apply chemical to a depth of 10 inches. Overall treatment:</u> Space chisels 12 inches apart and inject chemicals 10 inches deep.
	VIDDEN-D	6.6 gal. 20 gal.	None established	272	
	TELONE	5.3 gal. 16 gal.	None established	340	

TOMATO

NEMATODES CONTROLLED	NEMATICIDES	APPLICATION RATE PER ACRE (36" ROW) (OVERALL)	RESIDUE TOLERANCE (PPM)	NUMBER OF FEET ONE PINT PER CHISEL WILL TREAT	REMARKS
ROOT-KNOT SPIRAL ROOT- LESION	D-D	8 gal. 20 gal.	None established	272	<u>Apply chemical 14 days prior to transplanting. Row treatment:</u> Use 2 chisels spaced 12 inches apart per row. <u>Apply chemical to a depth of 10 inches. Prepare a slight list to mark the row. Overall treatment:</u> Space chisels 12 inches apart and inject chemical 10 inches deep.
	VIDDEN-D	8 gal. 20 gal.	None established	272	

# Nematodes

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## TOMATO (CONT'D.)

NEMATODES CONTROLLED	NEMATOCIDE	APPLICATION RATE PER ACRE (60" ROW) (OVERALL)	RESIDUE TOLERANCE (PPM)	NUMBER OF FEET ONE PINT PER CHISEL WILL TREAT	REMARKS
ROOT-KNOT SPIRAL ROOT- LESION	DASANIT (15% Granule)	100 lbs.	0.1		<u>Broadcast (overall) treatment:</u> Apply specified dosage as a uniform broadcast application and incorporate into soil 4 to 6 inches deep by disking or with other suitable tilling equipment. Plant crop in usual manner.
	TELONE	6.6 gal. 16 gal.	None established	340	<u>Apply chemical 14 days prior to transplanting. Row treatment:</u> Use 2 chisels spaced 12 inches apart per row. Apply chemical to a depth of 10 inches. Prepare a slight list to mark the row. <u>Overall treatment:</u> Space chisels 12 inches apart and inject chemical 10 inches deep.
	DOWFUME W-85	1.8 gal. 4.5 gal.	50	1,210	<u>Apply chemical 14 days prior to transplanting. Row treatment:</u> Use 2 chisels spaced 12 inches apart per row. Prepare a slight list to mark the row. <u>Overall treatment:</u> Space chisels 12 inches apart and inject chemical 10 inches deep.
	SOILBROME 85	1.8 gal. 4.5 gal.	50	1,210	

## SUMMER SQUASH, CUCUMBER

NEMATODES CONTROLLED	NEMATOCIDE	APPLICATION RATE PER ACRE (60" ROW) (OVERALL)	RESIDUE TOLERANCE (PPM)	NUMBER OF FEET ONE PINT PER CHISEL WILL TREAT	REMARKS
ROOT-KNOT SPIRAL STING LANCE ROOT- LESION	NEMAGON 12.1 EC	.8 gal. 1.75 gal.	25	2,720	<u>Preplant:</u> If preplanting application is made, wait 7 days before planting. Use overall application with chisels spaced 12 inches apart and inject chemical 10 inches deep. <u>At time of planting or post plant treatment:</u> Use row treatment with 2 chisels spaced 12 inches apart per row. Inject chemical 8 to 10 inches deep. Do not feed plant remains to livestock.
	FUMAZONE 86E	.8 gal. 2.0 gal.	25	2,720	
	OXY BBC 12E	.8 gal. 2.0 gal.	25	2,720	
	D-D	8 gal. 20 gal.	None established	272	<u>Apply 14 days prior to seeding. Row treatment:</u> Use 2 chisels spaced 12 inches apart per row. Apply chemical 10 inches deep. <u>Overall treatment:</u> Space chisels 12 inches apart and apply chemical 10 inches deep.
	VIDDEN-D	8 gal. 20 gal.	None established	272	
	TELONE	6.6 gal. 16 gal.	None established	340	<u>Apply 14 days prior to seeding. Row treatment:</u> Use 2 chisels spaced 12 inches apart per row. Apply chemical 10 inches deep. <u>Overall treatment:</u> Space chisels 12 inches apart and apply chemical 10 inches deep.
	SOILBROME 85	1.8 gal. 4.5 gal.	50 (for squash)	1,210	<u>Apply 14 days prior to seeding. Row treatment:</u> Use 2 chisels spaced 12 inches apart per row. Apply chemical 10 inches deep. <u>Overall treatment:</u> Space chisels 12 inches apart and apply chemical 10 inches deep.
	DOWFUME W-85	1.8 gal. 4.5 gal.		1,210	

## CANTALOUPE

NEMATODES CON- TROLLED	NEMATOCIDE	APPLICATION RATE PER ACRE (72" ROW) (OVERALL)		RESIDUE TOLERANCE (PPM)	NUMBER OF FEET ONE PINT PER CHISEL WILL TREAT	REMARKS
ROOT-KNOT	NEMAGON	.66 gal.	2.0 gal.	50	2,720	<u>At time of planting or post plant application:</u> Use 2 chisels spaced 12 inches apart per row and inject chemical 10 inches deep. Do not feed plant remains to livestock.
STING	12.1 EC					
ROOT- LESION	FUMAZONE	.66 gal.	2.0 gal.	50	2,720	
SPIRAL	86E					
	OXY BBC	.66 gal.	2.0 gal.	50	2,720	
	12E					
	VIDDEN-D	6.6 gal.	20 gal.	None established	272	<u>Apply 14 days prior to seeding. Row treatment:</u> Use 2 chisels spaced 12 inches apart per row. Apply chemical 10 inches deep. <u>Overall treatment:</u> Space chisels 12 inches apart and apply chemical 10 inches deep.
	D-D	6.6 gal.	20 gal.	None established	272	
	TELONE	5.3 gal.	16 gal.	None established	340	

## GREEN PEAS, LIMA BEANS AND ASPARAGUS

NEMATODES CON- TROLLED	NEMATOCIDE	APPLICATION RATE PER ACRE (36" ROW) (OVERALL)		RESIDUE TOLERANCE (PPM)	NUMBER OF FEET ONE PINT PER CHISEL WILL TREAT	REMARKS
ROOT-KNOT	VIDDEN-D	6.6 gal.	20 gal.	None established	272	<u>Apply chemical 10 to 14 days prior to seeding. Overall treatment:</u> Space chisels 12 inches apart and inject chemical 10 inches deep. <u>Row treatment:</u> Apply chemical with one chisel per row. Mark row to identify treated area.
SPIRAL	D-D	6.6 gal.	20 gal.	None established	272	
ROOT- LESION						
	TELONE	5.3 gal.	16 gal.	None established	340	<u>Apply chemical 10 to 14 days prior to seeding. Overall treatment:</u> Space chisels 12 inches apart and inject chemical 10 inches deep. <u>Row treatment:</u> Apply chemical with one chisel per row. Mark row to identify treated area.

## SNAPBEANS AND CARROTS

NEMATODES CON- TROLLED	NEMATOCIDE	APPLICATION RATE PER ACRE (36" ROW) (OVERALL)		RESIDUE TOLERANCE (PPM)	NUMBER OF FEET ONE PINT PER CHISEL WILL TREAT	REMARKS
ROOT-KNOT	NEMAGON	.75	--	75	2,720	Do not feed plant parts to livestock. <u>Row treatment:</u> Apply at time of planting. Place a single chisel in front of and one inch to the side of the planter sword. Apply chemical 8 inches deep. Do not feed plant remains to livestock
ROOT- LESION	12.1 EC					
SPIRAL	FUMAZONE	.75 gal.	--	75	2,720	
STING	86E					
	OXY BBC	.75 gal.	--	75	2,720	
	12E					
	D-D	6.6 gal.	20 gal.	None established	272	<u>Apply chemical 14 days prior to transplanting. Row treatment:</u> Use chisel centered in the row. Apply chemical to a depth of 10 inches. Seed in center of treated area. <u>Overall treatment:</u> Space chisels 12 inches apart and inject chemical 10 inches deep.
	VIDDEN-D	6.6 gal.	20 gal.	None established	272	

# Nematodes

## SNAPBEANS AND CARROTS (CONT'D.)

NEMATODES CONTROLLED	NEMATOCIDE	APPLICATION RATE PER ACRE (36" ROW) (OVERALL)	RESIDUE TOLERANCE (PPM)	NUMBER OF FEET ONE PINT PER CHISEL WILL TREAT	REMARKS
ROOT-KNOT ROOT-LESION SPIRAL STING	TELONE	5.3 gal. 16 gal.	None established	340	<u>Apply chemical 14 days prior to transplanting.</u> <u>Row treatment:</u> Use chisel centered in the row. Apply chemical to a depth of 10 inches. Seed in center of treated area. <u>Overall treatment:</u> Space chisels 12 inches apart and inject chemical 10 inches deep.

## CABBAGE, BROCCOLI, BRUSSEL SPROUTS AND CAULIFLOWER

NEMATODES CONTROLLED	NEMATOCIDE	APPLICATION RATE PER ACRE (36" ROW) (OVERALL)	RESIDUE TOLERANCE (PPM)	NUMBER OF FEET ONE PINT PER CHISEL WILL TREAT	REMARKS
ROOT-KNOT ROOT-LESION SPIRAL STING STUBBY-ROOT	NEMAGON	.66 gal. 1.75 gal.	50	2,720	<u>Apply as a preplant or time of planting application.</u> <u>Row treatment:</u> If preplanting treatment is made, wait 7-14 days before planting. Apply with one shank centered in row to a depth of 10 inches. <u>Overall treatment:</u> Space shanks 12 inches apart and to a depth of 10 inches. Do not feed plant remains to livestock.
	12.1 EC				
	FUMAZONE	.66 gal. 2.0 gal.	50	2,720	
	86E				
	OXY BBC	.66 gal. 2.0 gal.	50	2,720	
	12E				
	D-D	6.6 gal. 20 gal.	None established	272	<u>Apply 14 days or more prior to transplanting.</u> <u>Row treatment:</u> Apply with one shank centered in row to a depth of 10 inches.
	VIDDEN-D	6.6 gal. 20 gal.	None established	272	<u>Overall treatment:</u> Space shanks 12 inches apart and to a depth of 10 inches.
	TELONE	5.3 gal. 16 gal.	None established	340	

## SPINACH, KALE, COLLARDS

NEMATODES CONTROLLED	NEMATOCIDE	APPLICATION RATE PER ACRE (36" ROW) (OVERALL)	RESIDUE TOLERANCE (PPM)	NUMBER OF FEET ONE PINT PER CHISEL WILL TREAT	REMARKS
ROOT-KNOT SPIRAL STING STUBBY-ROOT	D-D	6.6 gal. 20 gal.	None established	272	<u>Apply 14 days or more prior to transplanting.</u> <u>Row treatment:</u> Apply with one shank centered in row to a depth of 10 inches. <u>Overall treatment:</u> Space shanks 12 inches apart and to a depth of 10 inches.
	VIDDEN-D	6.6 gal. 20 gal.	None established	272	
	TELONE	5.3 gal. 16 gal.	None established	340	

## SMALL FRUIT

STRAWBERRIES*, BLACKBERRIES, BOYSENBERRIES, DEWBERRIES, LOGANBERRIES AND RASPBERRIES					
NEMATODES CON- TROLLED	NEMATICIDE	APPLICATION RATE PER ACRE (36" ROW) (OVERALL)	RESIDUE TOLERANCE (PPM)	NUMBER OF FEET ONE PINT PER CHISEL WILL TREAT	REMARKS
ROOT- KNOT SPIRAL RING STUBBY- ROOT ROOT- LESION STYLET	NEMAGON 12.1 EC	1.32 gal. 2.0 gal.	25	2,720	<u>Preplant, time of planting, or post plant application.</u> For preplant use, wait 7 days before planting. <u>Row treatment:</u> Use 2 chisels spaced 12 inches apart per row. Inject chemical to a depth of 10 inches. <u>Overall treatment:</u> Space chisels 12 inches apart and apply chemical 10 inches deep. ALLOW 55 DAYS BETWEEN TREATMENT AND HARVEST.
	FUMAZONE 86E	1.32 gal. 2.0 gal.	25	2,720	
	OXY BBC 12E	1.32 gal. 2.0 gal.	25	2,720	
	D-D	13.2 gal. 20 gal.	None established	272	
	VIDDEN-D	13.2 gal. 20 gal.	None established	272	
TELONE	10.6 gal. 16 gal.	None established	340		

\*(Tolerance on strawberries 10 ppm)

STRAWBERRIES					
NEMATODES CON- TROLLED	NEMATICIDE	APPLICATION RATE PER ACRE (36" ROW) (OVERALL)	RESIDUE TOLERANCE (PPM)	NUMBER OF FEET ONE PINT PER CHISEL WILL TREAT	REMARKS
Control of Soil- Borne Fungus and Nematode Diseases)	TERR-O-GAS 67 Dowfume MC-33	---- 350 lbs./A	30	---	Prepare seedbed as you would for seeding, crop residues should be worked into soil and allowed time to decompose before treating. Soil temperatures should be between 50°F and 80°F at the 5 inch level. Treated soil must be sealed immediately after application by rolling or cultipacking and covered immediately with gas tight plastic. Aerate 14 days prior to setting transplants in treated areas.

"DESPITE THE USE OF BILLIONS OF POUNDS OF PESTICIDES ON MILLIONS OF ACRES OF CROPLAND, DAMAGE TO WILDLIFE HAS BEEN RELATIVELY INSIGNIFICANT AND IN THE VAST MAJORITY OF CASES, UNDETECTABLE."

--A SYMPOSIUM ON PEST CONTROL AND WILDLIFE RELATIONSHIPS--NATIONAL ACADEMY OF SCIENCES--NATIONAL RESEARCH COUNCIL

# Nematodes

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## ORNAMENTALS AND TURFGRASS

Procedures for collecting and handling samples for nematode assay. When nematode damage is suspected, an examination of plant roots, soil (a quart from around roots) and, with certain plants, above ground plant parts are necessary to determine accurately the specific nematode problem and control measures. (a) When sampling woody ornamentals - Remove and discard 2 inches of soil surface from root area. Take sample from root zone area and include some roots. (b) Samples from herbaceous or annual plants - Send entire plant if possible including roots and a quart of soil from around roots. Samples from turfgrass should contain grass roots and soil to a depth of 4 to 6 inches.

Plant tolerance to various chemicals - The last page of this section contains a listing of nursery plants reported as TOLERANT and MODERATELY TOLERANT to NEMAGON or FUMAZONE. Any plant not listed should be treated at a low dosage level--and on a small scale until plant tolerance is determined. Do not apply either material to carnations, chrysanthemums, or dwarf palms.

### ORNAMENTALS (Small area treatment to soil around established plants) (POSTPLANT APPLICATION)

NEMATODES CONTROLLED	NEMATICIDE	APPLICATION RATES	REMARKS
ROOT-KNOT ROOT-LESION SPIRAL STING RING STUNT STUBBY-ROOT STYLET CYST SHEATH LANCE DAGGER	NEMAGON 12.1 EC FUMAZONE 86E OXY BBC 12E	1/2 to 1 teaspoon per square yard of soil depending upon plant species tolerance	<u>Tolerant Plant Species:</u> (1) Punch holes 1 foot apart and 10 inches deep in soil around plants in the root zone area. (2) Prepare a diluted emulsion by mixing 1 teaspoon of Nemagon 12.1 EC or Fumazone 86E per gallon of water. (3) With sprinkling can, drench the area with one gallon of this dilute emulsion per square yard (3' x 3'). Sprinkle plants and treated area with water from garden hose to further wash chemical to root zone. (4) Press hole opening closed to prevent escape of fumigant (wear rubber boots). Soil temperature should be between 55 and 80°F. Apply in spring and fall. <u>Moderately tolerant species:</u> Use 1/2 teaspoon (Nemagon 12.1 EC or Fumazone 86E or Oxy BBC 12E) per gallon of water. <u>Safety precautions:</u> Wear rubber boots and follow manufacturer's instructions.

### (Small area treatment to seedbed without plants) (PREPLANT APPLICATION)

NEMATODES CONTROLLED	NEMATICIDE	APPLICATION RATES	REMARKS
All Nematodes Most Soil-Borne Diseases	DOWFUME MC-2 BROM-O-GAS	1 lb. per 100 square feet 1 lb. per 100 square feet	To obtain best results - plow or spade area to a 12 inch depth, prepare soil until it is free of clods and in good seedbed condition. Introduce chemical under a gas tight cover over area being treated. FOLLOW MANUFACTURERS INSTRUCTIONS.

### (Large area field or seedbed treatment)

NEMATODES CONTROLLED	NEMATICIDE	APPLICATION RATES	REMARKS
All Nematodes Most Soil-Borne Diseases (Soil Disinfectant)	DOWFUME-MC-33	350 lbs. per acre for overall treatment.	<u>Apply as a preplant application:</u> This treatment is effective against nematodes and other soil-borne pests. Treated area must be immediately covered with a plastic film. A mechanical applicator and plastic tarp layer is available for seedbed and field treatment: FOLLOW MANUFACTURERS INSTRUCTIONS.

ORNAMENTALS (CONT'D.)  
(Large area field or seedbed treatment)

NEMATODES CONTROLLED	NEMATICIDE	APPLICATION RATES	REMARKS
<u>PREPLANT APPLICATION</u>	VORLEX	40 to 60 gal. per acre for overall treatment.	<u>Apply as a preplant application:</u> This treatment is effective against nematodes and other soil-borne pests. Treated area must be immediately covered with a plastic film. A mechanical applicator and plastic tarp layer is available for seedbed and field treatment: FOLLOW MANUFACTURERS INSTRUCTIONS.
ROOT-KNOT SPIRAL ROOT-LESION STUNT STING STUBBY-ROOT STYLET	VAPAM	1.5 gal. in 40 gal. water per 100 square yards overall treatment	<u>Apply as a preplant application:</u> This treatment is effective against nematodes and other soil-borne pests. Treated area must be immediately covered with a plastic film. A mechanical applicator and plastic tarp layer is available for seedbed and field treatment: FOLLOW MANUFACTURERS INSTRUCTIONS.
CYST SHEATH LANCE DAGGER	D-D VIDDEN-D	30 gal. per acre overall treatment	<u>Apply preplant only:</u> <u>Overall application:</u> Apply 14 days prior to seeding planting in treated area. Inject chemical to a depth of 10 inches through chisels spaced 12 inches apart. Seal surface immediately with a roller or cultipacker to prevent rapid escape of soil fumigant. FOLLOW MANUFACTURERS INSTRUCTIONS.

TURFGRASS  
(PREPLANT APPLICATION)

NEMATODES CONTROLLED	NEMATICIDE	APPLICATION RATES PER 100 SQUARE YARDS	REMARKS
ROOT-KNOT LANCE SPIRAL ROOT-LESION STING STUBBY-ROOT DAGGER STUNT	DOWFUME MC-33 BROM-O-GAS	7.23 lbs. 9 lbs.	Prepare seedbed as you would for seeding. Crop residue should be worked into soil and allowed time to decompose before treating. Soil temperature should be between 50°F and 80°F at the 5 inch level. Treated soil must be sealed immediately after application by rolling or cultipacking and covered immediately with gas tight plastic.
	DOWFUME-MC-2	9 lbs.	Prepare seedbed as you would for seeding. Treat at soil temperature above 50°F under air tight cover. CAREFULLY READ AND FOLLOW MANUFACTURERS INSTRUCTIONS.
	VORLEX	4 qts.	Inject or incorporate chemical to a depth of 5 inches and cover with plastic immediately. Treatment should be at least 4 weeks before seeding. Remove cover at least one week prior to seeding and work soil lightly.
	VAPAM	1.5 gal.	Inject chemical to a depth of 5 inches at the rate of 1.5 gal. in 40 gal. water per 100 square yards. Cover area immediately with plastic. Remove cover at least one week prior to seeding and work soil lightly.

(POSTPLANT APPLICATION)

NEMATODES CONTROLLED	NEMATICIDE	APPLICATION RATES PER 1,000 SQUARE FEET	REMARKS
ROOT-KNOT LANCE SPIRAL ROOT-LESION STING STUBBY-ROOT DAGGER STUNT	NEMAGON 12.1 EC FUMAZONE 86E MOCAP (10% Granule) NEMACUR (15% Granule)	1 pint 1 pint 5 lbs. 3 lbs.	Mix 1 pint of (Nemagon 12.1 EC or Fumazone 86E) with 10 to 15 gallons of water and drench 1,000 sq. ft. of turf. Water turf immediately after application to insure penetration of nematicide into soil and to prevent toxic effects. Treat turf in spring and/or in fall when soil temperature is above 55°F. Aerifying turf before nematicide application improves results. This treatment is for professional use only. Do not graze treated areas. Do not feed clippings to livestock. Do not apply chemical to newly seeded areas. <u>Bentgrass:</u> Use 3/4 pint of chemical, CAREFULLY FOLLOW MANUFACTURERS INSTRUCTIONS.

TURFGRASS (CONT'D.)  
(POSTPLANT APPLICATION)

NEMATODES CONTROLLED	NEMATICIDE	APPLICATION RATES PER 1,000 SQUARE FEET	REMARKS
ROOT-KNOT LANCE SPIRAL ROOT-LESION STING STUBBY-ROOT DAGGER STUNT	MOCAP (10% Granule) NEMACUR (15% Granule)	5 lbs. 3 lbs.	Apply Mocap or Nematicur uniformly on established turfgrass - immediately apply 1/2 inch water to the turf. Do not use in newly seeded areas. For use only by professional turfmen - do not apply on home lawns. Do not apply more than twice per year. Birds and other wildlife may be killed in treated areas. <u>MOCAP</u> - approved for use on Bermuda, Zoysia, St. Augustine, and Centipede grass. <u>NEMACUR</u> - approved for use on Bermuda, Centipede, bluegrass and bentgrass. CAREFULLY FOLLOW MANUFACTURERS INSTRUCTIONS.

ORNAMENTALS  
(Field treatment to soil around established plants)

NEMATODES CONTROLLED	NEMATICIDE	Application rate - gal/A for designated row spacings:					cc* per 400 foot of row per chisel	REMARKS
		3 ft.	4 ft.	5 ft.	6 ft.	7 ft.		
ROOT-KNOT	NEMAGON 12.1 EC	2	1.5	1.2	1	.86	312	FOR TOLERANT PLANT SPECIES: AT TIME OF PLANTING OR POST PLANT TREATMENT:** Use 2 chisels per row and in such a manner as to treat both sides of the row, with chisel injection lines six inches from stem of plant on each side of plant. Use a narrow chisel and seal opening made by chisel with a press wheel or similar sealing device. Inject chemical to a 10 inch depth.
ROOT-LESION	FUMAZONE 86E	2	1.5	1.2	1	.86	312	
SPIRAL	OXY BBC 12E	2	1.5	1.2	1	.86	312	
LANCE STUBBY-ROOT STUNT STYLET DAGGER RING STING	NEMAGON 12.1 EC FUMAZONE 86E OXY BBC 12E	1.32 1.32 1.32	1.0 1.0 1.0	.8 .8 .8	.66 .66 .66	.55 .55 .55	208 208 208	FOR MODERATELY TOLERANT PLANT SPECIES: At time of planting or post plant treatment. Use 2 chisels per row in such a manner as to treat both sides of the row. Chisel injection lines should be six inches from stem of plant on each side of the row. Use a press wheel or similar sealing device. Inject chemical to a 10 inch depth.

\*\*Refer to page 19 for plant species which are tolerant and moderately tolerant to Nemagon or Fumazone.

\*A cubic centimeter (cc) is a unit of liquid measure. Some conversion units are: 1 teaspoon = 5 cc; 1 cup = 237 cc; 1 pint = 463 cc; 1 quart = 946 cc; and 1 gallon = 3,785 cc. Baby milk bottles and prescription bottles are usually marked with cc units and are useful in measuring fumigants.

USE CHEMICALS SAFELY--FOLLOW LABEL DIRECTIONS

## TOLERANT SPECIES

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Ajuga	Cherry, Mahaleb	Hibiscus	Pilea
African violet	root stock	Hypercium	Pine, white
Aglaonema	Columbine	Ilex rotundifolia	Pittsporom, Vari.
Amaryllis	Coreopsis	Holly	Plum
Anchusa	Crab apple	Incarvillea	Pothos
Andromeda	Crepe myrtle (purple)	Lavandula	Polygonium distorum
Apple	Croft lily	Ligustrum-Privit	Potentialla
Ardisia japonica	Cryptanthus	Lilly of the Valley	Protocarpus
Arrowwood	Daisy	Locust, seedlings	Pyrethrum, seed
Asclepias	Dianthus grenadin	Macrophylum	Rudbeckia
Ash	Decentra	Maple, red	Sansevieria
Asparagus fern	Diffenbachia	Maranta	Schefflera
Astilbe	Dogwood, white	Mountain Ash	Sedum
Azalea	Dracaena	Naphthytis	Spirea
Barberry Red Leaf & Dwarf	Elm	Oak, live	Springs-lilac
Buxus harlandi	Evonymus Vegetus	Oak, Northern Red	Sweet pea (perennial)
Boxwood	Exochorda	Oak, White	Taxus
Buxus japonica	Fatshedera	Pachysandra	Tritoms
Boxwood	Firethorn	Pansy	Violet
Calanthea	Forget-me-nots	Peach	Weigelia
Callistemon rigidus	Funkia	Pear	Yew, Japanese
Bottle Brush	Gypsophilum	Peony	Zinna
Caryopteria	Heliopsis	Peperomia	
Centranthus	Hellebrous	Periwinkle	
	Hemlock	Philodendron	

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## MODERATELY TOLERANT SPECIES

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Artemesia	Echinops	Magnolia grandiflora	Rosa
Blueberry	Forsythia	Magnolia soulangeana	(Var. Dr. Huey)
Camellia, japonica	Gardenia fortuniana	Phlox	Rosa
(Var. Pink Perfection)	(Var. Mystery)	Pine, slash	(Var. Countess Vandal)
(Var. Shell Pink)	Gardenia jasminoides	Polygoneum distorum	Rosa
Camellia Sasanqua	(Florida, August Bearty)	Phrethrum, plants	(Var. Isobel Harkness)
(Var. Elizabeth)	Geum	Rosa fortuneana	Stantolina
Campanula	Gladiolus	(Var. Happiness Rose)	Vinca
Chrysanthemum	Lythrum	Rosa sp.	
Delphinium		(Var. Jiminy Cricket)	

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## NURSERY ORNAMENTS

R. C. Lambe, *Extension Specialist, Plant Pathology*  
R. E. Baldwin, *Plant Pathologist*

Fungicides and bactericides play an important part in the prevention of ornamental and flower diseases. They do not take the place of cultural control methods, but should be used to complement them. In some disease situations there are no effective chemicals available. Several fungicides have been dropped from this guide because the manufacturer did not secure EPA registration. Many of these have been used for many years and were safe and efficacious. However, only the chemicals that have been tested under Virginia conditions are recommended.

Most fungicides on the market protect woody shrubs and flowers against diseases. This protection is accomplished by preventing plant pathogens from becoming established. Systemic fungicides are therapeutic and eradicate pathogens that are already established. Because chemicals are subject to weathering and degradation, they must be reapplied to the soil or container or susceptible plant parts at regular intervals as long as the danger of plant disease exists. Protectants must be reapplied more frequently than systemic ones. Tolerance to systemic chemicals will develop more rapidly if applied more frequently than recommended treatment intervals are used or rates in excess of registration applied.

In every instance the manufacturer's label should be read carefully and attention should be directed particularly to the safety measures listed on the label regarding mixing, handling, compatibility with other chemicals, and applying fungicides. It is always essential that the user familiarize himself with the antidote given on the label. In many instances the addition of a surfactant will improve retention of the chemical.

Additional information on cause and symptoms of common ornamental diseases may be found in Virginia Extension Division leaflets in the control series. Copies of these leaflets can be obtained from the county cooperative extension office.

PLANT	DISEASE	FUNGICIDE AND FORMULATION	ACTIVE INGREDIENT	RATE/100 GAL. (UNLESS OTHERWISE STATED)	REMARKS
Ajuga	<u>Sclerotium</u> rot	Terraclor (75% WP)	PCNB	2 lbs./1000 sq. ft. OR 2 1/2 lbs./300 gal. water	Dust or drench on soil surface before planting and thoroughly work into the top 2 inches of soil.
Arborvitae	<u>Phomopsis</u> needle and twig blight	Benlate (50% WP)	benomyl	1 lb.	Begin application at budbreak and repeat at 7 day intervals throughout the growing season. See Control Series 118.
Azalea (Rhododendron)	<u>Cylindrocladium</u> root rot	Benlate (50% WP)	benomyl	1 lb. (apply 1 pt./6" container)	Drench on the surface of growing medium to prevent disease development. Repeat at 2-4 wk. interval during disease pressure period. See MR-NN-36.
	<u>Exobasidium</u> leaf and flower gall				No fungicide registered. Hand pick infected leaves.
	<u>Ovulinia</u> petal blight	Benlate (50% WP) OR Dithane Z-78 (75% WP) OR Fore (80% WP)	benomyl  zineb  mancozeb	1 lb.  1 lb.  1 1/2 lb.	Apply Benlate when flowers start to show color & at 5 day intervals. Spray with mancozeb, or zineb 3 times each week during bloom. See Control Series 116.

PLANT	DISEASE	FUNGICIDE AND FORMULATION	ACTIVE INGREDIENT	RATE/100 GAL. (UNLESS OTHERWISE STATED)	REMARKS
Azalea (Rhododendron) (Cont'd.)	Phomopsis die-back				Prune out all diseased branches.
	<u>Phytophthora</u> root and crown rot	Dexon (35% WP)	diazoben	10 tsp./5 gal. water	Apply to 20 sq. ft. of area. Follow with additional water to allow penetration to 3-5 inches. Repeat every 10-14 days. See Control Series 90.
		OR Terrazole (35% WP) OR Truban (30% WP)	ethazol ethazol	8 oz. 8 oz.	
	Powdery mildew	Benlate (50% WP)	benomyl	1/2 lb.	Spray at 10-14 day intervals beginning when disease first appears. See MR-34.
	<u>Septoria</u> leaf spot	Benlate (50% WP)	benomyl	1 lb.	Repeat benomyl 10-14 day intervals throughout the growing season.
Camellia	Leaf gall				No fungicide registered. Hand pick infected leaves.
	<u>Sclerotinia</u> flower blight	Terraclor (75% WP)	PCNB	1 cup in enough water to give thorough coverage of 100 sq. ft.	Drench soil surface in late December or early January. See Control Series 99.
Carnation	<u>Alternaria</u> blight	Dithane Z-78 (75% WP)	zineb	1 1/2 lb.	Spray at 7 day intervals.
		OR Fore (80% WP)	mancozeb	1 1/2 lb.	
		OR Phaltan (75% WP)	folpet	1 lb.	
Cedar (See under Arborvitae)	<u>Phomopsis</u> needle and twig blight				

Nursery Ornamentals

PLANT	DISEASE	FUNGICIDE AND FORMULATION	ACTIVE INGREDIENT	RATE/100 GAL. (UNLESS OTHERWISE STATED)	REMARKS	
Chrysanthemum	<u>Ascochyta</u> ray blight	Benlate (50% WP)	benomyl	1 lb.	Apply first spray just before flower color show and at 7 day intervals. Apply at 10-14 day intervals.	
		OR Daconil 2787 (75% WP)	chlorothalonil	1 lb.		
		OR Daconil 2787 Flowable Fungicide (6F)	chlorothalonil	1 1/2 pt.		
		<u>Botrytis</u> blight	Benlate (50% WP)	benomyl	1/2 lb.	Spray every 10-14 days under normal weather.
		Leaf rust				No fungicides registered.
		<u>Pythium</u> root rot	Dexon (35% WP)	diazoben	10 tsp./5 gal. water	Drench plants and growing media at 10-14 day intervals.
			Terrazole (35% WP)	ethazol	4-6 oz. bedding plants	Retreat bedding plants at 4-8 week intervals. Retreat container plants at 4-12 week intervals.
	OR Truban (30% WP)		ethazol	3-4 oz. bedding plants 3-10 oz. container plants 8 oz. container plants		
	Powdery mildew	Actidione PM (0.027%)	cycloheximide	6 1/4 lb.	Spray cycloheximide when disease first appears at 7 day intervals throughout growing season. Spray benomyl at 10-14 day intervals.	
		OR Benlate (50% WP)	benomyl	1/2 lb.		
	<u>Septoria</u> leaf spot	Benlate (50% WP)	benomyl	1 lb.	Apply at weekly intervals when new shoot growth begins. Cover lower leaf surface completely. Apply benomyl at 10-14 day intervals.	
		OR Dithane Z-78 (75% WP)	zineb	1 1/2 lb.		
		OR Phaltan (75% WP)	folpet	1 lb.		
Crabapple	Cedar-apple rust	Dithane Z-78 (75% WP)	zineb	1 lb.	Starts as flower buds open and spray 3 times at 10-day intervals. See Control Series 128.	
		OR Fore (80% WP)	mancozeb	1 1/2 lb.		
	Fire blight	Agri-Strep OR Streptomycin ag. compd.	streptomycin sulfate	1/2 lb. (100 ppm)	Apply at early midseason and late flowering.	

PLANT	DISEASE	FUNGICIDE AND FORMULATION	ACTIVE INGREDIENT	RATE/100 GAL. (UNLESS OTHERWISE STATED)	REMARKS
Crabapple (Cont'd.)	Scab	Benlate (50% WP)	benomyl	1 lb.	Spray weekly from budbreak until 2 weeks after petal fall. Spray benomyl on 10-14 day schedule. See Control Series 89.
		OR Cyprex (65% WP)	dodine	1/2 lb.	
		OR Fore (80% WP)	mancozeb	1 1/2 lb.	
		OR Phaltan (50% WP)	folpet	2 lb.	
Crape Myrtle	Powdery mildew	Actidione PM (0.027% WP)	cyclo- heximide	6 1/4 lb.	Spray as flower buds break and repeat at 7 day intervals during growing season.
		OR Benlate (50% WP)	benomyl	1/2 lb.	Spray as flower buds break and repeat at 10-14 day intervals during growing season. See MR-34.
Cyclamen (See Chrysanthemum <u>Botrytis</u> leaf blight above)					
Dahlia (See under Azalea)	Powdery mildew				
Dogwood	<u>Botrytis</u> petal blight (See Chrysanthemum)				
	<u>Septoria</u> leaf spot	Benlate (50% WP)	benomyl	1 lb.	Spray at 10-14 day intervals beginning at budbreak. See Control Series 107.
	Spot anthracnose leaf and flower blights				No fungicide can be recommended. See Control Series 109.
Euonymus	Powdery mildew	Actidione PM (0.027% WP)	cyclo- heximide	6 1/4 lb.	Apply cycloheximide at 7 day intervals and benomyl at 10-14 day intervals during growing season. See MR-34.
		OR Benlate (50% WP)	benomyl	1/2 lb.	
Geranium (See Chrysanthemum above)	<u>Botrytis</u> leaf blight				
Gladiolus	<u>Botrytis</u> leaf blight	Benlate (50% WP)	benomyl	1/2 lb.	Spray every 7-10 days during normal weather, every 2-3 days during wet periods.
		OR Fore (80% WP)	mancozeb	1 1/2 lb.	
		OR Mertect 140-F	TBZ	16 oz.	

# Nursery Ornamentals

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PLANT	DISEASE	FUNGICIDE AND FORMULATION	ACTIVE INGREDIENT	RATE/100 GAL. (UNLESS OTHERWISE STATED)	REMARKS
Gladiolus (Cont'd.)	<u>Penicillium</u> and <u>Fusarium</u> corm rots (pre-planting)	Benlate (50% WP) OR Mertect 140-F	benomyl TBZ	1 lb. 30 oz.	Submerge clean corms for 10-15 minutes prior to planting. Stir solution constantly to be sure chemical remains in suspension. See Control Series 87.
Hawthorne	Cedar hawthorne rust (See under Crabapple)				See Control Series 128.
	<u>Entomosporium</u> leaf spot	Benlate (50% WP)	benomyl	1 lb.	Repeat at 2-4 week intervals.
Holly (American)	Anthracnose				No fungicide registered.
	Japanese Phomopsis				No fungicide registered. Prune out diseased branches.
Hollyhock	Rust	Fore (80% WP)	mancozeb	1 1/2 lb.	Start spraying in late May and continue at 10 day intervals thru early July.
Honeysuckle	<u>Herpobasidium</u> leaf blight	Fore (80% WP)	mancozeb	1 1/2 lb.	Start at 7-10 day intervals from when buds swell to just before bloom.
Hydrangea (See Chrysanthemum)	<u>Botrytis</u> leaf blight				
Iris	<u>Heterosporium</u> leaf spot	Daconil 2787 Flowable Fungicide (6F) OR Daconil 2787 (75% WP) OR Fore (80% WP)	chlorothalonil chlorothalonil mancozeb	1 1/2 pts. 1 1/2 lb. 1 1/2 lb.	Make 5 applications at 7-10 day intervals starting when leaves are 4" to 6" high. Include commercial spreader-sticker or liquid detergent (1/4 tsp./gal. water).
	<u>Didymellina</u> leaf spot	Benlate (50% WP)	benomyl	1 lb.	Make applications at 10-14 day intervals throughout growing season.
Juniper (See under Arborvitae)	Phomopsis needle and twig blight				
Lilac	Powdery mildew	Benlate (50% WP)	benomyl	1/2 lb.	Spray at 10-14 day intervals after leaves are 3/4 grown. See MR-34.

PLANT	DISEASE	FUNGICIDE AND FORMULATION	ACTIVE INGREDIENT	RATE/100 GAL. (UNLESS OTHERWISE STATED)	REMARKS
Mountain Laurel	<u>Cercospora</u> leaf spot	Benlate (50% WP)	benomyl	1 lb.	Spray when buds break in the spring and twice more at 2 wk. intervals. Apply at budbreak, 10 and 20 days later.
Narcissus (Dafodils)	Fusarium Basal rot (pre-planting)	Benlate (50% WP) OR Mertect 140-F	benomyl TBZ	1 lb. 30 oz.	Submerge clean bulbs for 10-15 minutes. Stir solution constantly to be sure chemical remains in suspension.
Pachysandra	<u>Volutella</u> leaf and stem blight	Fore (80% WP)	mancozeb	1 1/2 lb.	Apply first spray in the spring. Make 5 applications at 10-14 day intervals.
Peony	<u>Botrytis</u> blight	Benlate (50% WP) OR Dithane Z-78 (75% WP) OR Fore (80% WP)	benomyl zineb mancozeb	1/2 lb. 2 lb. 1 1/2 lb.	Spray when shoots are 3" to 6" high and again when they are 10" to 18" high. See <i>Control Series 120</i> .
Periwinkle ( <u>Vinca minor</u> )	<u>Phoma</u> stem rot	Benlate (50% WP)	benomyl	1 lb.	Thoroughly soak stems and soil before disease appears. (Early April in Tidewater, Virginia). Apply second application 1 month later. See MR-35.
Petunia	Fungus root rot (Rhizoctonia and Pythium)	Benlate (50% WP) + Dexon (35% WP) OR Banrot (60% WP)	benomyl + diazoben thiophanate methyl + ethazol	1 lb. + 10 tsp./5 gal. water 8 oz.	Drench on the surface of soil. Repeat at 2-4 week intervals. Banrot at 4 week intervals.
Photinia ( <u>Photinia serrulata</u> )	Powdery mildew	Benlate (50% WP)	benomyl	1/2 lb.	Spray at 10-14 day intervals starting when new leaf growth starts. See MR-35.
Pyracantha (firethorn)	Fire blight	Streptomycin ag. compound	streptomycin sulfate	100 ppm	Spray when 20% of the blossoms are open and repeat 5-7 days during bloom period. See <i>Control Series 88</i> . COMMERCIAL ORNAMENTAL USE ONLY.
	Scab	Benlate (50% WP)	benomyl	1 lb.	Apply the first spray at budbreak, 10-14 days later and at petal fall. See <i>Control Series 89</i> .
Quince (See under Crab-apple)	Cedar quince rust				See <i>Control Series 128</i> .

# Nursery Ornamentals

PLANT	DISEASE	FUNGICIDE AND FORMULATION	ACTIVE INGREDIENT	RATE/100 GAL. (UNLESS OTHERWISE STATED)	REMARKS
Rhododendron	Phytophthora root rot and wilt	Dexon (35% WP)	diazoben	10 tsp./5 gal.	Apply to 20 sq. ft. of area. Follow with additional water to allow penetration to 3-5 inches. Repeat every 10-14 days. See Control Series 90.
		OR Terrazole (35% WP) OR Truban (30% WP)	ethazol ethazol	3-10 oz.	
Rose	Black spot	Benlate (50% WP)	benomyl	1 lb.	Start applications in the spring as leaves expand. During dry weather treat at 7-10 day intervals for Daconil or Phaltan. Use a 10-14 interval with Benlate. Shorten intervals with all materials during rainy or humid weather. See Control Series 85.
		Daconil 2787 (75% WP)	chlorothalonil	1 lb.	
		Daconil 278 Flowable Fungicide (6F)	chlorothalonil	1 pt.	
		Fore (80% WP)	mancozeb	1 1/2 lb.	
		Phaltan (75% WP)	folpet	1 1/2 lb.	
	Fungus cane canker				Control rose black spot. Prune out diseased and dead canes.
	Powdery mildew	Actidione PM (0.027% WP)	cycloheximide	3 1/8 lb.	Start applications in the spring as leaves expand. Spray at 7 day intervals with Actidione PM and at 10 to 14 day intervals with Benlate. See Control Series 86.
		OR Benlate (50% WP)	benomyl	1/2 lb.	
Snapdragon	Rust	Dithane Z-78 (75% WP)	zineb	1 1/2 lb.	Spray as soon as rust pustules appear. Repeat at 7 day intervals.
		OR Fore (80% WP)	mancozeb	1 1/2 lb.	
	Anthracnose	Phaltan 75W	folpet	1 1/2 lb.	Begin spraying when plants emerge and repeat at 7 day intervals.
	Cercospora leaf spot	Benlate (50% WP)	benomyl	1 lb.	Apply spray at 10-14 day intervals.
		OR Dithane Z-78 (75% WP)	zineb	1 1/2 lb.	

PLANT	DISEASE	FUNGICIDE AND FORMULATION	ACTIVE INGREDIENT	RATE/100 GAL. (UNLESS OTHERWISE STATED)	REMARKS
Tulip	<u>Botrytis</u> blight	Benlate (50% WP) OR Fore (80% WP)	benomyl  mancozeb	1/2 lb.  1 1/2 lb.	Apply the spray at 7-10 day intervals beginning when the plants are 4" high. At least 4 applications should be made. See Control Series 100.
Yew	<u>Phytophthora</u> root and crown rot (See under Azalea)				See Control Series 90.

## HOME ORNAMENTALS

R. C. Lambe, Extension Specialist, Plant Pathology  
R. E. Baldwin, Plant Pathologist

The home gardener must contend with many of the same diseases confronting the professional nurserymen. But, whereas the nurserymen recognize the value of disease preventative schedules with regular applications of fungicides, bactericides or nematicides, the home gardener frequently waits until the disease is rampant and impossible to control with chemicals, or the plant is dead. This guide is intended to assist the non-professional to select the proper cultural practice such as a resistant variety, proper planting site, purchasing a healthy plant and using the appropriate chemical to prevent further disease.

PLANT	DISEASE	FUNGICIDE AND FORMULATION	ACTIVE INGREDIENT	RATE/GAL. (UNLESS OTHERWISE STATED)	REMARKS		
Ajuga	<u>Sclerotium</u> rot	Terraclor (75% WP)	PCNB	2 lbs./1000 sq. ft.	Dust on soil surface before planting and thoroughly work into the top 2 inches of soil.		
Arborvitae	<u>Phomopsis</u> needle and twig blight	Benlate (50%)	benomyl	1 tbsp.	Spray at budbreak and at 10-14 day intervals. See Control Series 118.		
Azalea (Rhododendron)	<u>Exobasidium</u> leaf and flower gall				No fungicide registered. Hand pick infected leaves and buds. See Control Series 119.		
	<u>Ovulinia</u> petal blight	Benlate (50%) OR Dithane Z-78 (75% WP) OR Fore (80% WP)	benomyl  zineb  mancozeb	1 tbsp.  2 tsp.  1 1/2 tbsp.	Spray benomyl at 10-14 day intervals. Spray mancozeb or zineb 3 times each week. Rake up and remove infected petals from vicinity of plant. See Control Series 116.		
		Powdery mildew	Benlate (50%)	benomyl		2 tsp.	Spray at 10-14 day intervals when disease first appears.
		<u>Phytophthora</u> root and crown rot	Dexon (35% WP)  OR Terrazole (35% WP) OR Truban (30% WP)	diazoben  ethazol ethazol		10 tsp./5 gal. water  8 oz./100 gal. water 8 oz./100 gal. water	Apply to 20 sq. ft. of area. Follow with additional water to allow penetration to 3-5 inches. Repeat every 10-14 days.
	Phomopsis die-back					Apply in sufficient water to saturate the soil. Retreat at 4-12 week intervals. See Control Series 90.	
Camellia	Leaf gall				No fungicide registered. Hand pick diseased leaves. See Control Series 119.		

PLANT	DISEASE	FUNGICIDE AND FORMULATION	ACTIVE INGREDIENT	RATE/GAL. (UNLESS OTHERWISE STATED)	REMARKS
Camellia (Cont'd.)	<u>Sclerotinia</u> flower blight	Terraclor (75% WP)	PCNB	1 cup in enough water to give thorough coverage of 100 sq. ft.	Drench soil surface in late December or early January. Rake up diseased blooms. See Control Series 99.
Carnation	<u>Alternaria</u> blight	Dithane Z-78 (75% WP) OR Phaltan (75% WP)	zineb  folpet	1 tbsp.  1 tbsp.	Spray at 7 day intervals. Remove diseased plants from flower bed at the end of the growing season.
Cedar (See under Arborvitae)	<u>Phomopsis</u> needle and twig blight				
Chrysanthemum	<u>Ascochyta</u> ray blight	Benlate (50% WP) OR Daconil 2787 (75% WP)	benomyl  chlorothalonil	1 tbsp.  1 tbsp.	Apply first spray just before flower color shows and at 7 day intervals with chlorothalonil and 10-14 day intervals with benomyl.
	Leaf rust				No fungicide registered.
	Powdery mildew	Actidione PM (0.027%) OR Benlate (50% WP)	cycloheximide  benomyl	5 tbsp.  2 tsp.	Spray cycloheximide at 7 day intervals starting when mildew first appears. Apply benomyl at 10-14 day intervals.
	<u>Pythium</u> root rot	Dexon (35% WP)  Terrazole (35% WP)	diazoben  ethazol	10 tsp.  8 oz./100 gal.	Drench plants at 10-14 day intervals. Provide good water drainage. Do not plant in same flower bed in 2 consecutive years.  Apply in sufficient water to saturate the soil. Retreat at 4-12 week intervals.
	<u>Septoria</u> leaf spot	Benlate (50% WP) OR Captan (50% WP) OR Dithane Z-78 (75% WP) OR Phaltan (75% WP)	benomyl  captan  zineb  folpet	1 tbsp.  2 tbsp.  1 tbsp.  1 1/2 tbsp.	Apply at weekly intervals when new shoot growth begins. Cover lower leaf surface completely.
Cotoneaster	Fire blight				No chemical recommendation. Prune out blighted limbs.
Crabapple	Cedar-apple rust	Dithane Z-78 (75% WP) OR Fore (80% WP)	zineb  mancozeb	2 tsp.  1 1/2 tbsp.	Start as flower buds open and spray 3 times at 10 day intervals. See Control Series 128.

# Home Ornamentals

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PLANT	DISEASE	FUNGICIDE AND FORMULATION	ACTIVE INGREDIENT	RATE/GAL. (UNLESS OTHERWISE STATED)	REMARKS
Crabapple (Cont'd.)	Fire blight (See under cotoneaster)				
	Scab	Benlate (50% WP) OR Cyprex (65% WP) OR Phaltan (50% WP)	benomyl  dodine  folpet	1 tbsp.  1 tsp.  2 tbsp.	Spray weekly from budbreak un- til 2 weeks after petal fall. Spray benomyl at 10-14 day intervals. See Control Series 89.
Crape Myrtle	Powdery mildew	Actidione PM (0.027% WP)	cyclo- heximide	5 tbsp.	Spray as flower buds break and repeat at 7 day intervals dur- ing growing season.
		Benlate (50% WP)	benomyl	2 tsp.	Spray as flower buds break and repeat at 14 day intervals during growing season.
Dahlia	Powdery mildew	Benlate (50% WP)	benomyl	2 tsp.	Spray at 10-14 day intervals.
Dogwood	<u>Botrytis</u> petal blight	Benlate (50% WP)	benomyl	2 tsp.	Spray at 10-14 day intervals.
	<u>Septoria</u> leaf spot	Benlate (50% WP)	benomyl	1 tbsp.	See Control Series 107.
	Spot anthracnose leaf and flower blight				No chemical recommendation. See Control Series 109.
Geranium (See Dogwood)	<u>Botrytis</u> leaf blight				
Gladiolus	<u>Botrytis</u> leaf blight	Benlate (50% WP)	benomyl	2 tsp.	Spray every 7-10 days during normal weather, every 2-3 days during wet periods.
	<u>Penicillium</u> and <u>Fusarium</u> corm rots (pre-planting)	Benlate (50% WP)	benomyl	1 tbsp.	Submerge clean corms for 10-15 minutes prior to planting. Stir solution constantly to be sure chemical remains in solu- tion. See Control Series 87.
Hawthorne (See under Crabapple, cedar apple rust)	Cedar hawthorne rust				See Control Series 128.
Hemlock	Twig rust				No fungicide recommendation. See Control Series 91.

PLANT	DISEASE	FUNGICIDE AND FORMULATION	ACTIVE INGREDIENT	RATE/GAL. (UNLESS OTHERWISE STATED)	REMARKS
Holly (American)	Anthraco nose	Benlate (50% WP)	benomyl	1 tbsp.	Start spraying in late spring and continue at 10-14 day intervals.
Holly (Japanese)	Phomopsis die-back				No fungicide registered. Prune out diseased branches.
Hollyhock	Rust	Fore (80% WP)	mancozeb	1 1/2 tbsp.	Start spraying in late May and continue at 10 day intervals thru early July.
Honeysuckle	<u>Herpobasidium</u> leaf blight	Fore (80% WP)	mancozeb	1 1/2 tbsp.	Spray at 7-10 day intervals, from when buds swell to just before bloom.
Hydrangae (See Dogwood)	<u>Botrytis</u> leaf blight				
Iris	<u>Heterosporium</u> leaf spot	Daconil 2787 (75% WP) OR Fore (80% WP)	chloro- thalonil  mancozeb	5 tsp.  1 1/2 tbsp.	Make 5 applications at 7-10 day intervals starting when leaves are 4-6" high. Include commercial spreader-sticker or liquid detergent (1/4 tsp./gal. water).
	<u>Didymellina</u> leaf spot	Benlate (50% WP) OR Captan (50% WP)	benomyl  captan	1 tbsp.  1 tbsp.	Apply at 7-14 day intervals.
Juniper (See under Arborvitae)	<u>Phomopsis</u> needle and twig blight				
Lilac	Powdery mildew	Benlate (50% WP)	benomyl	2 tsp.	Spray at 10-14 day intervals after leaves are 3/4 grown.
Mountain Laurel	<u>Cercospora</u> leaf spot	Benlate (50% WP)	benomyl	1 tbsp.	Spray when buds break in the spring and twice more at 2 week intervals. Rake up and destroy diseased leaves.
Narcissus (Dafodils) (See under Gladiolus)	<u>Fusarium</u> basal rot (pre-planting)				
Pachysandra	<u>Volutella</u> leaf and stem blight	Fore (80% WP)	mancozeb	1 1/2 tbsp.	Apply first spray in the spring. Make 5 applications at 10-14 day intervals. Purchase healthy plants.

# Home Ornamentals

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PLANT	DISEASE	FUNGICIDE AND FORMULATION	ACTIVE INGREDIENT	RATE/GAL. (UNLESS OTHERWISE STATED)	REMARKS
Peony	<u>Botrytis</u> blight	Benlate (50% WP)	benomyl	2 tsp.	Spray when shoots are 3" to 6" high and again when they are 10" to 18" high. See <i>Control Series 120</i> .
		OR Dithane Z-78 (75% WP)	zineb	4 tsp.	
		OR Fore (80% WP)	mancozeb	1 1/2 tbsp.	
Periwinkle ( <u>Vinca minor</u> )	<u>Phoma</u> stem rot	Benlate (50% WP)	benomyl	1 tsp.	Thoroughly soak stems and soil before disease appears in early April. Apply a second time 30 days later. Purchase healthy plants.
Petunia	Fungus root rot ( <u>Rhizoctonia</u> and <u>Pythium</u> )	Benlate (50% WP)	benomyl	1 tbsp.	Drench on the surface of soil. Repeat at 2-4 week intervals. Provide good water drainage.
		+ Dexon (35% WP)	diazoben	2 tsp.	
		OR Benlate (50% WP)	benomyl	1 tbsp.	Apply in sufficient water to saturate the soil. Retreat at 4-12 week intervals.
		+ Terrazole (35% WP)	ethazol	8 oz./100 gal.	
Photinia ( <u>Photinia serrulata</u> )	Powdery mildew	Benlate (50% WP)	benomyl	2 tsp.	Spray at 10-14 day intervals starting when new leaf growth begins.
Pyracantha (firethorn)	Fire blight	Streptomycin ag. compd.	streptomycin sulfate	100 ppm	Spray when 20% of the blossoms are open and repeat every 5-7 days during bloom period. See <i>Control Series 88</i> . Prune out all diseased limbs. <i>Commercial ornamental use only.</i>
	Scab	Benlate (50% WP)	benomyl	1 tbsp.	Apply the first spray at bud-break, 10-14 days later and at petal fall. See <i>Control Series 89</i> .
Quince (See under Crabapple)	Cedar quince rust				See <i>Control Series 128</i> .
Rhododendron (See under Azalea root and crown rot)	<u>Phytophthora</u> root				See <i>Control Series 90</i> .
Rose	Black spot	Benlate (50% WP)	benomyl	2 tsp.	Start applications in the spring as leaves expand. During dry weather treat at 7 day intervals for Daconil or Phaltan. Use 10 day intervals with Benlate. Shorten intervals with all materials during rainy or humid weather. Use sticker with Benlate, Phaltan and Fore. Plant resistant varieties. See <i>Control Series 85</i> .
		OR Daconil 2787 (75% WP)	chlorothalonil	1 tbsp.	
		OR Fore (80% WP)	mancozeb	1 1/2 tbsp.	
		OR Phaltan (75% WP)	folpet	1 tbsp.	

PLANT	DISEASE	FUNGICIDE AND FORMULATION	ACTIVE INGREDIENT	RATE/GAL. (UNLESS OTHERWISE STATED)	REMARKS
Rose (Cont'd.)	Powdery mildew	Actidione PM (0.027% WP) OR Benlate (50% WP)	cycloheximide  benomyl	2 tbsp.  2 tsp.	Start applications in the spring as leaves expand. Spray at 7 day intervals with Actidione PM and at 14 day intervals with Benlate. See Control Series 86.
Snapdragon	Rust	Dithane Z-78 (75% WP) OR Fore (80% WP)	zineb  mancozeb	1 tbsp.  1 1/2 tbsp.	Spray as soon as rust pustules appear. Repeat at 7 day intervals.
	<u>Cercospora</u> leaf spot	Benlate (50% WP) OR Dithane Z-78 (75% WP)	benomyl  zineb	1 tbsp.  1 tbsp.	Apply at 10-14 day intervals.
Tulip	<u>Botrytis</u> blight	Benlate (50% WP) OR Fore (80% WP)	benomyl  mancozeb	2 tsp.  1 1/2 tbsp.	Apply the spray at 10-14 day intervals beginning when the plants are 4" high. At least 4 applications should be made. See Control Series 100.
Yew (See under Azalea root and crown rot)	<u>Phytophthora</u> root and crown rot				See Control Series 90.
Zinnia	<u>Alternaria</u> blight	Fore (80% WP) OR Phaltan (75% WP)	mancozeb  folpet	1 1/2 tbsp.  1 1/2 tbsp.	Make 4 applications at 10-14 day intervals starting when plants are 10-12" high.
	Powdery mildew	Actidione PM (0.027% WP) OR Benlate (50% WP) OR Phaltan (75% WP)	cycloheximide  benomyl  folpet	5 tbsp.  2 tsp.  1 1/2 tbsp.	Spray cycloheximide and folpet during growing season at 7 day intervals and benomyl at 10-14 day intervals.

## FOREST TREES

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CROP	DISEASE CONTROLLED	CHEMICAL AND FORMULATION	RATE	METHOD	REMARKS
Oak, all species	Oak Wilt ( <i>Ceratocystis fagacearum</i> )	2,4,5-T*	4 lbs. a.e./gal. oil	Run-off	Apply to deep girdle and axe cuts in roots before 50% wilt of tree develops. Will kill infected trees and help prevent spread of disease.
		Vapam	--	--	See local Extension Agent, Agriculture for specific details.
Pine, all species	Root and butt rot ( <i>Fomes annosus</i> )	Borax 97% (powdered)	--	Light even coverage	Apply immediately to freshly cut stumps, see above.
Pine, all species	Needle cast (Several fungi)	Bordeaux mixture	8 lbs. copper sulfate 8 lbs. hydrated lime in 100 gal. water	Run-off	Apply when needles are one-half and fully developed in spring. Two week intervals during heavy rains.
		Maneb (80%)	1.2 lbs. active/100 gals. or 1.5 lbs. of formulated (80%) with 4 oz. spreader sticker	Run-off	
Pine, white	Air pollution injury	Fertilizer 25-9-9	Tree < 3' 1 cup Tree 3-5' 2 cup Tree > 5' 3 cup	Ground application	Evenly apply to ground surface around drip-line of tree.

\*2,4,5-T is not to be used around the home, recreational areas, pond or ditch banks, or similar sites. This treatment does not control the disease organism but helps prevent spread into adjacent trees.

## GUIDE FOR THE CHEMICAL CONTROL OF LANDSCAPE TREE DISEASES

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Many landscape tree diseases can be controlled with fungicides or with other chemicals. In all cases, however, trees should be maintained in the best possible vigor by a regular fertilization and watering program as needed. Soil tests are recommended before nutrients are applied. Additional information on several shade and ornamental tree diseases may be obtained from the County Cooperative Extension Office in the form of control series notes, bulletins, plant protection newsletters, mimeographed data, and so forth.

Pruning may be elected either as a horticultural practice, or in excising diseased or dead tissues or plant members. The disinfecting of tools used in these activities cannot be overemphasized. Many disease organisms are spread by careless workers who do not use disinfectants. Pruning tools should be dipped between cuts in some type of alcohol or in a household bleach solution made by combining 1 part of bleach and 9 parts of water (the solution is more effective when a little soap is added as a wetting agent). One may then apply a wound paint or spray, preferably one fortified with a disinfecting agent. Recent research indicates that certain wound paint preparations may not be effective in excluding wood-rotting organisms (See *ADDITIONAL COMMENT 3* at end of this section). In all cases, diseased tree parts of all kinds (whole trees, limbs, leaves, etc.) should be removed and, if possible, burned or buried. This eliminates or minimizes the source of inoculum.

A great number of decline problems are attributable directly to 1) *chemical exposure* (spillage of toxicants near or on roots, poisonous fumes, de-icing salts, excessive rates of turf herbicides, excessive rates of fertilizer, etc.); 2) *mechanical injury* (building, sidewalk or driveway construction, lawnmower injury at tree base, etc.); and to 3) *poor cultural factors* (improper planting or pruning method, inadequate or excessive soil moisture or fertilizer, lack of winter protection, etc.). In addition, trees that are weakened by the foregoing stresses are carelessly and unduly predisposed to the attack of disease organisms that normally are of little or no consequence. Insect control is also of great importance; insect attack is commonly observed in declining landscape trees and various species serve as vectors or carriers of important disease organisms. *Therefore, in the control of landscape tree diseases, one should seriously consider a total maintenance program.*

TREE AND DISEASE	FUNGICIDE, RATE <sup>1/</sup> AND REMARKS
APPLE, CRABAPPLE ( <i>Malus</i> )	See "Nursery Ornamentals" or "Home Ornamentals" section.
ARBORVITAE ( <i>Thuja</i> ) Twig and leaf infections	See "Nursery Ornamentals" section.
ASH ( <i>Fraxinus</i> ) Anthracnose	Collect and either burn or bury fallen leaves. Also, see directions for control of anthracnose of maple.
Rust	Destroy the alternate host (marsh and cord grasses).
BASSWOOD ( <i>Tilia</i> ) (See LINDEN)	
BIRCH ( <i>Betula</i> ) Anthracnose	Follow directions for anthracnose of maple.
Canker	Remove and destroy cankered branches by burning or burying in soil.
BUCKEYE ( <i>Aesculus</i> ) Leaf spot and blotch (See HORSE-CHESTNUT)	

<sup>1/</sup> All rates (e.g., lbs./100 gal.) are product rates, not active ingredient rates, unless specifically stated otherwise.

TREE AND DISEASE	FUNGICIDE, RATE <sup>1/</sup> AND REMARKS
<p>CATALPA (<i>Catalpa</i>) Leafspots</p> <p>Powdery mildew</p> <p>Verticillium wilt</p>	<p>Collect and either burn or bury fallen leaves. No chemical can be recommended.</p> <p>Spray with Benlate (0.5 lb./100 gal. = 1 tbsp./2 gal.) when disease first appears.</p> <p>See <i>Va. Coop. Ext. Ser. Control Series 117.</i></p>
<p>DAWN REDWOOD (<i>Metasequoia</i>) Dothiorella Canker</p>	<p>Remove and destroy cankered branches by burning or burying in soil.</p>
<p>DOGWOOD (<i>Cornus</i>)</p>	<p>See section on "Home Ornamentals."</p>
<p>ELM (<i>Ulmus</i>) Black leaf spot</p> <p>Verticillium wilt</p> <p>Dutch elm disease</p> <p>Wetwood (slime flux)</p>	<p>Collect and either burn or bury fallen leaves. Apply Bordeaux mixture (4-4-100) at budbreak in spring; repeat in 2-3 weeks.</p> <p>See <i>Va. Coop. Ext. Ser. Control Series 117.</i></p> <p>An integrated program for susceptible elms is strongly recommended for maximum protection against Dutch elm disease. <u>Prevention</u> is the critical key to disease management. This integrated program consists of (1) sanitation--prompt removal and destruction of diseased trees by burning or burial, (2) supplemental spraying with methoxychlor to control the insect vector, (3) chemical or mechanical severance of root graft unions between diseased and healthy trees, and (4) prompt removal at the trunk of individual branches with new and restricted (5% or less of crown involvement) beetle-transmitted infections. See <i>Va. Coop. Ext. Ser. Control Series 103 for details.</i></p> <p>Supplementary to this, foliar applications of benomyl have yielded additional efficacy, and these options are the use of (a) 1.0 lb. active ingredient (= 2.0 lb. Benlate product)/100 gallons water, using 10-20 gallons of diluted spray per mature tree by hydraulic equipment OR (b) 4.0 lb. active ingredient (= 8.0 lb. Benlate product)/100 gallons water, using 3 to 4 gallons of spray per mature tree by concentrate sprayer or mistblower. By either method, apply in spring when trees reach full leaf. A surfactant may be added to improve wetting of foliage.</p> <p>The internal application of Benlate water suspensions has not yielded satisfactory results. Current experimentation with solubilized benomyl and solutions of salts of its degradation product, MBC (methyl benzimidazol-2-yl-carbamate), has yielded encouraging results, but these compounds are not currently registered for utilization.</p> <p>See <i>Va. Coop. Ext. Control Series 139.</i></p>
<p>HAWTHORN (<i>Crataegus</i>) Rust (<i>Gymnosporangium</i>)</p>	<p>See "Nursery Ornamentals" section.</p>

<sup>1/</sup> All rates (e.g., lbs./100 gal.) are product rates, not active ingredient rates, unless specifically stated otherwise.

TREE AND DISEASE	FUNGICIDE, RATE <sup>1/</sup> AND REMARKS
HICKORY ( <i>Carya</i> ) Anthracnose	Collect and either burn or bury diseased leaves. Spray with zineb 75% WP (2 lb./100 gal. = 1 1/2 tbsp./gal.) at budbreak, then twice thereafter at 10-day intervals, OR use recommendations for anthracnose of maple.
HORSE-CHESTNUT and BUCKEYE ( <i>Aesculus</i> ) Leaf blotch and other leaf spots	Same as for control of anthracnose of hickory with zineb.
JUNIPER Rust ( <i>Gymnosporangium</i> )	Spray with zineb monthly as needed.
LINDEN or BASSWOOD ( <i>Tilia</i> ) Anthracnose, leaf spots and leaf blotch  Powdery mildew	Collect and either burn or bury diseased leaves. Spray with Bordeaux Mixture (8-8-100) just after budbreak, and repeat twice thereafter at 10-day intervals. Also for anthracnose control, see directions for anthracnose on maple.  Follow suggestions for powdery mildew of Catalpa.
MAGNOLIA ( <i>Magnolia</i> ) Powdery mildew  Leaf scorch, winter injury	Follow suggestions for powdery mildew of Catalpa.  Apply foliar anti-desiccant such as Vapor-Gard, Wilt Pruf NCF or other according to manufacturer's recommendation.
MAPLE ( <i>Acer</i> ) Anthracnose  Zonate leaf spot  Tar spot  Verticillium wilt	Apply Benlate (1 lb./100 gal. = 1 tbsp./gal.) at budbreak and repeat at 10-14 day intervals throughout the growing season.  Collect and either burn or bury diseased leaves.  Spray with Bordeaux Mixture 4-4-100 at budbreak; repeat in 2-3 weeks.  See Va. Coop. Ext. Ser. Control Series 117.
MIMOSA ( <i>Albizia julibrissin</i> ) Fusarium wilt	See Va. Coop. Ext. Ser. Control Series 95.
MOUNTAIN ASH ( <i>Sorbus</i> ) Fire blight  Cytospora canker  Leafspot	Follow directions for sanitation recommended for fire blight of apples in <i>Control Series Publication 35</i> .  Remove and destroy cankered branches by burning or burying in soil.  No chemical can be recommended.

<sup>1/</sup> All rates (e.g., lbs./100 gal.) are product rates, not active ingredient rates, unless specifically stated otherwise.

TREE AND DISEASE	FUNGICIDE, RATE <sup>1/</sup> AND REMARKS
<p>OAK (<i>Quercus</i>) Anthracnose</p> <p>Endothia canker</p> <p>Oak wilt</p>	<p>Collect and either burn or bury diseased leaves. Spray with zineb 75% WP (2 lb./100 gal. = 1 1/2 tbsp./gal.) at budbreak and twice thereafter at 10-day intervals, OR follow directions for control of anthracnose of maple.</p> <p><u>Endothia parasitica</u>, the chestnut blight pathogen, produces cankers on various species of oak, especially live oak. <u>Endothia gyrosa</u>, causal agent of pin oak blight, may also be pathogenic to other species of oak. Remove cankered branches at the trunk or at the major adjoining branch and destroy by burning or burying in soil. Avoid wounding of any kind, especially lawnmower injuries and trimming of lateral branches on the pin oak. Keep pin oaks well watered. Provide nutrients on a regular basis as needed.</p> <p>For prevention of root graft transmission: Immediately after a tree is positively diagnosed as having oak wilt, isolate the disease tree from healthy oak trees by drilling holes about 0.75 to 1.0 inch in diameter, 15 inches deep, and 6-9 inches apart in a line between the diseased and healthy tree sufficiently long to kill all oak roots of the two adjacent trees that are likely to be root grafted. Dilute 1 volume of a 32.7% formulation of Vapam (SMDC) with 10 volumes of water. Fill each hole with the diluted solution to within 2 inches of the soil surface and close by tamping with the heel. In order to reduce grass kill, avoid overflowing the holes. If a diseased tree is less than 20 feet from a healthy one, or if the diseased tree has advanced symptoms, it is necessary to treat between the diseased tree and the first healthy-appearing tree and also between the first and second healthy-appearing trees. About 2-3 weeks after Vapam application, the diseased tree should be removed and either burned or buried. For a diagrammatic sketch of the method, see <i>Control Series 103</i>.</p> <p>Although systemic fungicidal control methods are being developed, they are not recommended at this time.</p> <p>LIMITS: Should be done by professional applicators.</p>
<p>PEAR (<i>Pyrus</i>)</p>	<p>For fire blight control, see <i>Control Series 88</i>.</p>
<p>PINE (<i>Pinus</i>) Tip blight and needle cast</p>	<p>Collect and either bury or burn diseased twigs and needles in autumn.</p> <p>Spray with Bordeaux Mixture (4-4-100) as new growth starts, as needles emerge from sheath and when needles are 2/3 of mature length. Use a spreader-sticker with fungicide if possible.</p>
<p>POPLAR (<i>Populus</i>) Cankers</p>	<p>Remove and destroy cankered branches by burning or burying in soil.</p>
<p>PLANE-TREE, BUTTWOOD (See SYCAMORE)</p>	

<sup>1/</sup> All rates (e.g., lbs./100 gal.) are product rates, not active ingredient rates, unless specifically stated otherwise.

TREE AND DISEASE	FUNGICIDE, RATE <sup>1/</sup> AND REMARKS
SEEDLINGS, Various Damping-off	<u>Soil sterilization</u> : See procedures listed in "Nematode Control" section or consult Extension Agent.
SPRUCE ( <i>Picea</i> ) Cytospora canker	Remove and destroy cankered branches by burning or burying in soil.
SYCAMORE ( <i>Platanus</i> ) Anthracnose	Follow suggestions for control of anthracnose of maple, OR anthracnose of hickory, using zineb OR apply dodine (Cyprex) 65% WP (2 lb./100 gal. = about 2 tbsp./gal.) when buds start to swell; repeat, using 1 lb./100 gal. (about 1 tbsp./gal.) at budbreak and again 10-14 days later.
WALNUT ( <i>Juglans</i> ) Anthracnose	Follow directions for anthracnose of maple.
WILLOW ( <i>Salix</i> ) Fungal cankers  Crown gall	Remove and destroy cankered branches by burning or burying in soil.  See Ext. Publication MR-0-20, "Crown Gall of Ornamentals." Galls on larger trees may be removed surgically, and a wound paint applied to wound. Disinfect tools between cuts. Galls should be removed during late fall or mid-summer when sap flow is minimal.

<sup>1/</sup> All rates (e.g., lbs./100 gal.) are product rates, not active ingredient rates, unless specifically stated otherwise.

ADDITIONAL COMMENTS:

1. If Bordeaux Mixture is unavailable, another copper-containing fungicide may be substituted if there is a label clearance for its specific use.
2. For information on chemical injury to shade and ornamental trees, see *Va. Coop. Ext. Ser. Control Series CS 129*. Currently, no control measures can be recommended for injuries resulting from air or other chemical pollutants. Supplemental feeding may be helpful.
3. For the exclusion of wood-rotting fungi, any of the following compounds may be applied thinly and evenly over freshly-cut surfaces and wounds: 1.0% thiram, 3.3-10.0% copper naphthenate or 2.0% sodium o-phenylphenate in an asphalt or other non-fortified tree wound preparation.
4. If trees susceptible to *Verticillium* or *Fusarium* wilts or other root diseases must be planted in sites from which such diseased trees were removed, one must carefully and thoroughly fumigate the infested soil according to approved recommendations in the "Nematode control" section of this publication.
5. The vigor of unthrifty and undernourished trees, commonly susceptible to various diseases and environmental stresses, often can be greatly improved by periodic applications of nutrients. Soil tests are always recommended prior to feeding especially if a soil fertilization program has been in effect. In general, a 10-10-10 (NPK) fertilizer at the rate of 2-4 lbs. per inch of tree diameter at waist height can be applied in holes evenly distributed in the ground beneath the tree. See *Control Series 106* for specific recommendations.

## PEANUTS

W. Wyatt Osborne, Professor and Extension Specialist, Plant Pathology

DISEASE	CHEMICAL AND FORMULATION	RATE/A	REMARKS	PRECAUTIONS	RESIDUE TOLERANCE PPM		
					VINES	NUTS	HULLS
Cercospora leafspot	Bravo 6F	1-1 1/2 pts.	Begin treatment when disease first appears or no later than July 10. Repeat at 14 day intervals or as necessary to maintain control.	Do not apply within 14 days of harvest. Do not graze or feed treated vines, hay or hulls to livestock.	0.3		
	*Benlate 50% WP + Manzate 200 + Oil	4 oz. 1 1/2 lbs. 1 qt. crop oil	Same as above	Do not apply within 14 days of harvest. Do not graze or feed treated vines, hay or hulls to livestock.	(Forage and hay) Benlate 15 0.2 2.0 Manzate 200 0.5 65.0		
	Duel	5-7 lbs.	Same as above	No limitation on preharvest application or hay.	Exempt Exempt		
	Du-Ter 47.5% WP	6 oz.	Same as above	Do not apply within 14 days of harvest. Do not graze or feed treated vines, hay or hulls to livestock.	0.5 0.4		
	Dithane M-45 Manzate 200	1 1/2 lbs. 1 1/2 lbs.	Same as above	Do not apply within 14 days of harvest.	65.0	0.5	65.0 0.5
	Kocide 404S	2-3 qts.	Same as above	No limitation on preharvest application or hay.	Exempt Exempt		
	Top-Cop	3 qts.	Same as above	Same as above	Exempt Exempt		
	Fungi-Sperse	1 gal.	Same as above	Same as above	Exempt Exempt		
	Copper-Count NS	1/2-3/4 gal.	Same as above	Same as above	Exempt Exempt		
	Copper-Count N	1/2-3/4 gal.	Same as above	Same as above	Exempt Exempt		
Copper Sulfur (dust)	18-24 lbs.	Same as above	Same as above	Exempt Exempt			

\*Strains of *Cercospora arachidicola* and *Cercospora personata* (leafspot) are resistant to Benlate. If Benlate fails to provide leafspot control, change to another fungicide. Do not alternate Benlate with other fungicides in the spray program. *Cercospora* leafspot has developed resistance only to Benlate. Therefore, any other fungicide recommended will provide adequate control.

PEANUTS (CONT'D.)

DISEASE	CHEMICAL AND FORMULATION	RATE/A	REMARKS	PRECAUTIONS	RESIDUE TOLERANCE PPM		
					VINES	NUTS	HULLS
Cercospora leafspot (Cont'd.)	Micro-Sperse (dust)	25 lbs.	Begin treatment when disease first appears or no later than July 10. Repeat at 14 day intervals or as necessary to maintain control.	No limitation on preharvest application or hay.	Exempt	Exempt	
	Sulfur (325) Mesh (dust)	18-24 lbs.	Same as above	Same as above.	Exempt	Exempt	

PEANUTS (CONT'D.)

DISEASE	CHEMICAL AND FORMULATION	APPLICATION RATE/ACRE ROW	REMARKS	PRECAUTIONS	RESIDUE TOLERANCE PPM	
					VINES	NUTS
(Early Phase) POD ROT  <u>PYTHIUM</u> <u>RHIZOCTONIA</u>	TERR-O-CIDE 15	3 gal.	Apply preplant or at time of planting on light sandy soil. Provides nematode control and aids in control the early phase of pod rot. Apply 6-8 inches deep preplant or at time of planting on light sandy soils. Seal soil surface with press wheel or board immediately after chemical application. On heavy clay type cold wet soils apply chemical 3-7 days prior to planting.	Do not feed, sell or introduce into commerce hay or hulls taken from treated soil. Forage crops grown on treated soil should not be used as feed for dairy animals or animals being finished for slaughter until 2 years after row treatments or 3 years after overall treatments.	25	
	TELONE C TERR-O-CIDE 15 D TERR-O-CIDE 30	5 gal. 5 gal. 5 gal.	Apply one week preplant. Provide nematode control and aids in controlling the early phase of pod rot. Apply chemical 6-8 inches deep.			
(Late Phase) POD, PEG AND STEM ROT  <u>SCLEROTIUM</u> <u>ROLFSII</u>	TERRACLOR 40% Dust OR TERRACLOR 10% Granule OR TERRACLOR 75% WP	25 lbs.  100 lbs.  13 lbs.	Apply at early pegging on a 12 inch wide band over the row on fields with a history of pod rot caused by <u>Sclerotium rolfsii</u> (white mold).	Do not feed treated hay to livestock. Do not allow hogging down of treated peanuts. Use only one application per year.	1.0	

# Peanuts

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## PEANUTS (CONT'D.)

DISEASE	FUNGICIDE AND FORMULATION	RATE OZ/100 LB	REMARKS AND PRECAUTIONS
Seed decay and seedling blight	Thiram (75% dust)	3	Apply as seed protectant dust. Do not use treated seed for food, feed or oil purposes. Carefully follow precautions on the label.
	Botran + captan (30-30 dust)	3-5	
	Difolatan + captan (30-30 dust)	3-5	
	Captan + maneb (30-30 dust)	3-5	
	Captan + maneb (37.5-37.5 dust)	2-4	
	Terra-Coat SD-205 (25% dust)	2-4	
Difolatan + Botran (60-20 dust)	3		

### CYLINDROCLADIUM BLACK ROT

This soil-borne fungus disease invades peanut roots, pods and stems causing death of the entire plant. Extensive research has not provided adequate chemical control. Infected fields should be planted to grass or corn until effective disease control methods can be developed. Avoid spread of this disease by farm equipment.

### INTERNAL DAMAGE - BORON DEFICIENCY

Off-color of peanut "heart" may be caused by boron deficiency. Use only *one* of the recommendations listed below and use only *once*. Severe burning and reduction in yield may result if recommendations are not followed.

1. Apply 600 lbs per acre of borated land plaster, or
2. Apply 15 lbs per acre borated sulfur or copper sulfur dust once, or
3. Apply 1/2 lb per acre of actual (elemental) boron from other available sources.

## SEED AND SEEDLINGS

R. Pristou  
Extension Specialist, Plant Pathology

CROP	DISEASE TO BE CONTROLLED	FUNGICIDE AND FORMULATION	ACTIVE INGREDIENT	PRECAUTIONS AND REMARKS
Corn	Seed decay, seedling blight	Arasan 50 Arasan 75 Arasan 70S Orthocide 75 Captan 25 seed protectant <sup>a</sup> Captan + Maneb	Thiram  Captan Captan  Captan, Maneb	General use seed treatments. Apply dry or use slurry formulations. Use according to instructions on label.
Corn (Sweet)	Seed rots, seedling diseases	Arasan 75	Thiram	Use according to instructions on the label.
Barley, Oats, Wheat, Rye	Seed decay, seedling blights including the scab fungus (Seed treatments do not control head blight, = scab)	Arasan Formulations Captan 75 <sup>b</sup> Vitavax 75% Dithane M-45, Manzate 200 Terra-Coat (SD-205) <sup>a</sup> Captan + Maneb PMA	Thiram Captan Carboxin Maneb + zinc ion Pentachloronitrobenzene Captan, Maneb Phenylmercury acetate	Use according to instructions on the label. Vitavax not registered for rye.     Very toxic to mammals, handle with care. Not approved for rye. Also, see comments above.
Barley	Black loose smut, Covered smut	<sup>b</sup> Vitavax 75% PMA	Carboxin Phenylmercury acetate	Use according to label instructions. PMA is liquid and requires special applicator equipment.
Oats	Smuts	Terra-Coat LT-2 <sup>b</sup> Vitavax 75	Pentachloronitrobenzene Carboxin	Use according to instruction on the label.
Wheat	covered smut = stinking smut = bunt	Granox N-M  <sup>b</sup> Vitavax 75 Dithane M-45, Manzate 200 Terra-Coat SD-205	Maneb + Hexachlorobenzene Carboxin Maneb + zinc ion Pentachloronitrobenzene	Use according to instructions on the label.
	Covered smut, = stinking smut = bunt Seedling diseases including seedling blight caused by scab fungus	Ortho Drill Box Wheat Seed Protectant	Captan + hexachlorobenzene	Good combination for wheat only.

**NOTICE:** Do not use seed treated with any chemical named above for food or feed. Read label completely before you treat. Follow instructions carefully. Failure to do so may lead to impairment of your health, or that of your livestock or may damage your crop. Seed treatments are available if properly applied.

<sup>a</sup>Captan + Maneb formulation available as 37 1/2 + 37 1/2 or 30 + 30 percent mixtures.

<sup>b</sup>Do not graze or feed livestock on treated area for six weeks after planting.

## Seed and Seedlings

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CROP	DISEASE TO BE CONTROLLED	FUNGICIDE AND FORMULATION	ACTIVE INGREDIENT	PRECAUTIONS AND REMAKRS
Sorghum	Seed decay, seedling blight, loose and covered kernel smuts	Captan Arasan 75	Captan Thiram	Seed treatment, use according to instructions on the label.

NOTICE: Do not use seed treated with any chemical named above for food or feed. Read label completely before you treat. Follow instructions carefully. Failure to do so may lead to impairment of your health, or that of your livestock or may damage your crop. Seed treatments are available if properly applied.

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## SOYBEANS

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DISEASE FOLIAR, POD AND STEM	CHEMICAL AND FORMULATION	RATE/ACRE	METHOD AND TIME OF APPLICATION	PRECAUTIONS AND REMARKS	RESIDUE TOLERANCE PPM	
					VINES	BEANS
Frog-eye Leaf Spot and Purple Stain ( <i>Cercospora</i> ) Pod and Stem Blight ( <i>Diporthe</i> )	DUEL	5 lbs.	For Duel or Benlate make first applica- tion when pods first appear, make second application 14 days later.	Benlate - Do not apply within 35 days of harvest. Do not graze or feed soybean vines or hay to livestock. Do not use alkaline pesticides as a tank mixture.	0.2	0.2
	BENLATE	1 lb.				

## SOYBEANS (CONT'D.)

DISEASE	CHEMICAL AND FORMULATION	AMOUNT OF FORMULATION TO USE (OZ/ 100 LBS.)	METHOD AND TIME OF APPLICATION	PRECAUTIONS AND REMARKS	RESIDUE TOLERANCE PPM	
					VINES	BEANS
Seed decay and seedling  ( <i>Pythium</i> ) ( <i>Fusarium</i> ) ( <i>Rhizoctonia</i> )	TERRA-COAT SD-205 (25% DUST)	3 1/3 to 6 2/3	Use as a hopper box dust treatment	Do not use seed treated with any chemical named for food or feed. Read label com- pletely before you treat.		
	CAPTAN (75% Dust or slurry)	1 1/4	Seed treatment			
	ARASAN (50%) CAPTAN (37.5 Dust) +	2	Seed treatment			
	MANEB (37.5 Dust)	2 1/2 to 3 1/2	Seed treatment			
	Ortho-Soybeans Seed Protectant	4 to 6	Seed treatment			

## TOBACCO

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DISEASE	CHEMICAL AND FORMULATION	ACTIVE INGREDIENT	RATE	REMARKS
Blue mold and anthracnose	Dithane Z-78 (75% WP) Zineb 75 WP (Blue mold only)	Zineb	For spray: Zineb 3 lbs./100 gal. water (2-1/2 level tablespoonfuls/gal.) For dust treatment: Mixture containing 6.5% zineb with talc or pyrophyllite.	Begin chemical application when plants are about the size of a dime. Follow application twice per week until plants are transplanted to the field. *Rate per 100 square yards depends upon plant size. FOLLOW MANUFACTURERS INSTRUCTIONS.
	Carbamate Fungicide (76% WP) (Blue mold only)	Ferbam	For spray: ferbam 4 lbs./100 gal. water. (5 level tablespoons per gal. water). For dust treatment: Mixture containing 11.4% ferbam with talc or pyrophyllite.	Same as above.
	Dithane M-22 (80% WP)	Maneb	For spray: maneb 1/2 lb./100 gal. water (1 level teaspoon to 1 gal. water). For dust treatment: Mixture containing 1.4% maneb with talc or pyrophyllite.	Same as above
	Polyram (80% WP)**	[ethylenebis (dithiocarbamate)] zinc and [(dithio-bis) (thiocarbonyl) imino-ethylene] bis [dithiocarbamate] zinc	For spray: Polyram 80% WP, 2 lbs./100 gal. water. For Dust Treatment: Polyram, 3 1/2% dust.	Same as above.
Wildfire	Agri-Strep	streptomycin sulfate	For spray treatment: Use a 200 ppm* solution at rate of 5 gal./9 x 100 ft. bed. Follow mfr. suggestions in determining amount required to give 100 ppm dilution.	Begin chemical application when plants are in 2 leaf stage and put on 1 application a week for 5 weeks.
			For drench treatment: Use a 100 ppm solution at rate of 10 gal./9 x 100 ft. bed. Follow mfr. suggestions in determining amount required to give 100 ppm dilution.	Same as above.
Mosaic	Milk (whole or skim) Milk (dry skim)		5 gal./100 sq. yd. of bed 5 lb. in 5 gal. water/100 sq. yd.	Spray plants in plant bed 24 hours before pulling.

ppm - is an abbreviation for "parts per million".

\*\*Polyram has not been evaluated for anthracnose control under Virginia conditions.

## TOBACCO (CONT'D.)

DISEASE	CHEMICAL AND FORMULATION	ACTIVE INGREDIENT	RATE	REMARKS
Mosaic (Cont'd.)	Milk (whole) Milk (skim) Milk (dry skim)		1 lb. in 1 gal. water	<u>Dip</u> hands every 20 minutes while pulling plants and transplanting.

## COMMERCIAL VEGETABLES

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R. E. Baldwin, Plant Pathologist

CROP	DISEASE	CHEMICAL AND FORMULATION	RATE/ACRE (UNLESS OTHERWISE STATED)	REMARKS
ASPARAGUS	Rust	Maneb (80% WP) OR Polyram (80% WP) OR Zineb (75% WP)	2 lbs. 2 lbs. 2 lbs.	Use resistant varieties or apply several post-harvest sprays at 7-10 day intervals.
	Fusarium Root Rot	Captan (50% WP)	3 lbs./100 gal.	Dip roots in solution.
BEANS (snap and lima)	Anthraco nose	Maneb (80% WP) OR Zineb (75% WP)	2 lbs. (4-day waiting period) 2 lbs. (7-day waiting period)	Use certified western grown seed. Spray at weekly intervals. Do not work in field when plants are wet. Maneb on snap beans only.
	Bacterial blights	Kocide 101 WP	1.7 lbs. metal	Use certified western grown seed. Spray at 7-10 day intervals.
	Powdery mildew	Sulfur (95% WP) OR Sulfur dust (90-95%)	10 lbs. 30-35 lbs.	Use resistant varieties. Apply spray or dust when mildew first appears. Repeat at 7-10 day intervals.
	Rust	Bravo 6F OR Maneb (80% WP) OR Sulfur dust (90-95%) OR Zineb (75% WP)	2-3 pts. 2 lbs. (4-day waiting period) 30-40 lbs. 2 lbs. (7-day waiting period)	Spray or dust plants when rust threatens and repeat at 7-day intervals. Do not apply Bravo within 7 days of harvest and do not graze treated areas or feed treated areas or feed treated plants to livestock. Apply Bravo or maneb to snap beans only.
	Seed decay (snap)	Captan (75%) OR Terra-Coat SD-205 OR Thiram (75%)	1.3 oz./bu. 2 oz./bu. 1.5 oz./bu.	Use as dust or slurry as a seed treatment (Do not use treated seed for food or feed) Rough handling of lima seed reduces germination.
	(lima)	Thiram (75%) + Demosan (65%)	2 oz. + 4 oz./100 lbs.	
	White mold	Benlate (50% WP)	1/2 - 1 lb.	(For snap beans only) apply at 25 to 50 percent bloom and repeat at peak bloom. Do not apply within 14 days of harvest. Do not graze or feed treated bean vines or hay to livestock. For ground spray application only.
Botrytis Gray mold	Benlate (50% WP)	1/2 - 1 lb.		

CROP	DISEASE	CHEMICAL AND FORMULATION	RATE/ACRE (UNLESS OTHERWISE STATED)	REMARKS	
CABBAGE, BROCCOLI, BRUSSEL SPROUTS, CAULIFLOWER, TURNIPS, KALE, COLLARDS	Seed treatment Black leg Black rot			Purchase only hot water treated seed. Hot water treatment 122°F (50°C) for 30 min. for cabbage and brussel sprouts. 122°F for 20 min. for turnips, collards, cauliflower, and broccoli.	
	Field treatment Club root	Terraclor (75% WP)	6 lbs. in 100 gal. of water	Applied mixed with transplant water. Use 1/3 pt./plant. (Not registered for turnips, collards and kale). Use 1500 lbs. of hydrated lime incorporated as a preplant application.	
	Plant bed Damping-off or wire stem	Post emergence Captan (50% WP) + Terraclor (75% WP)		1/2 lb. of each in 100 gal.	Use as plant bed drench at 100 gals./2000 ft. <sup>2</sup> (Not registered for turnips, kale and collards.)
		Pre-plant fumigation Methyl bromide MC-2		1 1/2 lb./100 ft. <sup>2</sup>	
	Downy mildew Leaf spot	Bravo 6F OR Maneb (80% WP)* OR Zineb (75% WP)		1 1/2 pts. 2 lbs. 3 lbs.	(Bravo not registered for turnips, kale, and collards). Apply in seed bed 10 days after planting for earlier if disease is present. Repeat at 3-day intervals until plants are thinned. Begin field applications when the disease threatens and continue at weekly intervals. Shorten interval to 3-5 days under severe disease conditions. Do not apply maneb or zineb later than 7 days before harvest on cabbage and turnips (10 days on kale). If maneb is applied to broccoli within 3 days of harvest, remove excess residue by washing. *Limit of 2.25 lb. for brussel sprouts and cauliflower. Rates vary with crop so consult the label.
CARROTS	Leaf blights	Bravo 6F OR Maneb (80% WP) OR Zineb (75% WP)	1 1/2 - 2 pts. 2 lbs. 2 lbs.	Make applications at 7-10 day intervals or make frequently if needed. There is a 7-day waiting period for zineb if tops are to be used for food or feed. There is a 7-day waiting period for maneb and the tops are not to be used for food or feed purposes.	
CUCURBITS (Cucumbers, summer squash, cantaloupe, pumpkin)	Angular leaf spot	Kocide 101 WP	1 lb.	Apply as spray at 7-10 day intervals. (Copper may injure some young plants.) Not registered for squash, pumpkin and cantaloupe.	
	Anthracnose	Benlate (50% WP) OR Bravo 6F OR Difolatan 4 flowable OR Maneb (80% WP)* OR Phaltan (50% WP)	1/4 - 1/2 lb. 1 1/2 - 2 pts. 3 - 5 pts. 3 lbs. 1 - 3 lbs.	Start applications when plants are in the two leaf stage and repeat at 5-7 day intervals. Direct spray for thorough coverage of both upper and lower leaf surfaces. Difolatan not registered for squash or pumpkins. (Benlate and maneb are not registered for pumpkins.) Do not apply maneb on cucumbers, summer squash or cantaloupe later than 5 days before harvest. Include Ortho Spray sticker at the rate of 1/2 pt./A. with Phaltan. *Do not exceed 2 lbs./A. on melons and squash.	

# Commercial Vegetables

CROP	DISEASE	CHEMICAL AND FORMULATION	RATE/ACRE (UNLESS OTHERWISE STATED)	REMARKS
CUCURBITS (Cont'd.)	Downy mildew	Bravo 6F	1 1/2 - 2 pts.	Apply at 7-day intervals throughout the season after runners are formed. Difolatan not registered for squash or pumpkins. Do not apply maneb on cucumber, summer squash, cantaloupes later than 5 days before harvest. Include 1/2 pt./A. of Ortho Spray sticker with Phaltan.
		OR		
		Difolatan 4 flowable	3 - 5 pts.	
		OR		
	Maneb (80% WP)	2 lbs.		
	OR			
	Phaltan (75% WP)	3 lbs.		
Gummy stem blight	Benlate (50% WP)	OR	1/4 - 1/2 lb.	Apply at 7-10 day intervals throughout the season. Also seed treatment (as recommended for angular leaf spot). Difolatan not registered for squash or pumpkins. Maneb not registered for cucumber, squash and pumpkins. (Benlate not registered for pumpkins and cantaloupe.) Do not apply maneb on cantaloupe or zineb on cucumber, summer squash or cantaloupe later than 5 days before harvest. *Do not exceed 2 lbs./A. on melons and squash.
		Bravo 6F	2 - 3 pts.	
		OR		
		Difolatan 4 flowable	3 - 5 pts.	
Fruit rots ("belly rot")	Bravo 6F	OR	2 pts.	
		Difolatan 4F	3 pts.	
Powdery mildew	Benlate (50% WP)	OR	1/4 - 1/2 lb.	Apply at 7-10 day intervals. Do not apply closer than 7 days before harvest. Benlate not registered for pumpkins.
		Karathane (25% WP)	1/2 lb.	
Scab	Bravo 6F	OR	1 1/2 - 2 pts.	Apply fungicides at 7-10 day intervals. Difolatan registered for cucumber scab only.
		Difolatan 4 flowable	3 - 5 pts.	
Seed decay and damping-off	Thiram (75%)		3 oz./100 lbs.	Use as a seed treatment according to manufacturer's label.
EGGPLANT	Leaf spot, Phomopsis Fruit rot	Captan (50% WP)	2 lbs.	Use Captan 50% WP - 2 lbs./100 gals. for seed bed. Make applications at 7-10 day intervals. Do not apply maneb within 5 days of harvest.
		OR		
Maneb (80% WP)		2 lbs.		
Seed decay, damping-off	Thiram (75%)	OR	2 lbs.	Hot water treatment 122°F for 25 minutes. Rinse and dry seed before treating with Thiram.
		Zineb (75% WP)	2 lbs.	
IRISH POTATOES	Early blight, Late blight	Bravo 6F	1 - 1 1/2 pts.	Start applications as soon as the plants are 2-6 inches high and continue at 5-10 day intervals as long as blights threaten. Under severe disease conditions, use the shorter interval or the higher dosage. When late blight is present reduce intervals to 3-5 days. *Fixed copper only recommended for late blight. An example of a fixed copper Kocide 101.
		OR		
		Difolatan 4 flowable	3 - 5 pts.	
		OR		
		*Fixed Copper (50% WP)	Follow manufacturer's label	
		OR		
Maneb (80% WP)	2 lbs.			
OR				
Polyram (80% WP)	2 lbs.			

CROP	DISEASE	CHEMICAL AND FORMULATION	RATE/ACRE (UNLESS OTHERWISE STATED)	REMARKS
IRISH POTATOES (Cont'd.)	Rhizoctonia	Terraclor (75% WP)	2 lb. EC or 10% Granular	Use according to manufacturer's directions. Plant certified seed.
	Scab			Plant on soil with pH 5 to 5.5. Use a fertilizer with an acid reaction in soil with pH above 5.5. Use resistant varieties.
	Seed piece decay	Captan (7.5% dust) OR Captan (15% dust) OR Maneb (8% dust) OR Polyram (7% dust)	1 lb./100 lbs. of seed 8 oz./100 lbs. of seed 1 lb./100 lbs. of seed 1 - 1 1/2 lbs./100 lbs. of seed	Use as seed treatment dust according to manufacturer's label. Dust seed pieces immediately after cutting. Do not use treated seed pieces for food or feed purposes.
PEPPERS	Anthracnose	Maneb (80% WP)	1 1/2 - 2 lbs.	Make applications every 7-10 days. More often during wet seasons.
	Bacterial spot	Fixed copper (50% WP)* OR Kocide 101 WP	Follow manufacturer's label 1 - 2 lbs.	Make foliar applications at 7-10 day intervals. More often during wet seasons. *Example of a fixed copper is Kocide 101.
	Cercospora leaf spot	Maneb (80% WP)	1 1/2 - 2 lbs.	Make applications every 7-10 days.
	Damping-off	Captan (50% WP)	1 lb./100 gal.	Use as a drench in seed bed.
SPINACH	Damping-off	Captan (50% WP) OR Thiram (75%) (seed)	5 - 7 lbs. 5 oz./100 lbs. of seed	Apply seed treatment according to manufacturer's label. Use captan in 25-30 gal. water.
	Downy mildew	Maneb (80% WP) OR Zineb (75% WP)	1 1/2 lbs./A. 1 1/2 lbs./A.	Start applications when disease first appears in area and continue at 7-10 day intervals. (Do not apply later than 10 days before harvest.) (Remove maneb residues by washing.)
	White rust	Maneb (80% WP) OR Zineb (75% WP)	3 lbs. 3 lbs.	Apply every 7-10 days throughout the season. (Do not apply later than 10 days before harvest.) (Remove excess residues of maneb by washing.)
SWEET CORN	Bacterial wilt			Plant resistant varieties. Spray with approved insecticide to control flea beetles.

# Commercial Vegetables

CROP	DISEASE	CHEMICAL AND FORMULATION	RATE/ACRE (UNLESS OTHERWISE STATED)	REMARKS
SWEET CORN (Cont'd.)	Leaf blights	Bravo 6F OR Maneb (80% WP) OR Zineb (75% WP)	1 1/2 - 2 pts. 1 1/2 lbs. 3 lbs.	Plant resistant varieties. Bravo and maneb registered for Helminthosporium leaf blight only. Do not apply Bravo within 14 days of harvest. For use on fresh market corn crop only. Do not apply to sweet corn to be processed. Do not allow livestock to graze in treated fields. Do not ensile treated corn or use as livestock forage. Do not feed zineb treated forage to dairy animals or animals being finished for slaughter. Do not apply maneb within 7 days of harvest. Do not feed maneb treated forage to livestock.
	Seed decay	Captan (75% WP) OR Thiram (75% WP) OR Vitavax 200 WP*	3/4 oz./bu. of seed 1 oz./bu. of seed	Use as a seed treatment. Do not use treated seed for food or feed. *Use at manufacturer's recommendations.
SWEET POTATOES	Black rot, scurf	Thiram (75% WP)	1 lb. in 5 gal. of water	Use disease-free bedding stock. Use as a dip for 1/2 minute. Do not use treated roots for food or feed.
	Pox			Use disease-free seed and keep soil pH below 5.2.
	Post harvest decay	Botran (75% WP)	1 lb.	Dip washed roots for 10-15 seconds in well agitated suspension. Do not rinse after treatment. Add 3/4 lb. Botran to 100 gallons of dip suspension after 1,000 bushels are treated. After each 2,000 bushels treated, drain and flush tank. Refill with dip suspension.
TOMATOES	Anthracnose, Gray leaf spot, Septoria leaf spot, Gray leaf mold	Bravo 6F OR Difolatan 4 flowable OR Maneb (80% WP)	2 - 3 pts. 3 - 5 pts. 2 lbs.	<u>Hot water 122°F for 25 min.</u> Make foliar application when plants begin to set fruit. Repeat at 7-10 day intervals throughout the season. Under severe disease conditions, shorten spray interval. Difolatan not registered for gray leaf mold. For use on machine harvested tomatoes only. Difolatan 4 flowable may be used for fruit rot and anthracnose control at 2-4 gals./A. as a single spray when first fruits are formed; or at 1-2 gals./A. in 2 applications. The first application is applied when the first fruits are formed followed by a second 20 days later. Do not apply maneb later than 5 days before harvest. Do not apply Bravo for Septoria leaf spot.

CROP	DISEASE	CHEMICAL AND FORMULATION	RATE/ACRE (UNLESS OTHERWISE STATED)	REMARKS
TOMATOES (Cont'd.)	Bacterial spot	Fixed Copper (50% WP) OR Kocide 101 WP	1 lb.  1 - 2 lbs.	Make foliar applications every 7-10 days throughout the season.
	Damping-off	Captan (50% WP)	3/4 lb./100 gal.	Drench at rate of 100 gal./2000 ft. <sup>2</sup> gal.
	Early blight	Bravo 6F OR Difolatan 4 flowable OR Maneb (80% WP)	2 - 3 pts.  3 - 5 pts.  2 lbs.	Make application every 7-10 days throughout the season. Under severe disease conditions shorten spray interval. Difolatan registered for use on machine harvested tomatoes only. Do not apply maneb later than 5 days before harvest.
		Late blight	Bravo 6F OR Difolatan 4 flowable OR Fixed Copper (50% WP) OR Maneb (80% WP)	
	Seed decay	Thiram (75%)	1 tsp./lb. of seed	Use as a seed treatment according to manufacturer's label.
WATERMELON	Anthracnose, Downy mildew, Gummy stem blight, Alternaria leaf blight, Powdery mildew	Bravo 6F OR Difolatan 4 flowable OR Maneb (80% WP) OR Benlate (50% WP)	1 1/2 - 3 pts.  3 pts.  2 lbs.  1/4 - 1/2 lb.	Start application when conditions are favorable for disease development. Repeat applications at 7 day intervals. (Difolatan and maneb not registered for Alternaria leaf blight.) Do not apply maneb later than 5 days before harvest. Bravo, Difolatan, and Maneb give poor control of powdery mildew. Benlate not registered for downy mildew or alternaria leaf blight.

RESIDUE TOLERANCE IN PPM ON VEGETABLES

	Asparagus	Beans	Broccoli	Brussels sprouts	Cabbage	Carrots	Cantaloupe	Cauliflower	Collards	Corn (sweet)	Cucumber	Eggplant	Kale	Pepper	Potato (Irish)	Pumpkin	Spinach	Squash (summer)	Tomato	Turnips	Sweet potato	Watermelon
Benlate	-	2	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	1	5	-	-	1
Botran	-	20**	-	-	-	10***	-	-	-	-	-	-	-	-	0.25	-	-	-	-	5	10	-
Bravo	-	5	5	5	5	1	5	5	-	1	5	-	-	-	0.1	5	-	5	5	-	-	5
Captan	-	25	2	2	2	-	-	2	2	2	-	25	2	25	25	-	100	-	25	2	-	-
Difolatan	-	-	-	-	-	-	5	-	-	-	2	-	-	-	NE*	-	-	-	15	-	-	5
Dithane M-45	-	-	-	-	-	2	4	-	-	A	4	-	-	-	1.0	-	-	4	4	-	-	4
Dyrene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-
Folpet (Phaltan)	-	-	-	-	-	-	15	-	-	-	15	-	-	-	-	15	-	15	-	-	-	15
Karathane	-	-	-	-	-	-	0.1	-	-	-	0.1	-	-	-	-	0.1	-	0.1	-	-	-	-
Maneb	-	10	10	10	10	7	4	10	10	5	4	7	10	7	0.1	7	10	4	4	B	-	4
Manzate 200	-	-	-	-	-	2	4	-	-	A	4	-	-	-	1.0	-	-	4	4	-	-	4
Polyram	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	-	-	-	4	-	-	-
Terraclor	-	0.1	0.1	0.1	0.1	-	-	0.1	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-
Zineb	NE*	7	7	7	7	7	4	7	25	5	4	7	10	7	-	7	10	4	-	7	-	4

A = 0.5 on kernal and cob  
15.0 on fodder and forage

C = Seed piece only

B = 10 on tops and 7 on roots

\*\* = Snap beans only

NE\* = No tolerance established

\*\*\* = Post harvest only

## HOME VEGETABLES

R. Pristou & R. C. Lambe, Extension Specialists, Plant Pathology

The control of diseases in the home vegetable garden is important if the gardener is to harvest attractive nutritious vegetables. Although diseases are frequently seasonal in their occurrence, losses are highest if consideration is not given to a few basic principles. These are 1) using disease free seed of resistant varieties, 2) practicing rotation so that the same vegetable or closely related vegetables are not planted in the same location on consecutive years, and 3) the safe judicious use of fungicides and nematicides registered by the Environmental Protection Agency and recommended by Virginia Polytechnic Institute and State University.

CROP	DISEASE	CHEMICAL AND FORMULATION	ACTIVE INGREDIENT	RATE/GAL. (UNLESS OTHERWISE STATED)	REMARKS
ASPARAGUS	Rust	Maneb (80% WP) OR Zineb (75% WP)	maneb zineb	2 tbsp. 2 tbsp.	Use resistant varieties or apply several post-harvest sprays at 7-10 day intervals.
BEANS (snap and lima)	Anthracnose	Maneb (80% WP) OR Zineb (75% WP) OR Captan (50% WP)	maneb zineb captan	2 tbsp. 2 tbsp. 1 tbsp.	Use certified western grown seed. Spray at 7-day intervals. Do not work in garden when plants are wet.
	Bacterial blights	Fixed Copper OR Kocide 101	copper copper	3 tbsp. 2 tbsp.	Use certified western grown seed. Spray at 7-10 day intervals.
	Powdery mildew	Sulfur (95% WP) OR Sulfur dust (90-95%)	sulfur sulfur	6 tbsp.	Use resistant varieties. Apply spray or dust when mildew first appear. Repeat at 7-10 day intervals.
	Rust	Maneb (80% WP) OR Sulfur dust (90-95%) OR Zineb (75% WP) OR Captan (50% WP)	maneb sulfur zineb captan	2 tbsp.  2 tbsp. 1 tbsp.	Spray or dust plants when rust threatens and repeat at 7-day intervals. Do not apply Bravo within 7 days of harvest. Maneb on snap beans only.
	Seed decay	Captan (75%) OR Thiram (75%)	captan thiram	1.3 oz./bu. 1.5 oz./bu.	Use as dust or slurry as a seed treatment. (Do not use treated seed for food or feed.)
	<u>Sclerotinia</u> white mold	Benlate (50% WP)	benomyl	1 1/2 tsp.	(For snap beans only) Apply at 25 to 50 percent bloom and repeat at peak bloom. Do not apply within 14 days of harvest.
	Botrytis gray mold	Benlate (50% WP)	benomyl	1 1/2 tsp.	
BEETS	<u>Cercopsora</u> leaf spot	Zineb (75% WP) OR Captan (50% WP)	zineb captan	2 tbsp. 2 tbsp.	Spray at 7-10 day intervals beginning when disease first appears. Do not apply within 7 days of harvest if tops are to be consumed.

# Home Vegetables

CROP	DISEASE	CHEMICAL AND FORMULATION	ACTIVE INGREDIENT	RATE/GAL. (UNLESS OTHERWISE STATED)	REMARKS
CABBAGE, BROCCOLI, BRUSSELS SPROUT, CAULI-FLOWER, TURNIPS, KALE, COLLARDS	Black leg Black rot				Use western grown hot water treated seed.
	Club root	Terraclor (75% WP)	PCNB	6-8 tbsp.	Applied mixed with transplant water. Use 1/3 pt./plant. (Not registered for turnips, collards and kale.)
	Downy mildew Leaf spot	Maneb (80% WP) OR Zineb (75% WP)	maneb zineb	2 tbsp. 2 tbsp.	Begin garden application when the disease threatens and continue at weekly intervals. Shorten intervals to 3-5 days under severe disease conditions. Do not apply later than 7 days before harvest (10 days on kale). If maneb is applied to Broccoli within 3 days of harvest, remove excess residue by washing.
CARROTS	Leaf blights	Fixed Copper (50% WP) OR Maneb (80% WP) OR Zineb (75% WP) OR Captan (50% WP)	copper maneb zineb captan	1 tbsp. 2 tbsp. 2 tbsp. 2 tbsp.	Make applications at 7-10 day intervals or more frequently if needed. There is a 7-day waiting period for zineb if tops are to be used for food. There is a 7-day waiting period for maneb and the tops are not to be used for food.
CELERY	Leaf blights	Maneb (80% WP) OR Benlate (50% WP)	maneb benomyl	2 tbsp. 1 1/2 tsp.	Apply as a spray at 7-10 day intervals after disease first appears. Do not apply maneb within 14 days of harvest. Do not apply Benlate between 7 days of harvest.
CUCURBITS (Cucumbers, summer squash, cantaloupe, pumpkin)	Angular leaf spot	Kocide 101	copper	1 tbsp.	Apply as spray at 7-10 day intervals. (Copper may injure some young plants.) Not registered for squash, pumpkins and cantaloupe.
	Anthracnose	Benlate (50% WP) OR Maneb (80% WP) OR Phaltan (50% WP) OR Captan (50% WP)	benomyl maneb folpet captan	1 1/2 tsp. 3 tbsp. 3 tbsp. 2 tbsp.	Start applications when plants are in the two leaf stage and repeat at 5-7 day intervals. Direct spray for thorough coverage of both upper and lower leaf surfaces. Maneb is not registered for pumpkins. Benlate is not registered for pumpkins. Do not apply maneb on cucumbers, summer squash, or cantaloupe later than 5 days before harvest.

CROP	DISEASE	CHEMICAL AND FORMULATION	ACTIVE INGREDIENT	RATE/GAL. (UNLESS OTHERWISE STATED)	REMARKS
CUCURBITS (Cont'd.)	Downy mildew	Maneb (80% WP) OR Captan (50% WP)	maneb captan	2 tbsp. 2 tbsp.	Apply at 7-day intervals throughout the season after runners are formed. Do not apply maneb on cucumber, summer squash or cantaloupes later than 5 days before harvest.
	Gummy stem blight	Benlate (50% WP) OR Maneb (80% WP)	benomyl maneb	1 1/2 tsp. 3 tbsp.	Apply at 7-10 day intervals throughout the season. (Maneb is not registered for pumpkins.) (Maneb is not registered for cucumbers, squash, and pumpkins. Benlate not registered for pumpkins and cantaloupe.) Do not apply maneb on summer squash, or cantaloupes later than 5 days before harvest.
	Powdery mildew	Benlate (50% WP)	benomyl	2 tsp.	Apply at 7-10 day intervals. Do not apply closer than 7 days before harvest. Benlate not registered for pumpkins.
EGGPLANT	Leaf spot (seed bed)	Captan (50% WP) OR	captan	2 tbsp.	Use captan 50% WP - 2 tbsp. per gal. for seed bed. In the garden use maneb at 3 tbsp./gal. Make applications at 7-10 day intervals.
	Leaf spot (field) Phomopsis fruit rot	Maneb (80% WP)	maneb	2 tbsp.	
IRISH POTATOES	Early blight, Late blight	Maneb (80% WP) OR Captan (50% WP)	maneb captan	2 tbsp. 2 tbsp.	Start applications as soon as the plants are 2-6 inches high and continue at 5-10 day intervals as long as blights threaten. When late blight is present reduce intervals to 3-5 days.
	Rhizoctonia	Terraclor (75% WP)	PCNB		Use according to manufacturer's directions. Plant certified seed.
	Scab				Plant on soil with pH 5 to 5.5 Use a fertilizer with an acid reaction in soil with pH above 5.5. Use resistant varieties.
	Seed piece decay	Captan (7.5% dust) OR Captan (15% dust) OR Captan (50% WP)	captan captan captan	1 lb./100 lbs. of seed 8 oz./100 lbs. of seed 1-3 tbsp./ gal.	Use as seed treatment dust according to manufacturer's label. Dust seed pieces immediately after cutting. Do not use treated seed pieces for food. Dip seed potatoes.
LETTUCE	Downy mildew	Maneb (80% WP) OR Zineb (75% WP)	maneb zineb	3 tbsp. 2 tbsp.	Apply as a spray at 7-10 day intervals after disease first appears. Do not apply within 10 days of harvest.

# Home Vegetables

CROP	DISEASE	CHEMICAL AND FORMULATION	ACTIVE INGREDIENT	RATE/GAL. (UNLESS OTHERWISE STATED)	REMARKS
ONION	Blast Purple Blotch	Dyrene (50% WP) OR Maneb (80% WP)	dyrene maneb	2 tbsp. 3 tbsp.	Apply as a spray at 7-10 day intervals, after disease first appears.
	Downy mildew	Maneb (80% WP) OR Zineb (75% WP) OR Captan (50% WP)	maneb zineb captan	2 tbsp. 3 tbsp. 2 tbsp.	Apply as a spray at 7-10 day intervals after disease first appears. Do not apply zineb to green onions within 7 days of harvest.
PEPPERS	Anthraco nose	Captan (50% WP) OR Maneb (80% WP)	captan maneb	3 tbsp. 3 tbsp.	Make applications every 7-10 days. More often during wet season.
	Bacterial spot	Fixed Copper (50% WP) OR Kocide 101 WP	copper copper	2 tbsp. 3 tbsp.	Make foliar applications at 7-10 day intervals. More often during wet seasons.
	Cercospora leaf spot	Captan (50% WP) OR Maneb (80% WP)	captan maneb	3 tbsp. 3 tbsp.	Make applications every 7-10 days.
	Damping-off	Captan (50% WP)	captan	2 tbsp.	Use as a drench in seed bed.
RADISH	Leaf spot, Downy mildew	Zineb (75% WP)	zineb	2 tbsp.	Apply at 7-10 day intervals when disease first appears.
SPINACH	Damping-off	Thiram (75%)	thiram	5 oz./100 lbs. of seed	Apply seed treatment according to manufacturer's label.
	Downy mildew	Maneb (80% WP) OR Zineb (75% WP) OR Captan (50% WP)	maneb zineb captan	1 1/2 tbsp. 1 1/2 tbsp. 2 tbsp.	Start applications when disease first appears in area and continue at 7-10 day intervals. (Do not apply later than 10 days before harvest.) (Remove maneb residues by washing.)
	White rust	Maneb (80% WP) OR Zineb (75% WP)	maneb zineb	3 tbsp. 2 tbsp.	Apply every 7-10 days throughout the season. (Do not apply later than 10 days before harvest.) (Remove excess residues of maneb by washing.)
SWEET CORN	Bacterial wilt				Plant resistant varieties. Spray with approved insecticide to control flea beetles.
	Leaf blights	Maneb (80% WP) OR Zineb (75% WP) OR Captan (50% WP)	maneb zineb captan	1 1/2 tbsp. 2 tbsp. 1 1/2 tbsp.	Plant resistant varieties. Maneb registered for Helminthosporium leaf blight only.

CROP	DISEASE	CHEMICAL AND FORMULATION	ACTIVE INGREDIENT	RATE/GAL. (UNLESS OTHERWISE STATED)	REMARKS
SWEET CORN (Cont'd)	Seed decay	Captan (75% WP) OR Thiram (75% WP)	captan  thiram	3/4 oz./bu. of seed 1 oz./bu. of seed	Use as a seed treatment. Do not use treated seed for food or feed.
SWEET POTATOES	Black rot, Scurf	Thiram (75%)	thiram	1 lb. in 5 gal. of water	Use disease-free bedding stock. Use as a dip for 1/2 minute. Do not use treated roots for food or feed.
	Pox				Use disease-free seed and keep soil pH below 5.2.
	Post harvest decay	Botran (75% WP)	botran	1 lb. in 100 gal. of water	Dip washed roots for 10 to 15 seconds in well agitated suspension. Do not rinse after treatment.
TOMATOES	Anthracnose, Gray leaf spot, Septoria leaf spot, Gray leaf mold	Maneb (80% WP) OR Zineb (75% WP) OR Captan (50% WP)	maneb  zineb  captan	2 tbsp.  2 tbsp.  4 tbsp.	Make foliar application when plants begin to set fruit. Repeat at 7-10 day intervals throughout the season. Under severe disease conditions, shorten spray interval. Do not apply maneb or zineb later than 5 days before harvest.
	Bacterial spot	Fixed Copper (50% WP) OR Kocide 101 WP	copper  copper	3 tbsp.  2 tbsp.	Make foliar applications every 7-10 days throughout the season.
	Early blight	Dyrene (50% WP) OR Maneb (80% WP) OR Zineb (75% WP) OR Captan (50% WP)	dyrene  maneb  zineb  captan	3 tbsp.  2 tbsp.  2 tbsp.  4 tbsp.	Make application every 7-10 days throughout the season. Under severe disease conditions, shorten spray interval. Do not apply maneb or zineb later than 5 days before harvest.
	Late blight	Fixed Copper (50% WP) OR Maneb (80% WP) OR Zineb (75% WP) OR Captan (50% WP)	copper  maneb  zineb  captan	1 tbsp.  2 tbsp.  2 tbsp.  4 tbsp.	Make regular applications every 7-10 days. When disease is severe, reduce intervals to 3-5 days. Do not apply maneb or zineb later than 5 days before harvest.
	Seed decay	Thiram (75%)	thiram	1 tsp./lb. of seed	Use as seed treatment according to manufacturer's label.
WATERMELON	Anthracnose, Downy mildew, Gummy stem blight, Alternaria leaf blight	Maneb (80% WP) OR Benlate (50% WP)	maneb  benomy1	2 tbsp.  1 1/2 tsp.	Start application when conditions are favorable for disease development. Repeat applications at 7 day intervals. Do not apply maneb later than 5 days before harvest. Benlate not registered for downy mildew or alternaria leaf blight. Maneb not registered for alternaria.

## RESIDUE TOLERANCE IN PPM ON VEGETABLES

Chemical	Asparagus	Beans	Beets	Broccoli	Brussels sprouts	Cabbage	Carrots	Cantaloupe	Cauliflower	Celery	Collards	Corn (Sweet)	Cucumber	Eggplant	Kale	Lettuce	Onion	Pepper	Potato (Irish)	Pumpkin	Radish	Spinach	Squash (summer)	Tomato	Turnips	Sweet Potato	Watermelon
Benlate	-	2	-	-	-	-	-	1	-	3	-	-	1	-	-	-	-	-	-	-	-	-	1	5	-	-	1
Botran	-	20E	-	-	-	-	10 <sup>F</sup>	-	-	15	-	-	-	-	-	10	5	-	0.25	-	-	-	-	5	-	10	-
Captan	-	25	2	-	-	-	2	25	-	-	-	2	25	25	-	-	G	25	25	25	-	-	25	25	-	-	-
Difolatan	-	-	-	-	-	-	-	5	-	-	-	-	2	-	-	-	-	-	NE*	-	-	-	-	15	-	-	5
Dithane M-45	-	-	-	-	-	-	2	4	-	-	-	A	4	-	-	-	-	-	1.0	-	-	-	4	4	-	-	4
Dyrene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	10	-	-	1
Folpet (Phaltan)	-	-	-	-	-	-	-	15	-	-	1	-	15	1	-	1	1	1	1	15	1	1	15	1	1	1	15
Maneb	-	10	-	10	10	10	7	-	10	5	10	5	4	7	10	10	7	7	0.1	7	-	10	4	4	B	-	4
Manzate 200	-	-	-	-	-	-	2	4	-	-	1	A	4	-	-	-	-	-	1.0	-	1	1	4	4	-	-	4
Polyram	-	-	-	-	-	-	-	4	-	-	-	-	-	1	-	1	1	1	D	1	1	1	4	4	-	-	1
Terraclor	-	-	-	0.1	0.1	0.1	-	-	0.1	-	-	-	-	-	-	-	1	1	0.1	-	1	1	1	1	-	-	1
Zineb	NE*	7	7	7	7	7	7	4	7	-	25	5	4	7	10	10	7	7	-	7	7	10	4	-	7	-	4

NE\* = No tolerance established

A = 0.5 on kernal and cob  
15.0 on fodder and forage

B = 10 on tops and 7 on roots

C = 7.0 ppm on roots  
25.0 ppm on leaves

D = 0.5 seed piece only

E = Snap beans only

F = Post harvest

G = 50 ppm green onions, 25 ppm dry onions

## FRUIT

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Effective control of diseases that occur in commercial fruit crops is obtained only through the continual use of several control measures. Pesticides are used most frequently by the grower for disease control. These pesticides are usually applied as sprays or occasionally as dust. The problem of properly selecting the correct pesticide to do a specific job continues to be complex and challenging to commercial orchardists. The success or failure of any spray program is not due entirely to the specific pesticide or amount placed in the sprayer tank; but proper timing and thorough application of sprays are essential to quality fruit production.

The pesticides recommended here have proven to be effective and useful in the control of the various common diseases. Differences may exist among them in their effectiveness against specific diseases. It has become increasingly evident that no one spray program can provide equally satisfactory results in all orchards or plantings for all diseases.

In selecting a pesticide for control of fruit diseases, there are several factors that must be considered. Degree of control desired, type of fruit finish required by the market, type of spray used, compatibility with other pesticides and effectiveness against other diseases are some of the important factors that must be weighed. Today there are a large number of fungicides available for grower use and these vary somewhat in their effectiveness.

Generally, pesticides may be used alone for specific diseases or in combination for various diseases occurring at any one time, but reference should be made to the pesticide compatibility chart, on the front of Virginia Spray Bulletin for Tree Fruits, Va. Coop. Ext. Ser. Pub. 219, before mixing pesticides in the spray tank.

The amount of fungicides recommended for control of fruit diseases are based on a regular dilute (1X) spray. The application rate for apples is based on 300 to 400 gal. of dilute spray per acre during the pre-bloom and bloom periods and from 300 to 500 gal. per acre in the post-bloom period. The application rate for stone fruit is based on 150 to 200 gal. of dilute spray per acre during the pre-bloom and bloom period and from 250 to 350 gal. per acre in the post-bloom period. If fungicides are to be applied as concentrate sprays, the amount of actual pesticide to be applied per acre is approximately 20% less than that used for dilute sprays. Recommended amounts to use are listed in the "dosage table" for various spray concentrations for airblast sprayers on the following page. The application rate for grapes is based on 100 gal. per acre during the pre-bloom period, 200 gal. during early post-bloom, and gradually increased to 300 gal. during the late post-bloom period. The application rate for strawberries is based on 100 to 150 gal. per acre. The application rate on brambles is based on 150 to 250 gal. per acre. Whether to use low, intermediate or high gallonage per acre will depend on tree or plant size, foliage development, and prevailing weather conditions.

For more specific information on tree fruit disease control, use the 1975 Virginia Spray Bulletin for Tree Fruits, Va. Coop. Ext. Ser. Publication 219; Disease of Apples and Their Control in Virginia, Va. Coop. Ext. Ser. Publication 374; Fire Blight of Apple and Pear and its Control, Va. Coop. Ext. Ser. Publication 35 and Va. Coop. Ser. Publication 46, a spray guide for home gardeners. For additional information on grape diseases and their control, request Va. Coop. Ext. Ser. Publication 32 and Control Series 72. Also, additional information on strawberry and bramble diseases and their control is available in Va. Coop. Ext. Ser. Control Series 70 and 71 respectively. Further additional information on peach and nectarine diseases and their control is available in Va. Coop. Ext. Ser. Publication 475.

Only Pomace which has been tested and cleared for livestock feeding should be fed to livestock. Do not graze or feed forage from treated orchards or other treated areas.

### Airblast Sprayer Calibration

Step 1. Determine the rate of travel at which the sprayer will be pulled through the orchard. Ground speeds of 2.0 or 2.5 miles per hour are recommended, however, 3.0 mph may be used for small apple or low-growing stone fruits.

Step 2. Refer to Dosage Table to determine the number of gallons of spray output needed per minute from both sides of the sprayer to give the desired amount per acre. The figure given in the table should be divided by 2 to determine the amount for each side of the sprayer.

Step 3. Determine the pressure at the location of the nozzle at which the sprayer will be operated.

Step 4. Obtain from the sprayer dealer a data table showing the capacity in gallons per minute of the nozzles used in the sprayer. Note that the capacity of the nozzle varies with the pressure, with the capacity of the whirl plate or whirler used in some nozzle assemblies, and with the size of the hole or orifice in the disc. Select from the disc sizes (and whirl plates if needed) those required to obtain the necessary output in gallons per minute. Disc sizes should be selected and distributed along the manifold to allow a delivery of 85% of the spray volume from the upper 2/3 of the active airstream; 50% of this volume should be delivered from the top 1/3 of the nozzles. Example: Sprayer with 10 nozzles per side; need 12.9 gal./min. for both sides of machine to deliver 100 gpa at 2.0 mph with 32' spacing; thus 12.9 divided by 2 = 6.45 gal./min. needed for each side;  $6.45 \times .50 = 3.2$  gal./min. to be distributed among upper 3 nozzles;  $6.45 \times .85 = 5.5$  gal./min. to be distributed among the top 7 nozzles including the top 3;  $6.45 \times .15 = 0.95$  gal./min. to be distributed between the bottom 3 nozzles.

Step 5. After discs have been placed in nozzles, fill sprayer with water and determine the time necessary to spray out the entire contents. The theoretical time required can be calculated by dividing the number of gallons of water in the tank by the total sprayer output per minute; thus a sprayer delivering 12.9 gal./min. should deliver 500 gallons in 38.76 minutes. It is very common for this final check to show that the machine is not delivering the calculated amount of spray. Check the machine to see that it is operating properly, and then adjust nozzle sizes until the rate of delivery is correct.

Dosage Table. Sprayer output in gal./min. needed for various rates per acre for three ground speeds.

Row width in feet	GALLONS PER ACRE DESIRED							
	20	30	40	50	60	80	100	400
<u>Sprayer output needed for a ground speed of 2.0 mph</u>								
18	1.5	2.2	2.9	3.6	4.4	5.8	7.3	29.1
20	1.6	2.4	3.2	4.0	4.9	6.5	8.1	32.2
22	1.8	2.7	3.6	4.4	5.3	7.1	8.9	35.6
24	1.9	2.9	3.9	4.9	5.8	7.8	9.7	38.8
26	2.1	3.2	4.2	5.3	6.3	8.4	10.5	42.0
28	2.3	3.4	4.5	5.7	6.8	9.1	11.3	45.3
30	2.4	3.6	4.9	6.1	7.3	9.7	12.1	48.5
32	2.6	3.9	5.2	6.5	7.8	10.4	12.9	51.8
34	2.8	4.1	5.5	6.9	8.2	11.0	13.7	55.0
36	2.9	4.4	5.8	7.3	8.7	11.6	14.5	58.1
38	3.1	4.6	6.1	7.7	9.2	12.3	15.4	61.4
<u>Sprayer output needed for a ground speed of 2.5 mph</u>								
18	1.8	2.7	3.6	4.6	5.5	7.3	9.1	36.4
20	2.0	3.0	4.0	5.1	6.1	8.1	10.1	40.4
22	2.2	3.3	4.4	5.6	6.7	8.9	11.1	44.4
24	2.4	3.6	4.9	6.1	7.3	9.7	12.1	48.5
26	2.6	3.9	5.3	6.6	7.9	10.5	13.1	52.6
28	2.8	4.2	5.7	7.1	8.5	11.3	14.1	56.6
30	3.0	4.6	6.1	7.6	9.1	12.1	15.2	60.6
32	3.2	4.9	6.5	8.1	9.7	12.9	16.2	64.6
34	3.4	5.2	6.9	8.6	10.3	13.8	17.2	68.7
36	3.6	5.5	7.3	9.1	10.9	14.6	18.2	72.7
38	3.8	5.8	7.7	9.6	11.5	15.4	19.2	76.8
<u>Sprayer output needed for a ground speed of 3.0 mph</u>								
18	2.2	3.3	4.4	5.5	6.5	8.7	10.9	43.6
20	2.4	3.6	4.9	6.1	7.3	9.7	12.1	48.5
22	2.7	4.0	5.3	6.7	8.0	10.7	13.3	53.3
24	2.9	4.4	5.8	7.3	8.7	11.6	14.5	58.1
26	3.2	4.7	6.3	7.9	9.5	12.6	15.8	63.1
28	3.4	5.1	6.8	8.5	10.2	13.6	17.0	67.9
30	3.6	5.5	7.3	9.1	10.9	14.6	18.2	72.7
32	3.9	5.8	7.8	9.7	11.6	15.5	19.4	77.5
34	4.1	6.2	8.3	10.3	12.4	16.5	20.6	82.5
36	4.4	6.6	8.7	10.9	13.1	17.5	21.8	87.3
38	4.6	7.0	9.2	11.5	13.9	18.4	23.0	92.1

## GUIDE FOR THE CHEMICAL CONTROL OF FRUIT DISEASES

CROP AND DISEASE	CHEMICAL AND FORMULATION	RATE PER 100 GAL. DILUTE	ACRE CONC.	SPRAY TIMING AND REMARKS
APPLES Apple scab ( <i>Venturia inaequalis</i> )	*Benomyl 50% WP (Benlate) + Superior Oil OR Dodine 65% WP OR Captan 50% WP OR Dikar 80% WP OR Folpet 50% WP OR Polyram 80% WP OR Dithane M-45 OR Manzate 200 80% WP	2.0 oz. 1.0 qt.  0.5 lb.  2.0 lb.  2.0 lb.  2.0 lb.  2.0 lb.  2.0 lb.	0.5 lb. 1.0 gal.  1.5 lbs.  6.5 lbs.  6.5 lbs.  6.5 lbs.  6.5 lbs.	Apply Benlate with hydraulic ground equipment only. Apply spray every 6 to 7 days from the time first leaves appear until petal fall, then at 10-day to 2-week intervals for the remainder of the season. Note: beginning with second cover, reduce the rate of Dodine to 0.4 lb. There is a 5 day waiting period before harvest for Dodine; 7 days for Ferbam; 21 days for Dithane M-45, Manzate 200 and Dikar. Do not graze or feed forage from treated areas. Do not use apples treated with Dodine in the manufacture of apply pomace for use in livestock feeds.
<p>Remarks: *Benomyl 50 WP (6.0 ozs./100 gals. dilute or 1.5 lbs./A. Conc.) or a combination of benomyl 50WP (4 ozs./100 gals. dilute or 1.0 lb./A. Conc.) plus superior oil (1.0 qt./100 gals. dilute or 1.0 gal./A. Conc.) are effective in suppression of established apple scab. In those orchards where oil is used, Thiram 65% WP 2.0 lb. or Ferbam 76% WP 2.0 lb. or Polyram 80% WP 2.0 lb. or Dithane M-45 or Manzate 200 80% WP 2.0 lb. should be used in the first two (2) sprays. Starting 7 days after the oil spray, Dikar 80% WP may be used for combined control of apple scab, rust, and fruit rots.</p> <p>Caution: Do not use Captan or Folpet with oil or within four and Dikar seven days of an oil application. Folpet may cause more injury to fruit finish than Captan, and its all-season use is suggested primarily in those orchards where fruit rots are difficult to control.</p>				
Apple rusts cedar-apple-rust ( <i>Gymnosporangium juniperi-virginianae</i> ) quince rust ( <i>Gymnosporangium clavipes</i> )	Ferbam 76% WP OR *Thiram 65% WP OR Zineb 75% WP	0.6 lb.  1.0 lb.  0.6 lb.	2.0 lbs.  3.0 lbs.  2.0 lbs.	Apply spray at 6-7 day intervals from open cluster to early pink stage until petal fall and then at 10-day to 2-week intervals through second cover. There is a 7 day waiting period for ferbam and a 15 day waiting period for zineb. *Thiram is not approved for quince rust.
<p>Remarks: In those orchards where Polyram 80% or Dikar 80% or Dithane M-45 or Manzate 200 80% is used as the scab fungicide, no additional rust fungicide is required.</p>				
Apples, Powdery mildew ( <i>Podosphaera leucotricha</i> )	Benomyl 50% WP (Benlate) + Superior Oil OR Dinocap 25% WP OR liquid conc. 48% LC OR Dikar 80% WP OR *Sulfur 95% WP	2.0 oz. 1.0 qt.  0.5 lb.  4 oz.  2.0 lb.  1.4 lb.	0.5 lb. 1.0 gal.  1.5 lbs.  12 ozs.  6.5 lbs.  4.5 lbs.	Apply 6-7 day intervals from open cluster stage through petal fall, and 10-day to 2-week intervals until new growth hardens off, usually through fourth cover. There is a 21-day waiting period before harvest for Dinocap and Dikar.
<p>*Caution: Sulfur should not be applied when high temperatures prevail and it may roughen the finish of the Golden and Stayman varieties.</p>				
<p>Note: Dinocap, Dikar, and Benlate + oil in repeated sprays, has suppressed mite population.</p>				

CROP AND DISEASE	CHEMICAL AND FORMULATION	RATE PER 100 GAL. DILUTE	ACRE CONC.	SPRAY TIMING AND REMARKS
APPLES (Cont'd.) Fire blight ( <i>Erwinia amylovora</i> )	Streptomycin sulfate (15 to 21% WP)	60 ppm	no more than 100 ppm	The first application should be completed just before the center blossoms begin to open, and repeated at 5-day intervals until the petals have fallen. Spray to wet only, streptomycin is locally systemic and overspraying may cause foliage chlorosis and reduced fruit set. See Va. Coop. Ext. Ser. Publication 35 for further specific information on fire blight and streptomycin. Do not apply within 50 days of harvest.
Apple rots: white rot ( <i>Botryosphaeria ribis</i> ) black rot ( <i>Phyalospora obtusa</i> ) bitter rot ( <i>Glomerella cingulata</i> )	Folpet 50% WP OR Captan 50% WP OR Captan 50% WP + Zineb 75% WP OR Dikar 80% WP OR Polyram 80% WP OR Benomyl 50% WP + Manzate 200 OR Dithane M-45 80% WP	2.0 lb. 2.0 lb. 1.0 lb. 1.0 lb. 2.0 lb. 2.0 lb. 2.0-3.0 oz. 12.0 oz.	6.5 lbs. 6.5 lbs. 3.5 lbs. 3.5 lbs. 6.5 lbs. 6.5 lbs. 8.0-12.0 oz. 48.0 oz.	Apply sprays at 6-7 day intervals from open cluster through petal fall, and at 10-day to 2-week intervals through rest of growing season (cover sprays). If only bitter rot present, start at second cover. There is a 21 day waiting period for Dikar and a 15-day for Polyram and Zineb. Do not graze Polyram treated areas. Dikar is not registered for white rot, but if used for other rots, white rot usually will not be a problem. Benomyl, Dithane M-45 and Manzate 200 are not registered for white rot.
blossom end rot ( <i>Botrytis cinerea</i> )	Captan 50% WP	2.0 lb.	6.5 lbs.	Apply sprays at 6-7 day intervals from open cluster through petal fall.
Brook's spot ( <i>Mycosphaerella pomi</i> ) Sooty blotch ( <i>Gloeodes pomigena</i> ) Fly speck ( <i>Mycrothyriella rubi</i> )	Benomyl 50% WP OR Folpet 50% WP OR Captan 50% WP + Zineb 75% WP OR Dikar 80% WP OR Polyram 80% WP OR Captan 50% WP	4-6 oz. 2.0 lb. 1.0 lb. 1.0 lb. 2.0 lb. 2.0 lb. 2.0 lb.	1-1.5 lbs. 6.5 lbs. 3.5 lbs. 3.5 lbs. 6.5 lbs. 6.5 lbs. 6.5 lbs.	Starting with the fourth cover spray or approximately 7 wks. after petal fall, apply the spray at 2-week intervals through the cover sprays. There is a 21 day waiting period for Dikar and a 15 day for Polyram and Zineb. Do not graze treated areas. Benomyl, Dikar and Polyram are not registered for Brook's spot. If these compounds are used for sooty blotch or fly speck control, Brook's spot will usually not be a problem.
<u>DORMANT SPRAY</u> Peach and Nectarine Leaf curl ( <i>Taphrina deformans</i> )	Ferbam 76% WP OR Bordeaux mixture = copper sulfate + hydrated lime OR Liquid lime sulfur	2.0 lb. 2.0 lb. 4.0 lb. 4.0 gal.	No No No	Apply spray in the fall after most leaves have fallen but before hard freezing weather (sunny days in November) or in the spring before bud swell. Caution: Thoroughly clean the spray tank and pump after using Bordeaux mixture or liquid lime sulfur. Ferbam isn't registered for nectarines.

CROP AND DISEASE	CHEMICAL AND FORMULATION	RATE PER 100 GAL. DILUTE	ACRE CONC.	SPRAY TIMING AND REMARKS
<u>PRE-BLOOM AND BLOOM SPRAYS</u> PEACH Brown rot ( <i>Monilinia fructicola</i> )	Benomyl 50% WP (Benlate)	0.5 lb.	1.2 lbs.	Apply when the buds show pink and during the bloom period. Do not graze treated areas.
	OR Captan 50% WP	2.0 lb.	4.5 lbs.	
	OR Sulfur 95% WP	6.0 lb.	15.0 lbs.	
NECTARINE Brown rot ( <i>Monilinia fructicola</i> )	Benomyl 50% WP (Benlate)	0.5 lb.	1.2 lbs.	Same as above.
	OR Captan 50% WP	2.0 lb.	4.5 lbs.	
	OR Sulfur 95% WP	6.0 lb.	15.0 lbs.	
<u>POST BLOOM AND PRE-HARVEST SPRAYS</u> PEACH Brown rot ( <i>Monilinia fructicola</i> )	Benomyl 50% WP (Benlate)	0.5 lb.	1.2 lbs.	Apply Captan or Sulfur sprays when the petals are approximately 1/2 down, shuck-split, shuck-fall and continue at 10-14 day intervals until 1 week before harvest. Captan and sulfur sprays may be applied during harvest if necessary to control brown rot. Apply benomyl (Benlate) during late petal fall, late shuck-split to early shuck-fall, about June 15, 3 weeks before harvest and again 1 week before harvest. Benomyl can be used during harvest if necessary to control brown rot. Do not graze livestock in treated areas.
	OR Captan 50% WP	2.0 lb.	4.5 lbs.	
	OR Sulfur 95% WP	6.0 lb.	15.0 lbs.	
NECTARINE Brown rot ( <i>Monilinia fructicola</i> )	Benomyl 50% WP (Benlate)	0.5 lb.	1.2 lbs.	Apply Captan or Sulfur sprays when the petals are approximately 1/2 down, shuck-split, shuck-fall and continue at 7-10 day intervals until harvest. Nectarines are extremely susceptible to brown rot and satisfactory control depends on good cultural practices and correct timing of sprays. Captan is more effective than sulfur for brown rot control for the last 2 sprays before harvest. Apply benomyl (Benlate) during late petal fall, late shuck-split to early shuck-fall, about June 15, 3 weeks before harvest and again 1 week before harvest. Benomyl can be used during harvest if necessary to control brown rot. Do not graze livestock treated areas.
	OR Captan 50% WP	2.0 lb.	4.5 lbs.	
	OR Sulfur 95% WP	6.0 lb.	15.0 lbs.	
PEACH AND NECTARINE Rhizopus rot ( <i>Rhizopus nigricans</i> )	Botran 75% WP + Captan 50% WP	1.0 lb.  1.0 lb.	2.5 lbs.  2.5 lbs.	For Rhizopus (on peaches only) and continued brown rot control, apply the recommended combination of Botran and Captan 8 and 1 day before harvest. *Caution: Do not use Botran later than 1 day before harvest.

CROP AND DISEASE	CHEMICAL AND FORMULATION	RATE PER 100 GAL. DILUTE	ACRE CONC.	SPRAY TIMING AND REMARKS
<u>POST HARVEST TREATMENT</u> PEACH Rhizopus and Brown rot	Botran 75% WP	1.0 lb.	No	This is a post-harvest treatment in the hydrocooler. Botran at the same rate would be added to each additional 100 gallons of water added to the hydrocooler during operation. Benlate 50% WP can be used in the hydrocooler at the rate of 0.5 lb./100 gals. of water for brown rot control. Benlate will not control Rhizopus rot but it can be used in combination with Botran for better brown rot control.
PEACH Scab ( <i>Cladosporium carpophilum</i> )	Sulfur 95% WP OR Captan 50% WP OR Benomyl 50% WP (Benlate)	6.0 lb.  2.0 lb.  0.5 lb.	15.0 lbs.  4.5 lbs.  1.2 lbs.	Starting at shuck-fall make 3 applications 10-14 day intervals. In orchards where scab is a severe problem, apply a fourth spray 30-34 days after shuck-fall. Sulfur is more effective than captan for scab control. Benomyl (Benlate) has provided good scab control in experimental test plots. Apply benomyl at shuck-split and again at shuck-fall. If benomyl is used for brown rot control, no additional applications will be needed for scab. Do not graze treated areas.
NECTARINE Scab ( <i>Cladosporium carpophilum</i> )	Sulfur 95% WP OR Captan 50% WP OR Benomyl 50% WP (Benlate)	6.0 lb.  2.0 lb.  0.5 lb.	15.0 lbs.  4.5 lbs.  1.2 lbs.	Apply spray at shuck-split, shuck-fall and continue at 7-10 day intervals for 3 sprays. Sulfur is more effective than Captan for scab control. To assure better control of scab during first bearing year, apply 5 sprays of sulfur at 7-10 day intervals beginning at shuck-split the year before the first crop of fruit. Benomyl (Benlate) has provided good scab control in experimental test plots. Apply benomyl at shuck-split and again at shuck-fall. If benomyl is used for brown rot control, no additional applications will be needed for scab. Do not graze treated areas.
PLUMS AND PRUNES Brown rot ( <i>Monilinia fructicola</i> )	<u>Pre-bloom and bloom spray</u>  Benomyl 50% WP (Benlate) OR Captan 50% WP OR Dichlone 50% WP	0.5 lb.  2.0 lb.  0.5 lb.	1.2 lbs.  4.5 lbs.  1.2 lbs.	Apply immediately before blossoms open and at late full bloom. There is a 3 day waiting period before harvest for dichlone.
	<u>Post-bloom spray</u>  Captan 50% WP + Zineb 75% WP OR Benomyl 50% WP (Benlate)	1.0 lb. 1.0 lb.  0.5 lb.	2.5 lbs. 2.5 lbs.  1.2 lbs.	Apply as soon as the petals have fallen. Zineb can be used on Stanley or the prune-type plums when they are sold for fresh fruit. There is a 30-day waiting period before harvest for zineb.

CROP AND DISEASE	CHEMICAL AND FORMULATION	RATE PER 100 GAL. DILUTE	ACRE CONC.	SPRAY TIMING AND REMARKS
PLUMS AND PRUNES (Cont'd.) Brown rot ( <i>Monilinia fructicola</i> )	<u>Pre-harvest spray</u>			Apply spray about one week before harvest. Do not graze livestock in treated areas.
	Benomyl 50% WP (Benlate) OR Captan 50% WP	0.5  2.0 lb.	1.2 lbs.  4.5 lbs.	
CHERRIES Brown rot ( <i>Monilinia fructicola</i> )	<u>Early-season sprays</u>			Apply spray immediately before blossoms open and again at late full blossom. Dichlone has a 3 day waiting period before harvest. Do not graze livestock in treated areas.
	Benomyl 50% WP (Benlate) OR Captan 50% WP	0.5 lb.  2.0 lb.	1.2 lbs.  4.5 lbs.	
	OR Dichlone 50% WP	0.5 lb.	1.2 lbs.	
	<u>Mid-season and pre-harvest</u>			Apply about June 1, immediately before harvest and during harvest if necessary for brown rot control. Do not graze livestock in treated areas.
	Captan 50% WP OR	2.0 lb.	4.5 lbs.	
	Benomyl 50% WP (Benlate)	0.5 lb.	1.2 lbs.	
Leaf spot ( <i>Coccomyces hiemalis</i> )	<u>Post-bloom sprays</u>			Apply at petal-fall, shuck-fall and first cover (10 days after shuck-fall). Benomyl, use same timing as brown rot of cherries. Do not graze livestock in treated areas.
	Benomyl 50% WP (Benlate) OR	0.5 lb.	1.2 lbs.	
	Folpet 50% WP OR	2.0 lb.	4.5 lbs.	
	Captan 50% WP OR	2.0 lb.	4.5 lbs.	
	Ferbam 76% WP	2.0 lb.	4.5 lbs.	
	<u>Mid-season and pre-harvest sprays</u>			2 weeks after first cover (about June 1) and immediately before harvest. Do not graze livestock in treated areas.
	Benomyl 50% WP (Benlate) OR	0.5 lb.	1.2 lbs.	
	<u>Post-harvest sprays</u>			Apply Bordeaux mixture or dodine immediately after harvest. Apply benomyl 2 to 3 weeks after harvest. Do not graze livestock in treated areas.
	Bordeaux mixture OR	2-6-100	---	
	Dodine 65% WP OR Benomyl 50% WP (Benlate)	0.5 lb.  0.5 lb.	1.2 lbs.  1.2 lbs.	

CROP AND DISEASE	CHEMICAL AND FORMULATION	RATE PER 100 GAL. DILUTE	ACRE CONC.	SPRAY TIMING AND REMARKS
CHERRIES (Cont'd.) Powdery mildew ( <i>Podosphaera oxycanthae</i> )	<u>Post-harvest sprays</u> Sulfur 95% WP OR Benomyl 50% WP (Benlate)	1.4 lb. 0.5 lb.	4.0 lbs. 1.2 lbs.	Apply spray at petal-fall, shuck-fall and first cover (10 days after shuck-fall).
STRAWBERRY Leaf spot ( <i>Mycosphaerella fragariae</i> ) Leaf scorch ( <i>Marssoni fragariae</i> ) Leaf blight ( <i>Dendrophoma obscurans</i> ) Grey mold ( <i>Botrytis cinerae</i> )	Captan 50% WP OR Thiram 65% WP OR Benomyl (50% WP)	3.0 lb. 2.5 lb. 1.0 lb.	--- --- ---	Use approximately 150 gallons of spray per acre. Apply the spray at 7 to 10-day intervals from the time new growth starts to within 3 days of harvest. Captan can be applied during harvest to control rot. Apply sprays as needed to control diseases after harvest. Remove thiram residues by washing if applications are made within 3 days of harvest. ----- Do not use over 100 gals. of Benlate spray per acre.
BRAMBLES (Blackberries and raspberries) Anthracnose ( <i>Elsinoe veneta</i> )	<u>Dormant or Late Dormant Sprays</u> Liquid lime sulfur OR Bordeaux mixture copper sulfate hydrated lime	10 gals. 8.0 lbs. 8.0 lbs.	--- --- ---	Apply spray in late winter or early spring when new growth is less than 1/2" long. Be sure to thoroughly clean equipment after using Bordeaux mixture or liquid lime sulfur.

## BRAMBLES (Cont'd.)

CROP AND DISEASE	CHEMICAL AND FORMULATION	RATE PER 100 GAL. DILUTE	SPRAY TIMING AND REMARKS
BRAMBLES (Blackberries and raspberries) Anthracnose, ( <i>Elsinoe veneta</i> )	<u>Pre- and post-bloom and post-harvest sprays</u> Captan 50% WP OR Ferbam 76% WP	2.0 lb. 2.0 lb.	Apply spray just before blossoms open, when new growth canes are 1 1/2-2 feet long and just after harvest. There is a 40-day waiting period before harvest for ferbam.
Leaf spot ( <i>Mycosphaerella rubi</i> ) Cane blight ( <i>Leptosphaeria coniothyrium</i> )	Folpet 50% WP OR Captan 50% WP OR Ferbam 76% WP	2.0 lb. 2.0 lb. 2.0 lb.	Apply the spray just before blossoms open, when new growth canes are 1 1/2-2 feet long and just after harvest. There is a 40-day waiting period before harvest for ferbam. Folpet and captan are not registered for bramble leaf spot, but if either is used for cane blight, leaf spot will probably not be a problem.

CROP AND DISEASE	CHEMICAL AND FORMULATION	RATE PER 100 GAL. DILUTE	SPRAY TIMING AND REMARKS
BRAMBLES (Cont'd.) Fruit rots ( <i>Monilinia fructicola</i> ) ( <i>Botrytis cinera</i> ) etc.	Captan 50% WP	2.0 lb.	Apply spray during the period of fruit ripening and harvest (about 5 days before first picking and as needed).
GRAPES Black rot ( <i>Guignardia bidwellii</i> )	Folpet 50% WP OR Captan 50% WP OR Ferbam 76% WP OR Dithane M-45 80% WP	2.0 lb. 2.0 lb. 2.0 lb. 2.0 lb.	Apply spray when new growth is 1" to 2" long, 6" to 8" long, just before blossom, just after blossom, before berries touch in cluster (pea size), 10 to 14 days later (berries touch in cluster), and at 2-week intervals during June and July. There is a 7-day waiting period before harvest for ferbam. Do not apply Dithane M-45 within 66 days of harvest.
Dead arm ( <i>Phomopsis viticola</i> )	Folpet 50% WP OR Captan 50% WP OR Dithane M-45 80% WP	2.0 lb. 2.0 lb. 2.0 lb.	Apply when shoots are 1 to 2 inches long. Repeat when new shoots are 6 to 8 inches long. Do not apply Dithane M-45 within 66 days of harvest.
Downy mildew ( <i>Plasmopara viticola</i> )	Captan 50% WP OR Folpet 50% WP OR Ferbam 76% WP OR Dithane M-45 80% WP	2.0 lb. 2.0 lb. 2.0 lb. 2.0 lb.	Apply just before bloom, just after bloom, 7 to 10 days later, and 2 to 3 weeks later. There is a 7 day waiting period before harvest for ferbam. Do not apply Dithane M-45 within 66 days of harvest.
Powdery mildew ( <i>Uncinula necator</i> )	Folpet 50% WP OR Bordeaux mixture = Basic Copper Sulfate + hydrated lime	2.0 lb. 1.0 lb. 4.0 lb.	Apply when new growth is 6 to 8 inches long, just before bloom, just after bloom, before berries touch in cluster and at 2-week intervals rest of season.
Anthracoise ( <i>Elsinoe ampelina</i> )	Bordeaux mixture copper sulfate + hydrated lime	8.0 lb. 8.0 lb.	Apply during the dormant stage before buds open. This spray is necessary only in those vineyards where anthracnose has been a problem. Thoroughly clean spray tank and pump after using Bordeaux mixture.

APPLY PESTICIDES ONLY AS DIRECTED. APPLY THEM ONLY TO THE CROPS SPECIFIED, IN AMOUNTS SPECIFIED AND AT TIMES SPECIFIED IN LABEL INSTRUCTIONS, OR BY YOUR AGRICULTURAL AUTHORITIES.

## CHEMICAL RESIDUE TOLERANCE IN PPM ON FRUIT

Chemicals	Apples	Brambles <sup>1/</sup>	Cherries	Grapes	Nectarines	Peaches	Plums	Prunes	Strawberries
Benomyl (Benlate) <sup>3/</sup>	7.0	-	15.0	-	15.0	15.0	15.0	15.0	5
Botran	-	-	-	-	20.0	20.0	-	-	-
Captan	25.0	25.0	100.0	50.0	50.0	50.0	50.0	50.0	25.0
Dichlone	-	-	3.0	-	-	-	3.0	3.0	-
Dithane M45	7.0	-	-	<sup>2/</sup>	-	-	-	-	-
Dikar = + Karathane	0.1	-	-	-	-	-	-	-	-
Dinocap	0.1	-	-	-	-	-	-	-	-
Dodine	5.0	-	5.0	-	-	-	-	-	-
Ferbam	7.0	7.0	7.0	7.0	7.0	7.0	-	-	-
Folpet	25.0	25.0	50.0	25.0	-	-	-	-	-
Manzate 200	7.0	-	-	-	-	-	-	-	-
Polyram	2.0	-	-	-	-	-	-	-	-
Thiram	7.0	-	-	-	-	-	-	-	7.0
Zineb	2.0	-	-	-	-	-	7.0	7.0	-
Streptomycin	0.25	-	-	-	-	-	-	-	-
Basic Copper Sulfate	-	-	-	E	-	-	-	-	-
Bordeaux Mixture	-	E	-	E	E	E	-	-	-
Wettable Sulfur	E	E	-	E	E	E	-	-	-
Liquid Lime Sulfur	Apply only in dormant stage								

E = Exempt

- = Not recommended

<sup>1/</sup> = Brambles = blackberries and raspberries<sup>2/</sup> = in or on fresh fruit<sup>3/</sup> = 70.0 ppm on apple pomace

## TRADE, COMMON, AND CHEMICAL NAMES OF CHEMICALS MENTIONED IN THIS GUIDE

TRADE NAME	COINED OR COMMON NAME	CHEMICAL NAME	MANUFACTURER OR DISTRIBUTOR
Acti-dione TGF, PM	cycloheximide	(3-(2-(3,5-dimethyl-2-oxocyclohexyl)-2-hydroxyethyl)-glutarimide	Upjohn Company
Acti-dione Thiram	acti-dione Thiram	0.75% cycloheximide; 75% tetramethylthiuramdisulfide	Upjohn Company
Agrimycin 17	streptomycin	streptomycin sulfate	Chas. Pfizer and Company
Agri-Strep	streptomycin	streptomycin sulfate	Merck & Company, Inc.
Agrosan	PMA	phenylmercury acetate	-----
Arasan-42S, -50,-70S,-75	thiram	tetramethylthiuram disulfide	E. I. DuPont de Nemours Co.
Banrot	ethazol + methyl thiopantate	15% 5-ethoxy-3-trichloromethyl-1,2,4-thiodiazole + 25% dimethyl (4,4'-o-phenylenebis (3-thioallophanate)	Mallinckrodt Chemical Works
Benlate	benomyl	50% methyl 1-(butylcarbamoyl)-2-benzimidazole-carbamate	E. I. DuPont de Nemours Co.
Best BBC 12	DBCP	1,2-Dibromo-3-chloropropane 81.7% plus other halogenated C <sub>3</sub> compounds 4.3% plus inert ingredients	Occidental Chemical Co.
Borax	borax	97% borax	United States Borax
Bordeaux Mixture and other names	bordeaux mixture	copper sulfate plus lime in various combinations	various
Botran	dicloran	50% 2,6-dichloro-4-nitroaniline	Upjohn Company
Bravo 6F	chlorothalonil	75% tetrachloroisophthalonitrile	Diamond Shamrock Chemical Co.
Brom-O-Gas	none	methyl bromide 98% plus chloropicrin 2%	Great Lakes Chemical Corp.
Brom-O-Sol	none	methyl bromide 68.6% plus chloropicrin 1.4% plus inert ingredients 30%	Great Lakes Chemical Corp.
Brozone	none	methyl bromide 68.6% plus chloropicrin 1.4%	The Dow Chemical Company
Bromosan	none	diethyl 4,4'-o-phenylenebis[3-thioallophanate] + thiram	W. A. Cleary Corp.
Captan 50W, 75W, 80W, 7.5D, 15D	captan	N-(trichloromethylmercapto)-4-cyclohexene-1,2 dicarboximide	Stauffer Chemical Company
Cleary 3336	thiophanate ethyl	50% thiophanate ethyl	W. A. Cleary Corp.
Copper Count	none	copper metallic (from copper ammonium carbonate	Mineral Research & Development Corp.
Copper Sulfur	none	ammonical copper + sulfur	Mineral Research & Development Corp.
Cosamil	none	zineb + sulfur + copper	Occidental Chemical Co.
Cyprex	dodine	65% n-Dodecylguanidine acetate	American Cyanamide

TRADE NAME	COINED OR COMMON NAME	CHEMICAL NAME	MANUFACTURER OR DISTRIBUTOR
D-D	D-D	1,3-Dichloropropene, 1,2-dichloropropane and related hydrocarbons	Shell Chemical Company
D-D/Pic	none	D-D + chloropicrin	Shell Chemical Company
Dasanit	fensulfothion	15% O, O-diethyl O-[p-(methylsulfinyl) phenyl] phosphorothioate	Chemagro Corp.
Daconil 2787 75W	chlorothalonil	75% tetrachloroisophthalonitrile	Diamond Shamrock Corp.
Daconil 2787 Flowable Fungicide 6F	chlorothalonil	54% tetrachloroisophthalonitrile	Diamond Shamrock Corp.
Demosan 65W	chloroneb	65% 1,4-dichloro-2,5-dimethoxybenzene	E. I. DuPont de Nemours Co.
Dexon	diazoben	35% p-Dimethylaminebenzenediazo sodium sulfonate	Chemagro Corp.
Dichlone	dichlone	2,3-Dichloro-1,4-naphthoquinone	Uniroyal
Difolatan 4F	captafol	cis-N [(1,1,2,2-tetrachloroethyl) thio]-4-cyclohexene-1,2-dicarboximide	Chevron Chemical Co.
Dikar	none	coordination product of zinc ion and manganese ethylenebisdithiocarbamate; 2-(1-methylheptyl)-4,6-dinitrophenyl crotonate; & other nitrophenols & derivatives, chiefly 2-(1-methylheptyl)-4,6-dinitrophenol	Rohm & Haas Company
Dithane M-22	maneb	80% manganese ethylenebisdithiocarbamate	Rohm & Haas Company
Dithane M-45	mancozeb	80% coordination product of zinc ion and manganese ethylenebisdithiocarbamate	Rohm & Haas Company
Dithane Z-78	zineb	75% zinc ethylenebisdithiocarbamate	Rohm & Haas Company
Dowfume MC-2	none	98% methyl bromide + 2% chloropicrin	The Dow Chemical Company
Dowfume MC-33	none	67% methyl bromide plus 33% chloropicrin	The Dow Chemical Company
Dowfume W-85	none	ethylene dibromide	The Dow Chemical Company
Durham Nematocide 12.1	DBCP	1,2-dibromo-3-chloropropane and other halogenated C <sub>3</sub> compounds	Durham Chemical Company
Du-Ter	none	47% triphenyltin hydroxide	Thompson-Hayward Chem. Co.
Dyrene	dyrene	50% 2,4-dichloro-6-0-chloroanilino-s-triazine	Chemagro Corp.
Fore	mancozeb	80% coordination product of zinc ion and manganese ethylenebisdithiocarbamate	Rohm & Haas Company
Fungi-Sperse	none	Liquid sulfur	Standard Spray & Chemical Co.
Fumazone 86	DBCP	86E 1,2-Dibromo-3-chloropropane, and other halogenated C <sub>3</sub> compounds	The Dow Chemical Company
Fungo 50	thiophanate methyl	50% dimethyl 4,4-o-phenylenebis (3-thioallophanate)	Mallinckrodt Chemical Works

TRADE NAME	COINED OR COMMON NAME	CHEMICAL NAME	MANUFACTURER OR DISTRIBUTOR
Furadan	carbofuran	10%,2,3-dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate	FMC Corp.
Granox N-M	none	maneb + hexachlorobenzene	-----
Karathane	dinocap	25% (1-methyl heptyl) phenyl crotonate and other nitro phenols and derivatives chiefly dinitro (1-methyl heptyl) phenol	Rohm & Haas Company
Koban	ethazol	35% 5-ethoxy-3-trichloromethyl-1,2,4 thiadiazole	Mallinckrodt Chemical Works
Kocide 101	fixed copper	copper hydroxide	Kennecott Copper Corp.
Kocide 404S	none	cupric hydroxide + sulfur	Kennecott Copper Corp.
Manzate D	maneb	80% manganese ethylenebisdithiocarbamate	E. I. DuPont de Nemours Co.
Manzate 200	mancozeb	80% coordination product of zinc ion and manganese ethylenebisdithiocarbamate	E. I. DuPont de Nemours Co.
Mertect 140-F	TBZ	2-(4-thiazolyl) benzimidazole	Merck and Co., Inc.
Micro-Sperse	none	54% sulfur + 3% copper	Standard Spray & Chem. Co.
Mist-O-Matic	PMA	phenyl mercuriacetate	Gustafson Mfg., Inc.
Mocap	prophos	10% o,ethyl-g,s-dipropyl phosphorodithioate	Mobil Chemical Co.
Nemagon	DBCP	12.1 EC 1,2-Dibromo-3-chloropropane, and other halogenated C <sub>3</sub> compounds	Shell Chemical Co.
Nemacur	none	ethyl-3-methyl-4(methylethio-phenyl methylethyl) phosphoramidate	Chemagro Corp.
Orthocide 50W, 75W	captan	N-(trichloromethylmercapto)-4-cyclohexene-1,2-diocarboximide	Chevron Chemical Co.
Ortho Lawn & Turf Fungicide	none	60% N-(trichloromethylthio)-phthalimide; 5% cadmium carbonate; 10% tetramethylthiuramdisulfide	Chevron Chemical Co.
Ortho Wheat Seed Protectant	none	captan + hexachlorobenzene	Chevron Chemical Co.
OXY BBC	DBCP	1,2-dibromo-3-chloropropane	Occidental Chemical Co.
Phaltan 50W, 75W	folpet	(N-trichloromethylthio-phthalimide)	Chevron Chem. Co. & Stauffer Chemical Co.
Phygon	dichlone	2,3-dichloro-1,4-naphtha-quinone	Naugatuck
PMA	none	phenyl mercuriacetate	Troy Chemical Company
Polyram	metiram	80% mixture of 5.2 parts by wt. (83%) of ammoniates of [ethylenebis (dithiocarbamate) zinc with one part by wt. (16.1%) ethylenebis [dithiocarbamic acid], biomolecular and trimolecular cyclic anhydrosulfides and disulfides	FMC Corporation Niagara Chemical Division
Soilfume 85	EDB	ethylene dibromide	The Dow Chemical Co. & FMC Corp. (Niagara Chem. Division)

TRADE NAME	COINED OR COMMON NAME	CHEMICAL NAME	MANUFACTURER OR DISTRIBUTOR
Soilbrom 85	EDB	ethylene dibromide	Great Lakes Chem. Co.
Soilbrom 40	EDB	ethylene dibromide	Great Lakes Chem. Co.
Soilbrom 90 EC	EDB	ethylene dibromide	Great Lakes Chem. Co.
Sperlox	none	Liquid sulfur	Olin Chemical Corp.
Streptomycin ag. compd.	streptomycin	streptomycin sulfate	Chas. Pfizer & Co.
Sulfur	sulfur	95% wettable sulfur	-----
Telone	telone	dichloropropenes	The Dow Chemical Corp.
Telone C	none	1-3-dichloropropenes + related chlorinated aliphatics + chloropicrins	Dow Chemical Corp.
Temik	aldicarb	2-methyl-2(methylthio) propionaldehyde-O- (methylcarbomoyl) Oxime	Union Carbide Corp.
Terraclor	PCNB	75% pentachloronitrobenzene	Olin Corp.
Terraclor	PCNB	30% pentachloronitrobenzene	Olin Corp.
Terra-Coat SD-205	none	pentachloronitrobenzene	Olin Corp.
Tera-Coat LT-2	PCNB	pentachloronitrobenzene	Olin Corp.
Terrazole	ethazol	35% 5-ethoxy-3-trichloromethyl-1,2,4-thiadiazole	Olin Corp.
Terr-O-Cide 15	none	EDB + chloropicrin	Great Lakes Chem. Co.
Terr-O Cide 15D	none	1,3-dichloropropene,1,2-dichloropropane and re- lated chlorinated hydrocarbons plus chloropicrin	Great Lakes Chem. Co.
Terr-O-Cide 30	none	ethlenediobromide + chloropicrin	Great Lakes Chem. Co.
Terr-O-Gas 67	none	methyl bromide 67% plus chloropicrin 33%	Great Lakes Chem. Co.
Tersan 75	thiram	75% tetramethylthiuram disulfide	E. I. DuPont Nemours Co.
Tersan SP	chloroneb	65% 1,4-dichloro-2,5-dimethoxybenzene	E. I. DuPont Nemours Co.
Tersan LSR	maneb	Manganese ethylenebisdithiocarbamate	E. I. DuPont Nemours Co.
Tersan 1991	benomyl	50% methyl 1-(butylcarbomol)2-benzimidazolecarba- mate	E. I. DuPont Nemours Co.
Thiram 75W	thiram	75% tetramethylthiuram disulfide	E. I. DuPont Nemours Co.
Tobaz	TBZ	26.2% WP thiabendazole	Mallinckrodt Chem. Works
Trinoxol	2,4,5-T	2,4,5-trichlorophenoxyacetic acid (oil soluble)	E. I. DuPont Nemours Co.
Truban	ethazol	30% 5-ethoxy-3-trichloromethyl-1,2,4-thiadiazole	Mallinckrodt Chem. Works

TRADE NAME	COINED OR COMMON NAME	CHEMICAL NAME	MANUFACTURER OR DISTRIBUTOR
Vapam	SMDC	sodium methyldithiocarbamate	Stauffer Chem. Co.
Vidden-D	none	1,3-Dichloropropene,1,2,dichloropropane and related hydrocarbons	The Dow Chemical Co.
Vitavax + Thiram	none	2,4-dihydro-5-carboxanilido-6-methyl-1,1,4-oxathiin + tetramethylthiuram disulfide	Uniroyal
Vitavax 200W	none	2,4-dihydro-5-carboxanilido-6-methyl-1,1,4-oxathiin	Uniroyal
Vorlex	MIT	2-(2-methyl-4-chlorophenoxy) propionic acid chlorinated C <sub>3</sub> hydrocarbon - 80% plus methyl isothiocyanate - 20%	Nor-Am Ag. Prod., Inc.
Zineb	zineb	75% Zinc ethylenebisdithiocarbamate	E. I. DuPont Nemours Co.

## VIRGINIA'S POISON CONTROL CENTERS

<i>City</i>	<i>Name and Address</i>	<i>Telephone</i>	<i>Director and Assistant Director</i>
STATE COORDINATOR	State Department of Health Richmond 23219	(804)770-4265	
ALEXANDRIA	Poison Control Center Alexandria Hospital 709 Duke St. 22314	(703)370-9000 Ext. 555	James D. Milles, M.C. William J. Weaver, Jr., M.D.
ARLINGTON	Poison Control Center Arlington Hospital 5129 N. 16th St. 22205	(703)558-6161 Ext. 662, 751	William D. Dolan, M.D.
BLACKSBURG	Emergency Room Physicians Montgomery County Hospital Route 460 S. 24060	(703)951-1111 Ext. 120	
CHARLOTTESVILLE	Poison Control Center University of Virginia Hospital Box 307 Pediatric Clinic 22903	(804)296-9888	William I. Neikirk, M.D.
DANVILLE	Poison Control Center Danville Memorial Hospital 142 S. Main St. 22201	(804)799-2100	James F. Burch
FALLS CHURCH	Poison Control Center Fairfax Hospital 3300 Gallows Road 22046	(703)698-3600 or 698-3111	R. Leidelmeyer, M.D.
HAMPTON	Poison Control Center Hampton General Hospital 3120 Victoria Blvd. 23661	(804)722-1131	Thomas W. Sale, M.D. Frank Freda, M.D.
HARRISONBURG	Poison Control Center Rockingham Memorial Hospital 738 S. Mason St. 22801	(703)434-4421 Ext. 225	Charles C. Powel, M.D. Robert L. Miller, R. Ph.
LEXINGTON	Poison Control Center Stonewall Jackson Hospital 22043	(703)463-9141	F. A. Feddeman, M.D.
LYNCHBURG	Poison Control Center Lynchburg General Marshall Lodge Hospital, Inc. Tate Springs Road 24504	(804)846-6511 Ext. 203	Frank Daniel, M.D.
NASSAWADOX	Poison Control Center Northampton-Accomac Memorial Hospital 23413	(804)442-8000	Blaine S. Daugherty, R. Ph. Elizabeth F. Shrieves, R.N.
NORFOLK	Poison Control Center DePaul Hospital Granby Street & Kingsley Lane 23505	(804)489-5111	Donald C. Pryor, M.D.
PETERSBURG	Poison Control Center Petersburg General Hospital Mt. Erin & Adams Streets 23803	(804)732-7220 Ext. 327, 328	Barbara Bolte, Hospital Pharmacist
PORTSMOUTH	Poison Control Center U.S. Naval Hospital 23708	(804)397-6541 Ext. 425, 426, 427	James Hughes, M.D. Josephy Boudreaux, R. Ph.

Virginia's Poison Control Centers (Cont'd)

<i>City</i>	<i>Name and Address</i>	<i>Telephone</i>	<i>Director and Assistant Director</i>
RICHMOND	Poison Control Center Medical College of Virginia Hospital, Pediatric OPD Box 874 MCV Sta. 23298	(804)770-5123	William E. Laupus, M.D. William P. Spencer, M.D.
ROANOKE	Poison Control Center Roanoke Memorial Hospital Bellevue at Jefferson Street 24014	(703)981-7336	W. Graham Stephens, M.D.
STAUNTON	Poison Control Center King's Daughters' Hospital 1410 N. Augusta St. 24401	(703)885-0361 Ext. 247, 209	Gerald L. Selph, R. Ph. Paul C. Welk, M.S., R. Ph.
WAYNESBORO	Poison Control Center Waynesboro Community Hospital 501 Oak Avenue 22980	(703)942-8355 Ext. 440, 500	William C. Kappes, M.D.
WILLIAMSBURG	Poison Control Center Williamsburg Community Hospital Mt. Vernon Avenue, Drawer H 23185	(804)229-1120 Ext. 65	John S. Fletcher, M.D.

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AND AT TIMES SPECIFIED IN LABEL INSTRUCTIONS, OR  
BY YOUR AGRICULTURAL AUTHORITIES.

## NOTES