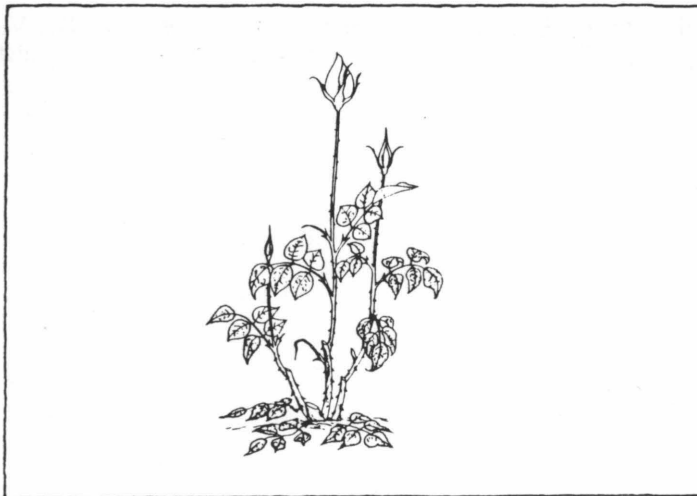


LD  
5655  
A762  
1988  
v.8  
c.2

Virginia Cooperative Extension Service

Publication 456-008  
Revised January 1988

**1988-89**  
**Pest Management Guide**  
**for**  
**FLORAL CROPS**



Insects .....	1
Diseases .....	16

Virginia Tech and Virginia State - Virginia's Land Grant Universities

VIRGINIA POLYTECHNIC INSTITUTE  
AND STATE UNIVERSITY LIBRARIES

Produced by the Department of Entomology and the Department of Plant Pathology, Physiology and Weed Science, VA Tech. Coordinator: J. M. Luna, Department of Entomology

LD  
5655  
A762  
1988  
v.8  
C-2

*Keys to the Proper Use of Pesticides*

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

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

*Disclaimer*

Commercial products are named in this publication for informational purposes only. The Virginia Cooperative Extension Service does not endorse these products and does intend discrimination against other products which also may be suitable.

Virginia Cooperative Service programs, activities and employment opportunities are available to all people regardless of race, color, religion, sex, age, national origin, handicap or political affiliation. An equal opportunity/affirmative action employer.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, and September 30, 1977, in cooperation with the U.S. Department of Agriculture. Mitchell R. Geasler, Director, Virginia Cooperative Extension Service, and Vice Provost for Extension, Virginia Polytechnic Institute and State University, Blacksburg, Virginia; Clinton V. Turner, Administrator, 1890 Extension Program, Virginia State University, Petersburg, Virginia.

# Insect Control for Commercial Greenhouse and Floral Crops

*John A. Weidhaas, Jr., Extension Entomologist*  
*Peter B. Schultz, Research Entomologist*

Relatively few kinds of insects and related pests occur on greenhouse and floral crops, but they attack a wide range of plants, can be highly destructive, and are difficult to control.

Many insecticide and miticide formulations are available to growers, but specific uses may be quite limited for any one crop, and plant varieties vary greatly in susceptibility to chemical injury. Your local Extension Agent may be able to help you to obtain the technical information you need.

## Proper Use of Pesticides

Insecticides are poisonous and their use in the greenhouse can present a serious danger to both the applicator and plant material if handled carelessly or improperly. Some extremely toxic chemicals are labeled and recommended for greenhouse use. If all precautions are followed meticulously, they are safe, but they should not be used by novices, or unsupervised inexperienced personnel, in home or garden greenhouses, or in greenhouses used for demonstrations, exhibits, teaching, or horticultural therapy. Restricted pesticides must be applied only by certified pesticide applicators, and are marked (+) in the publication.

In order to use a pesticide safely and effectively, the product label should be read thoroughly each time a control treatment is applied. By law, pesticides must be used in accordance with label directions. The following checklist is a guide to utilizing label information and directions. Prior to the actual application of any chemical treatment, determine which pesticide to use from the recommendations in this Pest Management Guide and become familiar with the general directions and precautions. Then, at the time of application, consult the label as follows.

1. Make sure the proper pesticide is being used; by the product name; the Trade or Brand name; the common name, if included; and most importantly, the ingredient statement on the container.
2. Ascertain the formulation and concentration of the chemical. The product name may indicate the percentage of the pounds of a.i. (active ingredient); for example, 2E, 4E, or 6E is 2, 4, 6 lbs. a.i. per gallon respectively, and 25 EC, 48 EC, or 57 EC is 25%, 48%, or 57% emulsifiable concentrate. A 25 W, 35 WP, or 50 W is 25%, 35%, or 50% wettable powder. Other formulations include: 5 A or 10 A for 5% and 10% aerosol, or 2 SG for 2% smoke generator. The ingredient statement always indicates percentage of the active ingredient by weight.
3. Find the signal word on the front of the label (caution, warning, danger or poison) and read the caution and hazard statements as well as the statement of practical medical treatment. Be prepared.
4. Look over the entire label for key restrictions such as "for professional use only", "This product is intended to be used only as specified on this label", "for outdoor use only", and statements regarding other restrictions, potential plant injury, and possible indirect effects of usage.
5. Among the uses listed find the plant name (carnation, rose, etc.) or plant category (greenhouse, flowers, or ornamentals), if individual plants are not specified. Treat only those plants indicated on the label.
6. Read all of the directions for proper treatment, frequency of applications, intervals between treatments, periods necessary before re-entry, etc.
7. Determine the correct dosage or mixing rates; make accurate calculations of equivalents for the application equipment to be used; and follow requirements for adequate protective devices and clothing.
8. Keep food plants or ornamental plants segregated when growing bedding plants.

Effective application of pesticides depends on: proper timing; favorable treatment conditions of temperature, humidity, moisture, time of day; plant condition; and thorough coverage, especially the undersides of leaves and in dense or low growing foliage. Thorough wetting is especially important on waxy foliage and waxy insects such as mealybugs and scales. Most insecticides do not act efficiently at temperatures below 50-55°F. And may cause plant injury if used when the temperature is above 90, especially when coupled with high humidity. Overhead irrigation or watering should be avoided for at least 12 hours after applying pesticide treatments. Plants should be well watered, with foliage allowed to dry, before applying chemicals.

Non-chemical control methods should not be overlooked, particularly preventative measures such as making sure not to introduce infested plants into production areas. Weeds and excess plants left around can harbor pests and may be a source of reinfestation. Under carefully controlled conditions, parasites (for example, *Encarsia formosa* for whiteflies) and predators (for example, *Cryptolaemus montrouresi* for mealybugs) can be introduced for biological control.

## Plant Injury

Phytotoxicity is a term referring to plant injury caused by chemicals, particularly pesticides. Greenhouse plants seem to be especially prone to this problem, in part because of the wide variety of plants often grown or held in one common area. Signs of phytotoxicity include: 1) tip or marginal burn of leaves; 2) chlorosis in spots, at tips, or on margins of the leaves; 3) leaf distortion, including curling, twisting, or cupping; 4) stunting or growth reduction in the size of entire plants or certain parts; and 5) abnormal or excessive growth of certain plant parts. Flower parts and bracts are especially sensitive in many cases and most critical to plant sales. New growth is most commonly affected when systemic chemicals are improperly used. Soil drenches and granular treatments may cause root injury resulting in decline, stunting, and damage to older leaves.

The following suggestions will reduce phytotoxic potential:

1. Do not apply pesticides to plants under stress.
2. Avoid spraying under extremely hot, sunny, humid conditions.
3. Apply sprays in the mornings between 6 and 10 A.M.
4. Avoid treating when temperature extremes or severe fluctuations are likely.
5. Apply pesticides when foliage is dry and conditions are conducive to drying.
6. Use wettable powders rather than emulsifiable concentrates.
7. Do not mix pesticides without prior experience; check compatibility.
8. Keep nozzles of aerosols or mist blowers at least 18-24" from plant being treated.
9. Never spray insecticides in equipment that has been used for applying herbicides (tanks, pumps, hoses, guns).
10. Clean sprayer, tank, pump, hose, and gun after each use.
11. Do not let spray mixes stand in the sprayer; do not expose spray concentrates to extreme heat or freezing.
12. Read ALL of the label directions every time you use each pesticide.

## Formulations and Application Methods

Pesticides are available in various formulations: as concentrates for spraying or producing vapors, and ready-to-use dusts, granular soil treatments, aerosols, smokes and fogs. In some cases only one or a few application methods may be registered for use of a specific pesticide. If only a single formulation is recommended, such as a fog, do not use other formulations of that pesticide as a spray or for other types of treatment.

Dilute sprays are applied with pressurized tank sprayer or high-pressure powered spraying machines. Formulations to be used may be wettable powders (WP), emulsifiable concentrates (E or E.C.), soluble powders (SP), liquids or liquid concentrates (L, LC), or flowables (F). Wettable powders are less likely to cause phytotoxicity problems. Dusts (D) are convenient, but wash off more readily than sprays.

Concentrate sprays are applied with motor-driven or electric mist sprayers and deliver droplets 5 to 20 times as concentrated as dilute sprayers. Extreme care and skill is necessary for the proper use of mist blowers to achieve effective, safe, non-phytotoxic treatments.

Aerosols, smokes, thermodusters and foggers create pesticide concentrations in air that are lethal to pests. Rates of application from aerosol bombs, generators, and foggers are based on air volume in closed greenhouses in terms of amount of pesticide per X number of cubic feet of air. It is important to close the greenhouse tightly for the appropriate length of time followed by adequate prescribed ventilation time periods.

Granular formulations are used for soil treatment only. Apply with mechanical spreaders for large bench areas, or by treatment with small volume measures to individual pots or container. Granules should not be allowed to fall or remain on foliage, nor be washed out of pots or treated benches. Liquid concentrates may be diluted for use as soil drenches in some cases.

### Compatibility and Coverage

The pesticides in these recommendations are compatible with each other, but care should be taken in mixing different chemicals. Mixing different formulations such as wettable powders and emulsifiable concentrates are not recommended. Never mix a herbicides or fungicides, nor use a sprayer that has been to apply herbicides for insecticide or fungicide application.

For especially waxy foliage, the addition of a wetting agent or spreader-sticker may be desirable when applying sprays. However, it is unnecessary if two or more pesticides are added together, since a greater amount of wetting agent or emulsifier will be present in the tank. The use of two or more emulsifiable concentrates mixed together in the same quantity of water results in twice as much or more solvent applied to the plants and may cause plant injury. Read the pesticide label carefully for compatibility statements and mixing precautions. Highly alkaline water (pH 8.0 or higher) will cause rapid or immediate breakdown of many pesticide chemicals.

### Safety and Toxicity

Modern pesticides are readily absorbed through the skin, as well as being poisonous by ingestion, by inhalation or by contact in the eyes. Penetration of the skin occurs immediately on contact and is most hazardous when handling undiluted concentrates. It is essential to wear protective clothing, proper gloves, boots, and adequate face shields and respirators or gas masks when directed on the label. Frequent changes to clean clothing and protective devices are essential. With the newer organic tin chemicals (Plictran, Vendex), potential eye damage warrants a danger or warning category on the label even though oral and dermal toxicities are in the caution range.

The signal word on the pesticide label (caution, warning, danger or poison) and the LD<sub>50</sub> values are helpful as a guide to relative toxicities of pesticides. The LD<sub>50</sub> is the lethal dose, orally (ingestion) or dermally (skin absorption) necessary to kill one-half of a test population and is expressed in milligrams of chemical per kilogram of body weight (mg/kg). LD50's below are for technical grade material.

Label Categories

Signal Word	Toxicity Category	LD <sub>50</sub> mg/kg	
		Dermal	Oral
DANGER, POISON (skull and crossbones)	Highly toxic	0-50	0-200
WARNING	Moderately toxic	51-500	201-2000
CAUTION	Slightly toxic	501-5000	2001-20,000
CAUTION	Relative non-toxic	over 5000	over 20,000

## Relative Toxicities

Pesticide	Toxicity LD <sub>50</sub> (mg/kg)		Pesticide	Toxicity LD <sub>50</sub> (mg/kg)	
	oral	dermal		oral	dermal
Avid	650	72,000	Orthene	945	866
diazinon	400	900	+ Penncap-M	60	1200
Dibrom	430	1100	Pentac	>3160	--
Dipel	none	none	+ Pramex, Pounce	4000	2000-4000
+ Dithion	7-10	--	+ Pydrin	451	2500
Dylox	470	2000	resmethrin	4240	2500
Enstar	4900	9000	Sevin	850	4000
ethion	96	--	Sumithrin	>10000	>10000
Kelthane	809	2100	+ Systox	12	14
lindane	125	1000	Tedion	14700	--
malathion	1375	4100	+ Temik	0.9	5
Mavrik	260	20,000	Thiodan	110	359
Mesuro	87-130	>2000	Vapona, DDVP	56-80	107
metaldehyde	250-1000	--	Vendex	2631	>2000
Metasystox-R	65-75	250	Zectran	24	--
methoxychlor	6000	6000			
nicotine	50	50-60			

+ Restricted use chemical.

### How to Use These Recommendations

Once the pest problem has been identified, consult Table 1. Find the pest or pest group (arranged alphabetically) to determine which control measures are available, the formulations that are registered, and the crops labeled. Then consult Table II for specific use and precautionary information on the control measure chosen. Be sure to check the potential phytotoxicity statements. If in doubt about a crop, treat a small sample area. Observe sprayed plants for several days, or for 2 or 3 weeks for systemic soil treatments, for indications of plant injury.

Restricted pesticides are marked with "+".

Pramex and Penncap-M are special State registrations, for which supplemental labeling must be in the possession of the applicator in addition to the regular label on the container.

After using the recommendations here, read and follow the directions on the pesticide label at the time of application.

Chemicals labeled "for restricted use" or "Danger-poison" should be used only by certified applicators and only for specified uses. Restricted use materials are marked by + throughout these recommendations.

Table I - Guide to Pesticide and Formulations Recommended by Pest or Pest Group

PESTICIDE	SIGNAL WORD	FOLIAR SPRAY	AEROSOL	SMOKE FOG VAPOR	SOIL	CROPS LABELED*
<b>APHIDS</b>						
Orthene	caution	75 SP	3A	--	--	Carnation, chrysanthemum, rose. Aerosol is labeled for most crops.
MSR + Temik	warning poison	25 SC --	-- --	-- --	25 C 10 G	all crops. carnation, chrysanthemum, Easter lily, gerbera, rose, snapdragon.
Enstar	caution	5 E	--	--	--	all crops.
resmethrin	caution	2 EC	--	--	--	all crops.
Sumithrin	caution	2 E	--	--	--	all crops.
Thiodan	warning	50 W	--	SG	--	all crops.
+ Dithio	poison	--	5A	SG	--	all crops.
malathion	caution	50 EC	15 A	F-EC F-EC	--	Numerous crops, but injury may occur on many. Fog is safest for carnation, chrysanthemum, geranium, rose, snapdragon.
diazinon	warning	50 W 48 EC	--	F-EC	--	azalea, carnation chrysanthemum, rose.
lindane	warning	25 W 18.5 EC	--	SG F	--	all crops.
nicotine	warning	--	--	V-40 EC SG	--	all crops.
Dibrom	warning	--	--	F-8 EC	--	all crops.
Vapona	poison	--	10 A	V,F,SG	--	all crops.
+ Systox	poison	2 E 6 E	--	--	2 E 6 E	chrysanthemum, dahlia, rose
Mavrik	caution	2 AF	--	--	--	All crops. See label for phototoxicity.
toxamyl	poison	2 L	--	--	10 G	see label
Talstar	warning	10 WP	--	--	--	greenhouse grown ornamentals, trees, shrubs.
<b>CATERPILLARS, CUTWORMS, LOOPERS, ARMYWORMS</b>						
Dipel	non-toxic	WP	--	--	--	Consult label of this and other brands of <i>Bacillus thuringiensis</i> available for specific pest uses. All crops.
Sevin	caution	50 W 80 S	--	--	--	
lindane	warning	25 W	--	--	--	azalea, carnation, chrysanthemum, geraniums, rose, snapdragon.
Mavrik	caution	2 AF	--	--	--	All crops
Dylox	caution	80 SP	--	--	--	crops listed on label.
methoxychlor	caution	50 Q	--	--	--	crops listed on label.
Talstar	warning	10 WP	--	--	--	greenhouse grown ornamentals trees, shrubs
<b>CENTIPEDES (see MILLIPEDES)</b>						
<b>CYCLAMEN MITE</b>						
Thiodan	warning	50 W 2 E	--	--	--	african violet, cyclamen, snapdragon, begonia gerbera.
Kelthane	caution	18.5 EC	--	--	--	african violet, cyclamen, snapdragon, gerbera.
diazinon	warning	50 W AG 500	--	--	--	crops listed on label.
<b>FUNGUS GNATS (ADULTS)</b>						
Resmethrin	caution	2 EC	1A	--	--	all crops.
Vapona	poison	--	10A	V-41, 4EC F - EC	--	all crops.
Dithio	poison	--	15 A	--	--	all crops.
+ oxamyl	poison	2 L	--	--	10 G	see label

PESTICIDE	SIGNAL WORD	FOLIAR SPRAY	AEROSOL	SMOKE FOG VAPOR	SOIL	CROPS LABELED*
<b>FUNGUS GNATS (larvae)</b>						
malathion	--	--	--	50 EC	--	see label
diazinon (Knox-out)		2 FM	--	--	--	all crops
<b>LEAFMINERS</b>						
+ Pramex	warning	13.3 EC	--	--	--	chrysanthemum only.
+ Pounce	caution	3.2 E	--	--	--	chrysanthemum only.
+ Temik	poison	--	--	--	10 G	chrysanthemum, gerbera.
Dibrom	warning	--	--	V-58 EC	--	all crops.
Vapona	poison	--	10 A	--	--	all crops.
diazinon	warning	--	--	F	--	aster, carnation, chrysanthemum, snapdragon.
+ Penncap-M	warning	2 F	--	--	--	chrysanthemum only.
Avid	caution	0.15 EC	--	--	--	flower crops, foliage plants, other non-woody ornamentals
<b>LEAFROLLERS</b>						
Orthene	caution	75 SP	--	--	--	rose.
Vapona	poison	--	10 A	F	--	all crops
Dibrom	warning	--	--	--	--	
Talstar	warning	10 WP	--	--	--	greenhouse grown ornamentals, trees, shrubs
<b>MEALYBUGS (FOLIAR)</b>						
+ Temik	poison	--	--	--	10 G	poinsettia only.
Vapona	poison	--	10 A	--	--	all crops.
+ Dithio	poison	--	5 A	S, F	--	all crops.
+ oxymal	poison	2L	--	--	10 G	see label
Dibrom	warning	--	--	F, V	--	all crops.
Orthene	caution	75 SP	3 A	--	--	foliage plants, orchids, anthrium, cacti, poinsettia
Enstar	caution	5 E	--	--	10	all crops.
malathion	caution	--	15 A	--	--	all crops.
+ Systox	poison	2 E	--	--	2 E	chrysanthemum, dahlia, rose.
		6 E	--	--	6 E	
Sumithrin	caution	2 E	--	--	--	labeled crops.
Talstar	warning	10 WP	--	--	--	greenhouse grown ornamentals trees, shrubs.
<b>MEALYBUGS - ROOT</b>						
diazinon	warning	--	--	--	4 E	see label directions.
					25 WP	
Enstar	caution	5 E	--	--	25 WP	all crops.
ethion	warning	--	--	--	4 M	bench or ground treatment.
malathion	caution	--	--	--	57 EC	bench or ground treatment.
diazinon	warning	--	--	--	AG 500	bench or ground treatment.
<b>SCALE INSECTS</b>						
Enstar	caution	5 E	--	--	--	all crops
Orthene	caution	75 W	3 A	--	--	see crops listed on label.
+ Dithio	poison	--	5 A	S, F	--	all crops
malathion	caution	--	--	F	--	all crops.
+ Systox	poison	2 E	--	--	2 E	see crops listed on label.
		6 E	--	--	6 E	
+ oxamyl	poison	2L	--	--	10 G	see label
<b>SLUGS, SNAILS</b>						
metaldehyde	caution	--	--	--	bait	all crops
Mesurool	warning	--	--	--	bait	all crops except food plants.
Zectran	warning	2 E	--	--	2 E	see label.
<b>SOWBUGS (see MILLIPEDES)</b>						

PESTICIDE	SIGNAL WORD	FOLIAR SPRAY	SMOKE		SOIL	CROPS LABELED*
			AEROSOL	FOG VAPOR		
<b>SPIDER MITES</b>						
+ Temik	poison	--	--	--	10 G	carnation, chrysanthemum, Gerbera, Cymbidium orchid, poinsettia, rose, snapdragon, or (see crops listed on label).
Pentac	caution	50 WP, 4	--	F	--	azalea, carnation, chrysanthemum, delphinium, gardenia, poinsettia, snapdragon, zinnia.
+ Avid						
Vendex	danger	50 WP, 4L	--	--	--	all crops.
Talstar	warning	10 WP	--	--	--	greenhouse grown ornamentals, trees, shrubs.
Kelthane	caution	35 WP	--	--	--	all crops.
Tedion	caution	25 WP	--	--	--	all crops.
+ Dithion	poison	--	5 A	--	--	all crops.
Dibrom	warning	--	--	F, V	--	all crops.
+ Systox	poison	2 E	--	--	2 E	chrysanthemum, dahlia,
		6 E	--	--	6 E	rose.
Vapona	poison	--	10 A	--	--	all crops.
MSR	warning	2 E	--	--	2 E	all crops.
+ oxamyl	poison	2 L	--	--	10 G	see label
<b>SPRINGTAILS</b>						
malathion	--	--	--	57 EC	25 WD	bench and ground treatment.
<b>THRIPS</b>						
Orthene	caution	75 WP	3 A	--	--	all crops.
diazinon	warning	--	--	F	--	aster, carnation, chrysanthemum, snapdragon.
Vapona	poison	--	10 A	F	--	all crops.
lindane	warning	18.5 EC	--	F	--	all crops.
		25 W				
resmethrin	caution	--	2 A	--	--	--
Dibrom	warning	--	--	V	--	all crops.
MSR	warning	25 SC	--	--	--	all crops.
+ Dithio	poison	--	5 A	S, F	--	all crops.
malathion	caution	--	15 A	F	--	carnation, chrysanthemum, geranium, rose, snapdragon.
+ Avid						
oxamyl	poison	2L	--	--	10 G	see label
Mavrik	caution	2 AF	--	--	--	All crops
+ Temik	poison	--	--	--	10 G	chrysanthemums
<b>WHITEFLIES</b>						
resmethrin	caution	2 A	--	--	--	all crops.
		2 EC	--	F	--	azalea, begonia, bird of paradise, coleus, dieffenbachia, geranium, Indian rubber tree, lily Norfolk island pine, palm, poinsettia, snapdragon, wandering jew.
Sumithrin	caution	Aerosol	--	--	--	see label
		2 E				
+ oxamyl	poison	2L	--	--	10 G	see label
Mavrik	caution	2 F	--	--	--	All crops
Enstar	caution	5 E	--	--	--	all crops
Orthene	caution	75 SP	3 A	--	--	all crops
Thiodan	warning	50 WP	--	S	--	all crops
+ Temik	poison	--	--	--	10 G	chrysanthemum, gerbera, poinsettia
Vapona	poison	--	10 A	S, F	--	all crops.
Dibrom	warning	--	--	S, V	--	all crops.
+ Dithio	poison	--	5 A	S, F	--	all crops.
+ Systox	poison	2 E	--	--	2 E	---
		6 E	--	--	6 E	
lindane	warning	25 W	--	S, F	--	all crops.
		18.5 EC				
+ Pydrin	poison	2.4 EC	--	--	--	all crops.
Talstar	warning	10 WP	--	--	--	greenhouse grown ornamentals, trees, shrubs.

+ Restricted use chemical.

\*Be sure to check precautions for phytotoxicity for each pesticide in Table II.



PESTS LABELED	FORMULATION	50 gal.	10 gal.	3 gal.	PRECAUTIONS AND REMARKS
<b>DIPEL</b> caterpillars, loopers, tobacco budworm, omnivorous leafroller, armyworms.	16,000 IU WP	4-8 oz.	4.5-9 T	1.5-3 T	Full coverage foliar spray when larvae are small. Use lower rate for light, higher rate for severe infestations. Double the rate for armyworms.
NOTES: DIPEL is non-toxic to man, animals, birds, fish, bees, and is exempt from tolerance on crops.					
<b>+ DITHIO</b> aphids, mealybugs, scales, spider mites	5% Aerosol	4-lb bomb treats 20,000 cu. ft. or use a 2-4 second exposure for each 1,000 cu. ft.			Treat when foliage is dry with vents closed at least 2 hours or overnight. House temperature should be 70-80° F. Often for- mulated with Tedion (tetradifon), a miticide. Use according to label directions. Where needed, retreat at 7- day intervals. Aerosol may be less effective against mites.
	15% Smoke	3.5 oz. smoke generator treats 10,000 cu. ft.			
<b>DYLOX</b> armyworms, cutworms leafminers, plant bugs, tobacco budworm, webworm. Narcissus bulb fly	80 SP	10-15 oz.	2-3 oz.	4-6 t	Spray plants until thoroughly wet, repeat as necessary.
	80 SP	10 oz.	2 oz.	4 t	Apply 50 gallons of mixture as drench per 500 feet of row. Direct stream to base plants at beginning of adult fly activity (early May to June). Repeat annually.
NOTES: Phytotoxicity has occurred on certain varieties of carnations, chrysanthemums, hydrangeas, and zinnias. May injure African violets, gold dust plant, schefflera, and Syngonium. When large plantings are to be sprayed for the first time, treat only a few plants and observe for 4 to 5 days before spraying the entire planting.					
<b>ENSTAR</b> whiteflies, aphids, mealybugs, soft and armored scales	5 E	3-5 oz.	1.5 T	1.5 t	Apply to runoff every 2 weeks. For severe adult populations, make two applications 7 days apart at twice the given dosage rate.
<b>ETHION</b> millipedes	8 Aqua	6.6 T	1.3 T	1 t	Soil treatment: Apply mixture at a rate of 3 gal. per 100 square feet of bench space. Wear approved mask or respirator.
	4 Misc.	13.3	2.3 T	2 t	
<b>INSECTICIDAL SOAP</b>	Safer's Conc.	4-10 pt	.8-2 pts	8-20 T	See label. Repeated applications of high rates may cause plant damage.

PESTS LABELED	FORMULATION	50 gal.	10 gal.	3 gal.	PRECAUTIONS AND REMARKS
<b>KELTHANE</b> spider mites, Cyclamen mite	35 WP	1/2 lb.	15 T	4.5 T	Apply 2 to 3 times at 4-7 day intervals. Works best at cool temperatures. Use EC for cyclamen mite.
	18.5 EC	.5 pt.	3-6 T	1 to 2 T	
spider mites	fog	1 oz. EC/3,000 cu. ft.			For carnations, mums, roses. Foliage should be dry. Close vents for 1-1/2 hr. Ventilate 1 hr. before re-entry. Maintain temperature 70-80° F.
NOTES: Phytotoxicity: May cause injury to African violets, Anthrium, asparagus fern, begonia, carnation, chrysanthemum, cyclamen, croton, Epiphyllum, Euphorbia, gardenia, geranium, hibiscus, kalanchoe, maidenhair fern, peperomia, poinsettia, pothos, Streptocarpus, sweet pea, TI plant.					
<b>LINDANE</b> aphids, caterpillars fleabeetles, leafhoppers, leafrollers, plant bugs, psyllids, thrips, whiteflies.	20% EC	.5 pt.	3.3 T	1 T	Apply as full coverage foliar spray.
	25% WP	.5 lb.	10 T	3 T	
	fog	1 oz. EC/3,000 cu. ft.			Foliage should be dry. Close vents for 1-1/2 hrs. Ventilate 1 hr. before re-entry. Temperature 70-85° F. Smoke may injure seedlings.
	smoke	see label			
weevils, black vine, fuller rose.	20% liquid	1 pt	6.6 T	2 T	Spray to saturate soil around plants in beds. For potted plants spray soil surface lightly, comparable to a light watering.
NOTES: May cause injury to: anthrium, Aralia, carnation, cyclamen, Dizygotheca, English ivy, ferns, fuchsia, gardenia, gerbera, hibiscus, hydrangea, iris, kalanchoe, kangaroo vine, maidenhair fern, narcissus, poinsettia, rose, Swiss cheese plant, white foil, zebra plant.					
<b>MALATHION</b> aphids, mealybugs, spider mites, thrips, whiteflies.	15% aerosol	Use 1 lb. bomb/50,000 cu. ft.			2-3 treatments at 4-7 day intervals. Foliage must be dry. Close vents for at least 2 hours or overnight. Repeat in 3 days or as needed. Foliage should be dry. Close vents for at least 1-1/2 hrs. Maintain temperature at 70-85° F. Ventilate 1 hr. before reentry.
	Fog	Use 1 oz. EC/3,000 cu. ft.			
aphids, mealybugs, scale crawlers, spider mites, whiteflies.	25 W	1.5 lbs.	4.8 oz.	9 T	Apply 1-2 times at 4-7 day intervals or as needed. Apply mixture at rate of 1 gal./150 sq. ft. of soil surface.
	50% EC	.5 C	5 T	1.5 T	
	50% EC	1 C	3.3 T	1 T	
millipedes, fungus gnats, springtails, sowbugs					
NOTES: May cause plant injury to African violets, Anthrium, Aralia, aster, begonia, camellia, carnation, chrysanthemum, cyclamen, dahlia, dumbcane, ferns, ficus, fuchsia, gardenia, gloxinia, hibiscus, hydranga, liex, impatiens, jade plant, kalanchoe, liliium, Nephytis, orchids, peperomia, petunia, pilea, poinsettia, pothos, rose, schefflera, sweet pear, violet.					
<b>MAVRIK</b> aphids, thrips, mites whiteflies, leaf-eating caterpillars	2 AF	1 to 2.5 fl. oz.	1 T	1 t	Repeat at 5-10 day intervals. See label for precautions.

PESTS LABELED	FORMULATION	50 gal.	10 gal.	3 gal.	PRECAUTIONS AND REMARKS
<b>MESUROL</b> snails, slugs, sowbugs, crickets, millipedes	2 % gran- ules	1 lb/1,000 sq. ft.			Apply bait to soil around plants or flats but not on plant foliage. Do not apply to food crops.
<b>METALDEHYDE</b> snails, slugs	3.25% pel- lets	1 lb/1,000 sq. ft.			Apply bait only to soil surface around plants, not foliage or other plant parts.
NOTE: May cause injury to <i>Cattleya</i> , <i>Phalaenopsis</i> orchids, <i>Gerbera</i> , <i>Ferns</i> .					
<b>METASYSTOX - R</b> aphids, leafhoppers, mites, thrips, whiteflies	SC	.75 pt.	5 T	1.5 T	Foliage spray. Apply as full coverage spray. Repeat as necessary. Soil drench: Apply 1/2 cup mixture per 6 to 8-inch pot. Repeat as necessary. For control of aphids, mites, thrips.
NOTES: Do not handle plants until spray deposit has dried. When large plantings are to be sprayed, treat only a few plants and observe for sensitivity before treating the entire planting. May damage: <i>Anthurium</i> , <i>Aralia</i> , asparagus fern, <i>begonia</i> , <i>Bromeliaceae</i> , <i>chrysanthemum</i> ( <i>Hurricane</i> , <i>icebur</i> , <i>Whitetop</i> , and <i>Penant</i> varieties.), <i>crassula</i> , <i>English ivy</i> , <i>ferns</i> , <i>figus</i> , <i>fuchsia</i> , <i>hernaum</i> , <i>kangaroo vine</i> , <i>Lilium</i> , <i>maidenhair fern</i> , <i>Nephtytis</i> , <i>peperomia</i> , <i>schefflera</i> , <i>Spathiphyllu</i> , <i>zinnia</i> .					
<b>METHOXYCHLOR</b> beetles, thrips, caterpillars, leafhoppers, rose, chafer.	50% WP	1 to 1.5 lb.	3.2 to 4.8 oz	6 to 9 T	Outdoor use only.
NOTE: May cause injury to <i>chrysanthemums</i> .					
<b>NICOTINE</b> aphids, thrips, mealybugs	14 % smoke generator	6 oz./10,000 cu. ft.			Foliage should be dry. Close vents for 2-3 hrs. or overnight. Maintain temperatures between 70-80°F. Apply 2-3 treatments at 4-7 day intervals as needed.
	40% EC	.5 to 1 pt.	3.3 to 6.6 T	1 to 2 T	
NOTES: Do not use smoke on open blooms of snapdragons or geraniums. May injure: <i>African violet</i> , <i>Anthurium</i> , <i>aster</i> , <i>carnation</i> , <i>chrysanthemum</i> , <i>cyclamen</i> , <i>ferns</i> , <i>gardenia</i> , <i>gladiolus</i> , <i>gloxinia</i> , <i>jade plant</i> , <i>kalanchoe</i> , <i>kangaroo vine</i> , <i>maidenhair fern</i> , <i>salvia</i> , <i>Streptocarpus</i> .					
<b>ORTHENE</b> aphids, leafroller mealybugs, scale crawler, thrips, whitefly,	75 SP	.3 lb.	6.6 T	2 T	Repeat in 7-10 days as needed. Greenhouse use on roses, carna- tions, mums. Do not respray mums or car- nations within 28 days.
aphids, leafroller, mealybug, scale crawler, thrips, whitefly, leafminer cabbage looper	3% aerosol	spray 5 seconds per 100 sq. ft.			Apply 5-10 seconds/100 sq. ft. Do not use under high tempera- ture and humidity conditions or where gas heating systems are unvented.
NOTES: Injury may occur on <i>Blechnum gibbum</i> , <i>Chamaedorea elegans</i> , <i>Ficus triangularia</i> , <i>Fittonia verscharreffil</i> , <i>Florida ruffle fern</i> , <i>gloxinia</i> , <i>golden shrimp plant</i> , <i>kangaroo vine</i> , <i>Polypodium</i> , <i>Philodendron</i> , <i>Ploystichum</i> , <i>prayer plant</i> , <i>salvia</i> , <i>swedish ivy</i> , <i>Tolmiea meniesil</i> , and many varieties of <i>chrysanthemums</i> . Before treating a large area, spray only a few plants and observe 2 weeks of phytotoxicity.					

PESTS LABELED	FORMULATION	50 gal.	10 gal.	3 gal.	PRECAUTIONS AND REMARKS
+ OXAMYL	10 G	1.4 to 1.9 lbs/1000 sq ft or 2-3 oz. per cubic yard as soil mix			See label for list of recommended species. Wear protective clothing, goggles and mask.
	2L	1 to 2 pts	6 to 13 T	2 to 4 T	See label for directions on using as a soil mix treatment, liquid drench, or root, corm or bulb dip.
+ PENNCAP-M Leafminer	2F	1 pt.	6-2/3 T	2 T	On chrysanthemum only. Apply full coverage foliage spray when damage threatens and repeat at 7-day intervals. Use in well-ventilated area or wear respiratory. Supplemental label must be in operators possession; restricted use.
PENTAC spider mites	4 AF	.25 pt	6.6 t	2 t	Apply 2 times at 2-week intervals. Thorough coverage of both leaf sides is necessary. Works best at 68-75° F. Apply 2 times at 12-day intervals. Foliage should be dry. Close vents for at least 1-1/2 hrs. Maintain temperatures at 70-80° F. Ventilate 1 hour before reentry. May require 3-5 days to show effects.
	50% WP	.25 lb.	5 T	1.5 T	
	Fog	1 oz. EC/3,000 cu. ft.			
NOTES: May injure chrysanthemum foliage. Do not apply to open blooms. May injure Gloxinia, Kalanchoe.					
POUNCE leaf miner on chrysanthemum	3.2 E	10 fl.oz	3.3 T	1 T	Avoid spraying blooms; use on foliage only. May be applied weekly if necessary.
NOTES: Plant injury may occur on some cultivars. If uncertain, test on a small number of plants to determine plant safety prior to large scale use.					

PESTS LABELED	FORMULATION	50 gal.	10 gal.	3 gal.	PRECAUTIONS AND REMARKS
<b>PRAMEX</b> leafminer	13.3% EC	.5 pt.	3.3 T	1 T	Apply as full coverage foliar spray at 4-day intervals to achieve population control.
NOTES: This is a special State registration (24-C) and supplemental labeling must accompany the regular label when in use.					
<b>PYDRIN</b> whiteflies	2.4 EC	2.6-fl.oz.1 to 2 T		1 - 2 t	Apply as needed to maintain control. Apply sprays before extensive webbing or leaf-rolling is evident.
NOTES: Spotting of leaves has occurred on some ornamentals (see label).					
<b>RESMETHRIN</b> whiteflies	26%liquid	.5 pt.	3.3	1 T	Spray weekly to point of runoff for 4 weeks. Best results at 70° F. When fewer applications preferred, use higher rates. Foliage should be dry. Close vents for at least 1-1/2 hr. Maintaining temperature of 70° F. Ventilate before reentry for 1 hr. Apply at weekly intervals for at least 4 weeks.
	Fog	1.5 fl oz/10,000 cu. ft.			
whiteflies, fungus gnats, thrips, cucumber beetles, aphids	1% aerosol (PT 1200)	Apply 5-10 sec./100 sq. ft. of bench			
leafhoppers, plant bugs, spittlebug	24% L	.5 pt.	3.3 T	1 T	Apply in early evening when foliage is dry and temperature is 70-80° F. Keep greenhouse closed 2-4 hours following treatments. Spray directly on insects
NOTES: Treat poinsettias prebract only. Do not use on red calceolaria or open blooms of "Shoesmith" chrysanthemum.					
<b>SEVIN</b> blisterbeetle, flea beetle, leafhoppers, leafrollers, mealybugs, plant bugs, thrips (exposed) (exposed)	10 D	Apply a light covering of dust barely visible when completed			Treat when plants are dry and humidity is low. Use caution for greenhouse treatments if conditions are not suitable.
	50 W	1 lb.	6.6 T	6 T	
	80 SL	10 oz.	4 T	3-3/4 T	
NOTES: Do not use on Boston ivy or Virginia creeper. Injury may occur on tender growth if plants are wet or humidity is high. Plant injury may occur on black olive, Boston fern, Cuban laurel, English ivy, hibiscus, maidenhair fern, peperomia, pilea, Sheffiera, Syngonium.					
<b>SUMITHRIN</b> whiteflies, aphids	2 E	1 pt.	6.6 T	2 T	Spray in late afternoon or at night only. For whiteflies repeat applications weekly. When fewer applications are preferred, use the same amount in 1/2 the amount of water.
mites, mealybugs	2 E	2 pts.	13.3 T	4 T	
	Aerosol Spray	Apply 15 oz. per 3000 sq. ft.			

PESTS LABELED	FORMULATION	50 gal.	10 gal.	3 gal.	PRECAUTIONS AND REMARKS
+ SYSTOX aphids, mealybugs, mites, whiteflies  camellia scale Rhododendron scale, soft brown scale, tea scale	2 E	.5 to .75 pts.	3.3 to 4.6 T	1 to 1.5 T	Foliage spray. Spray plants until thoroughly wet.
	6 E	.18-.25 pts.	3.3 to 4.6 t	1 to 1.5 t	Soil drench.
	2E	1 pt.	6.6 T	2 T	Apply 1 pint of mixture per each square foot of bench or bed area. For potted plants apply 1/4 pint of mixture per 6 inch pot.
	6 E	.3 pt.	6.6 T	2 t	

NOTES: Extremely toxic. Systox is a systematic insecticide in plants. Do not apply within 5 days of handpicking, pruning, transplanting, or other handling. Phytotoxicity may occur of African violet, cibotium ferns, croft lilies, Alternanthera, Amaryllis, Anthrium, asparagus fern, azalea, begonia, camellia, Cattleya, chrysanthemum, cineraria, coleus, cyclamen, Euphorbia, ferns, Ficus, Fittonia, fuschsia, gardenia, geranium, gerbera, Helxine soleivollii, hibiscus, hydrangea, liex, impatiens, kalanchoe, maidenhair fern, Monstera, poinsettias, pothos, Spironema.

TALSTAR aphids, whiteflies, mealybugs, spider mites, leafroller, armyworms	10 WP	3-8 oz.	1 to 3 T	1 to 3 t	Apply as full coverage foliar spray. Repeat as necessary. Do not handle plants till dry.
--	-------	---------	----------	----------	--

TEDION spider mites	miscible liquid	1 pt.	3.3 T	1 T	Apply thoroughly to both sides of leaves. Works best at temperatures above 80° F.
------------------------	-----------------	-------	-------	-----	---

NOTES: Do not use on mums. Injury (leaf drop) has occurred on White Butterfly and Cinderella roses. Phytotoxicity on Anemone, anthurum, begonia, Brunfelsia, calceolaria, carnation, cineraria, cissus, cyclamen, cyripedium, dahila, Euphorbia, Ficus, freesia, gardenia, gladiolus, hibiscus, hydrangea, kalanchoe, sweet pea. Scumbergera gaetineri, schefflera, Senecio, Sinningla, Stephanotis. Tedion is most likely to be available in combination with Dithio as a smoke.

+ TEMIK aphids, leafminers thrips	10% G	50-75 lbs./A		For certified	commercial application in commercial production. Use higher rate on heavy organic or clay soils, or if pest populations become severe. If beds are covered with leaf or compost type mulch, remove mulch or place granules beneath mulch, work into soil and water thoroughly. Apply granules evenly around base of plants. Wash off granules adhering to foliage. Do not mix granules with potting soil, nor mix with water. Do not market potted plants for 4 weeks after treatment. Do not plant food crops in soil treated previously with Temik.
		61-92 ozs./linear ft row			
Rates for treatment of individual containers:					
Container Size (inches diameter)	Grams per container for equivalent rate (lbs./A)				
	50	75	100		
4	0.05	0.075	0.10		
6	0.1	0.15	0.2		
8	0.2	0.3	0.4		
10	0.3	0.45	0.6		
12	0.5	0.75	1.0		
Equivalent weights for teaspoon measures (based on rounded teaspoonfuls)					
Size	Approx. wt. in grams				
1/8 tsp.	0.45				
1/4 tsp.	0.91				
1/2 tsp.	1.30				
1 tsp.	3.20				
2 tsp.	6.40				
1 T	9.45				

NOTES: Extremely toxic. Do not mix granules with water. Apply after plants are established and as pests appear. Do not apply to foliage. May injure some varieties of chrysanthemums, Freesia spp., Rieger begonia, Vinca major.

PESTS LABELED	FORMULATION	50 gal.	10 gal.	3 gal.	PRECAUTIONS AND REMARKS
THIODAN aphids, Cyclamen mite, whitefly, rose chafer  aphids, thrips, whiteflies	3 EC	.3 qt.	4 T	4 t	Use proper mask or respirator. EC may injure some chrysanthemums. Foliage should be dry. Close vents for at least 2 hrs. overnight.
	50 WP	.5 lb.	10 T	3 T	
	smoke				

NOTES: On chrysanthemums, best results will be obtained if applied before plants flower. Phytotoxicity: Injury may occur on African violet, Anthrium, kangaroo vine, crape Myrtle, crossandra, gardenia, geraniums, gloxinia, grape ivy, poinsettia, rose, scindapsus, some varieties of chrysanthemums.

VAPONA aphids, leafminers, leafrollers, mealybugs, thrips, whiteflies	10% aerosol	Use 2-4 second application for each 1,000 cu. ft.			Treat when foliage is dry. Best and safest at house temperature of 60-65 F. Keep vents closed at least 2 hrs., or overnight.
	4 E	vaporize 1 oz. per 10,000 cu.ft.			
aphids, mealybugs, spider mite, thrips, whitefly	Fog	1 oz. EC/3,000 cu. ft.			For carnations, mums, roses. Foliage and blooms should be dry. Close vents for 1-1/2 hrs. Ventilate 2 hrs. before reentry. Foliage should be dry. Close vents for at least 2 hrs. overnight.
	Smoke	6 oz. can/10,000 cu. ft.			

NOTES: May injure certain mum varieties, particularly Shasta and Pink Champagne, rose, and snapdragon varieties. Ageratum, aster, kangaroo vine, poinsettia, wandering jew.

VENDEX spruce spider, Oligonychus, two- spotted spider	50 WP	2 to 4 oz.	3.75 to 7.5 T	.75 to 1.5 T	Do not add oil to spray solution. Apply when mites appear. Repeat as necessary to maintain control, but not more than once every 28 days.
	4 L	4 to 8.	3.3 T	1	

NOTES: Apply to foliage only of chrysanthemum (pre-bloom) and poinsettia (prebract).

Zectran	2 E		3.3 T	1 T	
---------	-----	--	-------	-----	--

Abbreviations: AF-aquaflow; W, WP-wettable powder; E, EC-emulsifiable concentrate; L-liquid; SP, sprayable or soluble powder; SC-spray concentrate; D-dust; G-granular; A-aerosol; F-fog; SG-smoke generator; V-vapor; lb.-pound; pt.-pint; oz.-ounce; fl. oz.-fluid ounce; cu. ft.-cubic feet; c-cup; T-tablespoon; t-teaspoon.

**USEFUL EQUIVALENTS**

1 lb. WP/100 Gal. - 1 T/1 gal	2 Tablespoons - 1 fl. oz.
1 pt. EC/100 gal. - 1 t/1 gal	16 fl. ounces - 1 pint
3 teaspoons - 1 Tablespoon	2 pints - 1 quart

## Diseases of Floral Crops

*R.C. Lambe, Extension Plant Pathologist*

The conditions under which many floral and foliage crops are produced, i.e. high humidity, low light intensity and frequent watering are favorable for the development of fungal and bacterial diseases. If insects are uncontrolled in the greenhouse, viruses can become a major problem. Nematodes may be introduced on infected plant material or unsterilized soil.

Sanitation in propagation and growing will reduce the incidence of disease. Soil-less culture, healthy plant material, clean containers and benches, and pathogen-free water are important considerations. Plant culture on wire benches will avoid soil-borne pathogens. Most fungicides are protectants and require frequent reapplication. Early correct identification of causal agents is important in preventing heavy disease losses and avoiding improper use of pesticides.

PLANT Disease	Fungicide & Formulation; Rate/100 Gal	Remarks
<b>AFRICAN VIOLETS</b>		
<u>Phytophthora root rot</u>	Subdue 2E (25%); 0.5-2.0 oz; metalaxyl	Apply in 100 gal of water over 400-800 sq ft (0.5 pt/ft <sup>2</sup> ). Repeat at 1- to 2-month intervals
	Subdue 5G (5% G); 2 12.0-24.0 oz/1000 ft <sup>2</sup> ; metalaxyl every 6 weeks.	Repeat at 1- to 2-month intervals. Irrigate to thoroughly wet soil after application. Do not apply rate of 9 oz more often than once
Powdery mildew	Banrot (40% WP); 6.0-12.0 oz; etridiazole + thiophanate methyl	Apply additional water immediately after application. Repeat at 4-wk intervals. Apply at monthly intervals.
	Benlate (50% WP); 0.5 lb or 2 tsp/gal; benomyl	Apply at weekly intervals.
	Bayleton (25% WP); 2.0-4.0 oz; triadimefon	Apply at 7- to 14-day intervals.
	Milban EC; 32 oz; dodemorph	Apply at 14-day intervals.
<b>AZALEA (Rhododendron)</b>		
<u>Botrytis blight</u> (Gray mold)	Chipco 26019 (50% WP); 1.0-2.0 lb; iprodione	Spray every 10 to 14 days.
	Benlate (50% WP); 0.5 lb or 2 tsp/gal; benomyl	Spray every 7 to 10 days.
	Daconil 2787 Flowable Fungicide (500 g/l); 2.0 pt or 2 tsp/gal; chlorothalonil	Spray every 7 to 10 days during wet weather. Apply at early bloom.
	Exotherm (Termil); 3.5 oz/1000 sq ft; chlorothalonil	Fumigate every 7 to 14 days.
<u>Cylindrocladium root rot</u>	Benlate (50% WP); 1.0 lb (apply 1 pt/6 inch container) or 1 tbsp/gal; benomyl	Drench on the surface of growing medium to prevent disease development. Repeat at 2- to 4-week intervals during disease pressure period.
<u>Ovulinia flower blight</u>	Daconil 2787 Flowable Fungicide (500 g/l); 2.0 pt or 2 tsp/gal; chlorothalonil	Spray every 7 to 10 days. Apply at new leaf emergence.
	Daconil 2787 (75% WP); 1.5 lb or 5 tsp/gal; chlorothalonil	
	Zyban (75% WP); 1.5 lb or 5 tsp/gal; thiophanate methyl + mancozeb	Spray at 7- to 10-day intervals.
	Bayleton (25% WP); 8.0-16.0 oz; triadimefon	Begin applications at the expanded bud stage.

PLANT Disease	Fungicide & Formulation; Rate/100 Gal	Remarks
Powdery mildew	Bayleton (25% WP); 2.0-4.0 oz; 0.5-1.0 tsp/gal; triadimefon	Apply to run-off when mildew first appears.
Phytophthora shoot blight	Daconil 2787 Flowable Fungicide (500 g/l); 2.0 pt or 2 tsp/gal; chlorothalonil	Spray every 7 to 10 days. Apply at new leaf emergence.
	Daconil 2787 (75% WP); 1.5 lb or 5 tsp/gal; chlorothalonil	
	Subdue 2E (25%); 1.2-2.4 oz; metalaxyl	See manufacturer's directions. Spray to run-off. Repeat at 2- to 3-month intervals.
Phytophthora root and crown rot	Banrot (50% WP); 6.0-12.0 oz; etridiazole + thiophanate methyl	Container & Bedgrown Plants: Mix 8 oz with 100 gal of water per 400 sq ft or apply in sufficient amount to saturate the soil mixture, such as 1/2 pt/6 inch pot. Irrigate immediately with additional water equal to at least half the volume of the fungicidal drench for improved soil penetration of the fungicide. Repeat at 4-week intervals if necessary.
	Truban (30% WP); 8.0 oz; etridiazole	
	Terrazole (35% WP); 8.0 oz; etridiazole	Repeat at 2- to 3-month intervals.
	Subdue 2E (25%); 1.2-2.4 oz; metalaxyl	Irrigate to thoroughly wet the soil after application. Repeat application at 2- to 4-month intervals.
	Subdue 5G (5% G); 15.0-30.0 oz/1000 oz; metalaxyl	
Septoria leaf spot	Benlate (50% WP); 1.0 lb or 1 tbsp/gal water; benomyl	Repeat 10-to 14-day intervals throughout the growing season.
<b>BEGONIA</b>		
Botrytis flower spot (Gray mold)	Ornalin (50% WP); 1.0-1.5 lb or 3-5 tsp/gal; vinclozolin	Spray every 10 to 14 days.
	Exotherm (Termil); 3.5 oz/1000 cu ft; chlorothalonil	Fumigate every 7 to 14 days.
	Benlate (50% W); 0.5 lb or 2 tsp/gal; benomyl	Spray every 7 to 14 days.
Powdery mildew	Benlate (50% WP); 0.5 lb or 2 tsp/gal; benomyl	Spray every 7 to 14 days. Follow label instructions. Do not apply sulfur when temperatures are above 90° F.
	Bayleton (25% WP); 2.0-4.0 oz or 0.5-1.0 tsp/gal; triadimefon	Spray to run-off when mildew first appears.
	Milban EC; 32 oz; dodemorph	Spray at 14-day intervals.
Pythium root rot	Truban (30% WP) 3.0-10.0 oz or 1/3-1 tsp; etridiazole	Apply on 400 sq ft or saturate the soil medium, such as 1/2 pt/6 inch container.
	Subdue 2E (25%); 0.25-0.5 oz; metalaxyl	Apply at seeding in 100 gal of water over 800 ft <sup>2</sup> (1 pt/sq ft).
	Subdue 5G (5% G); 6.0-12.0 oz/1000 ft <sup>2</sup> ; metalaxyl	At transplanting (2 to 3 inches deep) uniformly apply water to thoroughly wet soil. Repeat at 1 to 2 months. Do not apply more than 9 oz more than once every 6 weeks.

PLANT Disease	Fungicide & Formulation; Rate/100 Gal	Remarks
Bedding - various flowering plants Damping-off, Rhizoctonia, Pythium	Banrot (40% WP); 4.0-8.0 oz or 1.5 tsp/gal; thiophanate methyl + etridiazole	Apply 100 gal of Banrot to 800 ft <sup>2</sup> of bed (1 gal/8 ft <sup>2</sup> ) at seeding and transplanting.
	Benlate (50% WP); 1.0 lb + 4.0-6.0 oz; Truban (30% WP) 1.0 tbs + 1.0 tsp/gal; benomyl + etridiazole	Apply Truban or Terrazole plus Benlate in 100 gal to 800 ft <sup>2</sup> of bed (1 gal/8 ft <sup>2</sup> ) and use at seeding and transplanting.
<b>CARNATION (Dianthus)</b>		
<u>Alternaria</u> blight	Zyban (75% WP); 0.5 lb or 2 tsp/gal; thiophanate methyl + mancozeb	Spray at 7-day intervals.
	Fore (80% WP); 1.5 lb or 1.5 tbs/gal; mancozeb	Spray at 7-day intervals.
	Daconil 2787 Flowable Fungicide (500 g/l); 2.0 pt or 2 tsp/gal; chlorothalonil	Spray on cuttings.
<u>Botrytis</u> flower spot (Gray mold)	Chipco 26019 (50% WP); 1.0-2.0 lb; Iprodione	Spray every 10 to 14 days.
	Exotherm (Termil); 3.5 oz/1000 cu ft; chlorothalonil	Fumigate every 7 to 14 days.
	Benlate (50% WP); 0.5 lb or 2 tsp/gal; benomyl	Spray every 7 to 14 days.
	Ornalin (50% WP); 1.5 lb or 5 tsp/gal; vinclozolin	Spray every 10 to 14 days.
<u>Fusarium</u> stem rot	Benlate (50% WP); 1.0 lb or 1 tbs/gal; benomyl	Spray during cool, moist conditions. Set sand-grown plants on high benches when planting.
<u>Rhizoctonia</u> stem rot	Chipco 26019 (50 WP); 0.4 lb; iprodione	Apply 1 to 2 pt/sq ft every 14 days.
	Terraclor (75% WP); 0.5 lb or 2 tsp/gal; quintozene	Apply 1 pt of solution/sq ft or 100 gal to 800-1000 sq ft.
<b>CHRYSANTHEMUM</b>		
<u>Botrytis</u> blight (Gray mold)	Chipco 26010 (50% WP); 1.0-2.0 lb; iprodione	Apply every 10 to 14 days.
	Benlate (50% WP); 0.5 lb or 2 tsp/gal; benomyl	Apply Benlate every 10 to 14 days under normal weather.
	Daconil 2787 Flowable Fungicide (500 g/l); 2.0 pt or 2 tsp/gal; chlorothalonil	Spray every 7 days during blooming season. Apply at prebloom.
	Daconil 2787 (75% WP); 1.5 lb or 5 tsp/gal; chlorothalonil	
	Ornalin (50% WP); 1.5 lb or 5 tsp/gal; vinclozolin	Spray every 10 to 14 days.
Powdery mildew	Benlate (50% WP); 0.5 lb or 2 tsp/gal; benomyl	Spray Benlate at 10- to 14-day intervals

PLANT Disease	Fungicide & Formulation; Rate/100 Gal	Remarks
	Bayleton (25% WP); 2.0-4.0 oz or 0.5-1.0 tsp/gal; triadimefon	Spray to run-off when mildew first appears.
<u>Puccinia horiana</u> white rust	Dithane Z-78 (75% WP); 1.5 lb or 1.5 tbsp/gal; zineb Bayleton (25% WP); 2.0-4.0 oz or 0.5-1.0 tsp/gal; triadimefon	Control of this rust consists of avoiding wetting of the foliage when watering and spraying with zineb when disease is first observed. If not controlled, cut back plants to the ground, gather all plant material and debris and incinerate. Spray Bayleton to run-off when mildew first appears.
<u>Mycosphaerella</u> ray blight	Daconil 2787 Flowable Fungicide (500 g/l); 2.0 pt or 2 tsp/gal; chlorothalonil Daconil 2787 (75% WP); 1.5 lb or 5 tsp/gal; chlorothalonil	Apply at transplanting of cuttings.
<u>Pythium</u> root rot	Subdue 2E (25%); 0.25-0.5 oz; metalaxyl Subdue 5G (5% G); 2 12.0-24.0 oz/1000 ft <sup>2</sup> ; metalaxyl Terrazole (35% WP); 4.0 oz; bedding plants; etridiazole Truban (30% WP); 3.0-4.0 oz; bedding plants; etridiazole Truban (5% G); 10.0 oz/cu yd; etridiazole	Apply at seeding in 100 gal of water to 800 sq ft. See African Violets. Retreat bedding plants with etridiazole at 4- to -8 wk intervals. Retreat container plants at 4- to 12-week intervals. Incorporate in growth media.
<u>Pythium</u> and <u>Rhizoctonia</u> root rot	Banrot (40% WP); 4.0-8.0 or 1 tsp/gal; etridiazole PLUS thiophanate methyl	Drench on media surface at 4-week intervals
<u>Rhizoctonia</u>	Chipco 26019 (50% WP); 0.4 lb; iprodione	Apply 1 to 2 pt/ft <sup>2</sup> every 14 days.
<u>Septoria</u> leaf spot	Benlate (50% WP); 1.0 lb or 1 tbsp/gal; benomyl Daconil 2787 Flowable Fungicide (500 g/l); 2.0 pt or 2 tsp/gal; chlorothalonil Daconil 2787 (75% WP); 1.5 lb or 5 tsp/gal; chlorothalonil Dithane Z-78 (75% WP); 1.5 lb or 1.5 tbsp/gal; zineb	Apply at weekly intervals when new shoot growth begins. Cover lower leaf surface completely. Apply benomyl at 10- to 14-day intervals. Spray chlorothalonil every 7 to 14 days. Apply at transplanting of cuttings.
<b>CYCLAMEN</b>		
<u>Botrytis</u> leaf blight (Gray mold)	Chipco 26019 (50% WP); 1.0-2.0 lb; iprodione Ornalin (50% WP); 1.5 lb or 1.5 tbs/gal; vinclozolin Benlate (50% WP); 0.5 lb or 2 tsp/gal; benomyl	Spray every 10 to 14 days. Apply every 10 to 14 days. Apply every 10 to 14 days and reduce humidity.
<b>FOLIAGE, Various</b>		
Stem and root rots <u>Pythium</u> and <u>Rhizoctonia solani</u>	Banrot (40% WP); 8.0-12.0 oz or 1.5 tsp/gal; etridiazole PLUS thiophanate methyl	Sterilize growing medium. Remove and destroy affected plates. Drench at 4-week intervals. (See label for specific plants allowed).

PLANT Disease	Fungicide & Formulation; Rate/100 Gal	Remarks
Pythium root rot	Truban (30% WP); 12.0 oz or 1.5 tsp/gal; etridiazole	Use well-drained growing medium. Sanitation, above ground benches. Avoid overhead watering. Drench at 4-week intervals. (See label for specific plants allowed). Incorporate into media when seeding or transplanting.
	Truban (5% G); 10.0 oz/cu yd; etridiazole	
	Subdue 2E (25%); 0.4-1.2 oz; metalaxyl	Apply in 100 gal water over 400 sq ft of bed area. Repeat at 2- to 3-month intervals.
	Subdue 5G (5% G); 8.0-16.0 oz/2000 ft <sup>2</sup> ; metalaxyl	See manufacturer's directions.
<b>GERANIUMS</b>		
Botrytis leaf blight (Gray mold)	Chipco 26019 (50% WP); 1.0-2.0 lb; iprodione	Spray every 10 to 14 days.
	Benlate (50% WP); 0.5 lb or 2 tsp/gal; benomyl	Apply Benlate every 10 to 14 days under normal weather. Complete sanitation, keep humidity low and avoid splashing water and drips. Remove old plants and burn affected parts. Spray Daconil during cool, moist conditions.
	Daconil 2787 (75% WP); 1.5 lb/100.0 gal; 5 tsp/gal; chlorothalonil	
	Daconil 2787 Flowable Fungicide (500 g/l); 2.0 pt/100.0 gal or 2 tsp/gal; chlorothalonil	
Pythium blackleg or black rot	Truban (5% G); 10.0 oz/cu yd; etridiazole	Good ventilation and spacing of plants. incorporate into growth media.
	Truban(30% Wp) 3.0-10.0 oz or 1-2 tsp/gal; etridiazole	Apply 1/2 pt/6 inch container. Sterilize rooting media, pots, and benches with steam--follow sanitation program.
	Subdue 2E (25%); 0.25-0.5 oz; metalaxyl	See manufacturer's directions.
	Subdue 5G (5% G); 6.0-12.0 oz/1000 ft <sup>2</sup> ; metalaxyl	See Begonia.
Rhizoctonia root and stem rot	Chipco 26019 (50% WP); 0.4 lb; iprodione	Apply 1 to 2 pt/sq ft every 14 days.
	Benlate (50% WP); 1.0 lb or 1.0 tbs/gal; benomyl	Apply as a drench or heavy spray (1.0-2.0 pt/ft <sup>2</sup> ) after transplanting into containers or propagation beds.
Rust	Daconil 2787 (75% WP); 1.5 lb/100.0 gal; 5 tsp/gal; chlorothalonil	Apply during cool, moist conditions.
	Daconil 2787 Flowable Fungicide (500 g/l); 2.0 pt/100.0 gal or 2.0 tsp/gal; chlorothalonil	
	Bayleton (25% WP); 2.0-4.0 oz or 0.5-1.0 tsp/gal; triadimefon	Spray at first sign of disease
Powdery mildew	Bayleton (25% WP); 2.0-4.0 oz or 0.5-1.0 tsp/gal; triadimefon	Spray to run-off when mildew first appears.
<b>KALANCHOE</b>		
Botrytis	Chipco 26019 (50% WP); 1.0-2.0 lb; iprodione	Spray every 10 to 14 days.

PLANT Disease	Fungicide & Formulation; Rate/100 Gal	Remarks
Powdery mildew	Zyban (75% WP); 1.5 lb or 1.5 tbs/gal; thiophanate methyl + mancozeb	Spray every 10 to 14 days.
	Benlate (50% WP) 0.5 lb or 2 tsp/gal; benomyl	Spray every 7 to 14 days.
<b>LILY</b>		
<u>Botrytis</u> blight	Chipco 26019 (50% WP); 1.0-2.0 lb; iprodione	Spray every 10 to 14 days.
	Ornalin (50% WP); 1.5 lb or 1.5 tbs/gal; vinclozolin	Spray every 10 to 14 days.
	Daconil 2787 Flowable Fungicide (500 g/l); 2.0 pt/or 2 tsp/gal; chlorothalonil	Spray every 7 to 14 days. Apply at prebloom.
	Daconil 2787 (75% WP); 1.5 lb/or 5 tsp/gal; chlorothalonil	
	Exotherm (Termil); 3.5 oz/1000 cu ft; chlorothalonil	Fumigate every 7 to 14 days.
	Benlate (50% W); 0.5 lb or 2.0 tsp/gal; benomyl	Spray every 7 to 14 days.
<u>Pencilium</u> and <u>Fusarium</u> bulb rot	Benlate (50% WP); 1.0 lb or 1 tbs/gal; benomyl	Soak cleaned bulbs for 15 to 30 minutes in warm dip (80-85° F), preferably within 48 hours after digging. Dry bulbs after treatment. A fungicide for <u>Pythium</u> should be added.
	Ornalin (50% WP); 1.5-2.0 lb or 1.5-2.0 tbs/gal; vinclozolin	
<u>Root rot complex Pythium</u> spp. and <u>Rhizoctonia solani</u>	Banrot (40% WP); 6.0-12.0 oz or 1.5 tsp/gal; etridiazole + thiophanate methyl	Drench to saturate the soil mixture such as 1/2 pt/6 inch pot. Retreat at 4- to 12-week intervals.
<b>PETUNIA</b>		
Fungus root rot ( <u>Rhizoctonia</u> and <u>Pythium</u> )	Banrot (40% WP); 8.0 oz or 1.5 tsp/gal; thiophanate methyl + etridiazole	Drench on the surface of soil. Repeat at 2- to 4-week intervals.
<u>Botrytis</u> blight	Daconil 2787 (75% WP); 1.5 lb/100.0 or 5 tsp/gal; chlorothalonil	Spray every 7 to 10 days.
	Daconil 2787 Flowable Fungicide (500 g/l); 2.0 pt/100.0 gal or 2 tsp/gal; chlorothalonil	
<b>POINSETTIAS</b>		
<u>Botrytis</u> blight	Chipco 26019 (50% WP); 1.0-2.0 lb; iprodione	Spray every 10 to 14 days.
	Ornalin (50% WP); 1.5 lb or 1.5 tbs/gal; vinclozolin	Spray every 10 to 14 days.
	Benlate (50% WP); 0.5 lb or 2 tsp/gal; benomyl	Spray every 7 to 14 days.
	Exotherm (Termil); 3.5 oz/1000 cu ft; chlorothalonil	Fumigate every 7 to 14 days. Do not apply when foliage is wet or when temperature is above 75oF.

PLANT Disease	Fungicide & Formulation; Rate/100 Gal	Remarks
Root Rot Complex <u>Rhizoctonia solani</u> <u>Pythium spp.</u> <u>Thielaviopsis basicola</u>	Benlate (50% WP); 1.0 lb or 1 tbsp/gal; benomyl + Truban (30% WP); 3.0-10.0 oz or 1/2 pt/6 inch; etridiazole	Benlate will not control Pythium. However, a mixture of Benlate and Truban or Banrot applied every 4 weeks will prevent root rot caused by most soil-borne fungi.
	Banrot (40% WP); 8.0-12.0 oz or 1.5 tsp/gal; etridiazole + thiophanate methyl	See above.
	Subdue 2E (25%); 0.5-2.0 oz; metalaxyl	Controls Pythium root rot only. Apply in 100 gal water to 400-800 sq ft (1/2 pt/sp ft). Repeat at 1- to 2-month intervals. See African Violets.
	Subdue 5G (5% G); 2, 12.0-24.0 oz/1000 ft <sup>2</sup> ; metalaxyl	
<u>Rhizoctonia</u> leaf blight	Benlate (50% WP); 1.0 lb or 1 tbsp/gal; benomyl	Spray every 7 to 14 days during propagation to protect the leaves from infection.
	Zyban (75% WP); 1.5 lb or 1.5 tbs/gal; thiophanate methyl + mancozeb	Spray at weekly intervals.
<b>ROSE</b>		
Powdery mildew	Benlate (50% WP); 0.5 lb or 2 tsp/gal; benomyl	Spray Benlate in the spring as leaves expand and at 10- to 14-day intervals to cover all plant parts.
	Milban (39% EC); 1.0 qt; dodemorph	Spray Zyban and Triforine every 7 to 10 days. Spray Milban every 10 to 14 days.
	Triforine EC 12.0-18.0 oz; funginex	See above.
	Zyban (75% WP); 0.5 lb or 2 tsp/gal; thiophanate methyl + mancozeb	See above.
	Bayleton (25% WP); 2.0-4.0 oz or 0.5-1.0 tsp/gal; triadimefon	Spray to run-off when mildew first appears.
<b>SNAPDRAGONS</b>		
<u>Botrytis</u> blight	Exotherm (Termil); 3.5 oz/1000 cu ft; chlorothalonil	Fumigate every 7 to 14 days.
	Benlate 0.5 lb or 2.0 tsp/gal; benomyl	Spray every 7 to 14 days.
	Chipco 26019 (50% WP); 1.0-2.0 lb; iprodione	Spray every 10 to 14 days.
	Zyban (75% WP); 1.5 lb or 1.5 tbs/gal; thiophanate methyl + mancozeb	Spray every 7 to 10 days.
Rust	Dithane Z-78 (75% WP); 1.5 lb or 1 tbsp/gal; zineb	Spray as soon as rust pustules appear. Repeat at 7-day intervals.
	Fore (80% WP); 1.5 lb or 1.5 tbs/gal; mancozeb	Spray at 7-day intervals.
	Bayleton (25% WP); 2.0-4.0 oz or 0.5-1.0 tsp/gal; triadimefon	Spray to run-off when rust first appears.
Powdery mildew	Bayleton (25% WP); 2.0-4.0 oz or 0.5-1.0 tsp/gal; triadimefon	Spray to run-off when mildew first appears.
<u>Rhizoctonia</u> root rot	Chipco 26019 (50% WP); 0.4 lb; iprodione	Apply 1 to 2 pt/sq ft every 14 days.

PLANT Disease	Fungicide & Formulation; Rate/100 Gal	Remarks
<b>TULIP</b>		
<u>Botrytis</u> blight (Gray mold)	Ornalin (50% WP); 1.5 lb or 1.5 tbs/gal; vinclozolin	Spray at 10- to 14-day intervals.
	Benlate (50% WP); 0.5 lb or 2 tsp/gal; benomyl	Apply the spray at 7- to 10-day intervals beginning when the plants are 4 inches high.
	Fore (80% WP); 1.5 lb or 1.5 tbs/gal; mancozeb	
<u>Fusarium</u> and <u>Penicillium</u> bulb rot	Chipco 26019 (50% WP); 1.0-2.0 lb; iprodione	Spray every 10 to 14 days.
	Benlate (50% WP); 1 2/3 lb or 5 tsp/gal; benomyl	Soak cleaned bulbs for 15 to 30 minutes in warm dip (80-85°F). Dry bulbs after treatment.
	Mertect 340-F; 30.0 oz; thiabendazole (TBZ)	Dip for 15 to 30 minutes at 55-75°F.
<b>ZINNIA</b>		
<u>Alternaria</u> blight	Chipco 26019 (50% WP); 1.0-2.0 lb; iprodione	Spray every 10 to 14 days.
	Zyban (75% WP); 1.5 lb or 1.5 tbs/gal; thiophanate methyl + mancozeb	Spray at 7- to 10-day intervals. Note: <u>Alternaria zinneae</u> may be seed borne in some seed lots.
Powdery mildew	Daconil 2787 (75% WP); 1.5 lb or 5 tsp/gal; chlorothalonil	Treat at 7- to 10-day intervals at first sign of disease.
	Daconil 2787 Flowable Fungicide (500 g/l); 2.0 pt or 2 tsp/gal; chlorothalonil	
	Zyban (75% WP); 1.5 lb; or 1.5 tbs/gal; thiophanate methyl	Spray every 7 to 10 days.
	Triforine EC (18.2%); 12.0-18.0 oz; funginex	Spray every 7 to 10 days
	Bayleton (25% WP); 2.0-4.0 oz or 0.5-1.0 tsp/gal; triadimefon	Spray every 7 to 10 days





