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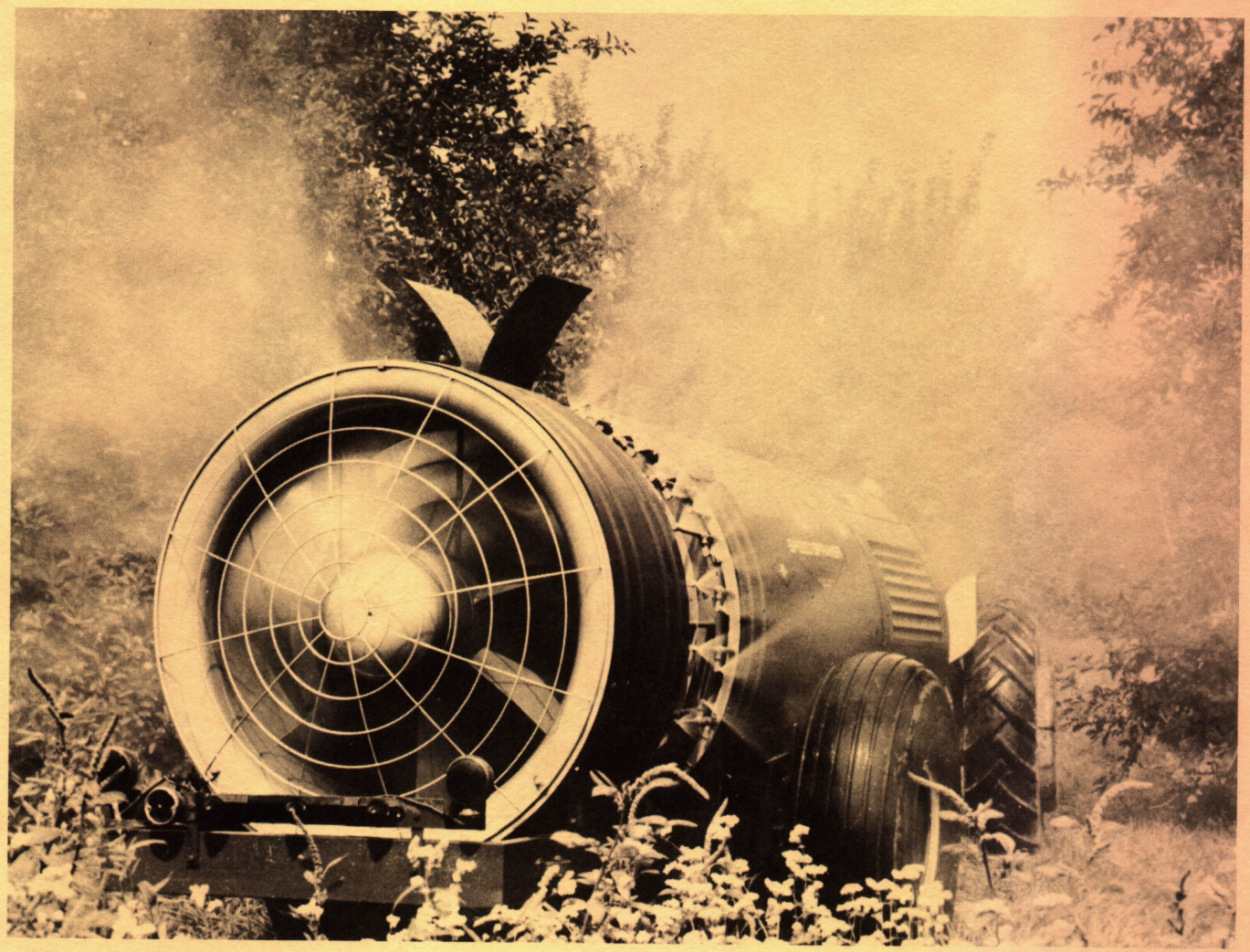
**For Commercial Fruit Growers**

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# FRUIT SPRAYING CALENDAR

COOPERATIVE EXTENSION SERVICE  
MICHIGAN STATE UNIVERSITY

Extension Bulletin 154 Farm Science Series





## WARNING STATEMENT

At the time this publication was prepared certain pesticides, identified by marginal dots (●) were registered on a "no residue" or "zero tolerance" basis.

After December 31, 1967, registration under the Federal Insecticide, Fungicide, and Rodenticide Act for pesticides previously registered for use in a manner involving food or feed on a "no residue" or "zero tolerance" basis will be cancelled unless: (1) finite (numerical) tolerances or exemptions from the requirements of a tolerance have been established by the Food and Drug Administration; or (2) progress reports have been submitted to the Pesticides Registration Division, USDA, showing that studies are being conducted to obtain data to support finite tolerances.

Before using any pesticide in this publication identified by a marginal dot (●) consult your County Extension Agricultural Agent regarding the registration status of that material on food or feed crops.

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# 1968 FRUIT SPRAYING CALENDAR

PREPARED BY A. E. MITCHELL<sup>1</sup>, P. H. WOOLEY<sup>2</sup>, E. J. KLOS<sup>3</sup>, AND A. J. HOWITT<sup>2</sup>

MUCH GOES INTO THE PLANNING of an economical and effective spraying program. In fruit growing, a successful pest control schedule must be based on a knowledge of:

- (1) the life history of the important insects and diseases likely to be encountered;
- (2) the various kinds of pesticide chemicals available, and their proper use; and
- (3) susceptibility of the different kinds and varieties of fruit to insect, disease and spray injury.

In order to provide more complete reference information, four extension publications dealing with fruit pests have been written by members of the Departments of Entomology, Botany and Plant Pathology and Horticulture at Michigan State University. They have the following titles and bulletin numbers:

1. *Tree Fruit Diseases in Michigan* by E. J. Klos, Extension Bulletin E-361.
2. *Small Fruit Diseases in Michigan* by R. H. Fulton, Extension Bulletin E-370.
3. Bulletins on *Fruit Insects in Michigan* will be available in 1968.
4. *Chemical Weed Control for Horticultural Crops* by A. R. Putnam, S. K. Ries, J. Hull and R. P. Larsen, Extension Bulletin E-433.
5. *Plant Parasitic Nematodes and Their Control* by P. H. Wooley and J. A. Knierem, Extension Bulletin E-571.

The pest control schedules in this publication are merely guides to aid each grower in preparing his own pest control program. The same insects and diseases are not always present or economically important in all orchards and small fruit plantings. Thus, during any single season, each grower has to adjust his pest control program to fit his specific conditions.

The chemicals included in each fruit pesticide schedule in this publication have been suggested only at the times they may be used without danger of excessive residues (not to exceed established tolerances) on harvested fruit. The allowable chemical residue and required waiting period between last application and harvest are given for each chemical in Table 1 on page 45 as well as at the end of each spray schedule section.

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The authors express their appreciation for the valuable help and suggestions received from district horticultural agents, county agricultural agents, and Extension and Research personnel in the Departments of Horticulture, Entomology, and Botany and Plant Pathology.

## USE CHEMICALS SAFELY

### Phosphate Insecticides

Growers using phosphate-type insecticides should obtain a doctor's prescription for 1/100 of a grain of atropine tablets and keep a supply of these for emergency use in treating poison symptoms. Early symptoms include weakness, headache, nausea, vomiting, and tightness in the chest.

*Never take atropine before symptoms occur. It is not safe to give tablets by mouth to an unconscious person.*

A new antidote, specific for phosphate chemicals, has recently been released for use by doctors for emergency treatment of phosphate poisoning. This antidote, protopam chloride or pralidoxime called PAM, can be injected intravenously by doctors or prescribed in tablet form. In several instances, persons poisoned by phosphate chemicals have responded to treatment with PAM when atropine failed to give the desired results.

### All Agricultural Chemicals

The National Agricultural Chemical Association has published a 12-point safety code for insecticides and other agricultural chemicals. *Study these 12 rules repeatedly until each is adopted and becomes a habit with you:*

1. Always read the label before using any pesticide. Note warnings and cautions each time before opening the container.
2. Keep pesticides out of the reach of children, pets and irresponsible people. Pesticides should be stored outside the home and away from food and feed.
3. Always store pesticides in original containers and keep them tightly closed. Never keep them in anything but the original container.
4. Never smoke while working with pesticides.
5. Avoid inhaling sprays or dusts. When directed on the label, wear protective clothing and masks.
6. Do not spill pesticides, sprays or dusts on the skin or clothing. If they are spilled, remove contaminated clothing immediately and wash thoroughly.
7. Wash hands and face and change to clean



clothing after spraying or dusting. Also wash clothing each day before reuse.

8. Cover food and water containers when treating around livestock or pet areas. Do not contaminate fishponds.

9. Use separate equipment for applying hormone-type herbicides in order to avoid accidental injury to susceptible plants.

10. Always dispose of empty containers so that they cannot harm humans, animals or valuable plants.

11. Observe label directions and cautions to keep residues on edible portions of plants within the limits permitted by law.

12. If symptoms of illness occur during or shortly after spraying or dusting, call a physician or get the patient to a hospital immediately.

### In Case of Poisoning

1. Call your physician: Note to Physician: The table below lists Poison Control Centers in Michigan which can furnish specific information including antidotes, for various trade named poisons. Services of the Centers are intended mainly for Medical Doctors.

However, offices remain open 24 hours a day and can give emergency poison treatment advice over the phone. If information is not available at your local Poison Control Center, call the University Hospital, Ann Arbor.

### POISON CONTROL CENTERS

Name of Center, street address, telephone, name of director

#### City

#### ADRIAN

Poison Control Center  
Emma L. Bixby Hospital  
818 Riverside Drive  
275-6161  
Robert Greiner, M.D.

#### ANN ARBOR

Poison Control Center\*  
University Hospital  
1313 E. Ann St.  
764-5102

#### BAD AXE

Poison Control Center  
Hubbard Memorial Hospital  
423 E. Irwin St.  
CO 9-6444  
Alice J. Shoemaker, R.Ph.  
Roy Gettel, M.D.

#### BATTLE CREEK

Poison Control Center  
Community Hospital  
200 Tomkins St.  
Woodward 3-5521  
Sterling L. Butterfield, R.Ph.

#### BAY CITY

Poison Control Center  
Mercy Hospital  
100 15th St.  
TWinbrook 5-8511  
Theodore Meyer, Pharmacist

#### BENTON HARBOR

Poison Control Center\*  
Mercy Hospital  
960 Agard  
(Also see St. Joseph)

#### COLDWATER

Poison Control Center  
Branch County Community Health  
Center  
274 E. Chicago St.  
279-9501  
John C. Heffelfinger, M.D.  
Office 278-2359

#### DETROIT

Poison Control Center  
Children's Hospital  
5224 St. Antoine St.  
833-1000  
Paul V. Wooley, Jr., M.D.  
Regine Arorow, M.D.

Poison Treatment Center  
Registrar's Office  
Herman Kiefer Hospital  
1151 Taylor Avenue  
872-3334  
Paul T. Chapman, M.D.  
William G. Frederick, Sc.D.

Poison Treatment Center  
Saratoga General Hospital  
15000 Gratiot Ave.  
Lakeview 6-5100  
Wm. B. Hennessey, Chief  
Pharmacist

#### FLINT

Poison Control Center  
Hurley Hospital  
6th Ave. & Begole  
Cedar 2-1161  
Douglas L. Vivian, R.Ph.

#### GRAND RAPIDS

Poison Control Center  
Butterworth Hospital  
100 Michigan, N.E.  
451-3591  
John R. Wilson, M.D.

#### Poison Control Center

Blodgett Memorial Hospital  
1800 Wealthy, S.E.  
456-9548  
John P. Foxworthy, M.D.

#### Poison Control Center

St. Mary's Hospital  
201 Lafayette, S.E.  
459-3131  
John Rupke, M.D.

#### Poison Control Center

Grand Rapids Osteopathic Hospital  
1919 Boston St., S.E.  
452-5151  
Eugene M. Johnson, D.O.  
Wallace Stolcenberg, R.Ph.

#### JACKSON

Poison Treatment Center\*  
Foote Memorial Hospital  
205 N. East St.  
State 3-2711  
Ethan Stone, M.D.

#### KALAMAZOO

Poison Control Center  
Bronson Methodist Hospital  
252 E. Lovell St.  
342-9821  
H. Sidney Heersma, M.D.  
Kenneth Huckendubler, Asst. Dir.

#### LANSING

Poison Control Center  
St. Lawrence Hospital  
1210 W. Saginaw St.  
372-3610  
Howard Comstock, M.D., Dir.  
William Mueller, Pharm., Asst.  
William Adrian, Pharm.

\*Facilities available for determining cholinesterase levels in blood samples.



Poison Treatment Center  
Edw. W. Sparrow Hospital  
1215 E. Michigan Ave.  
487-6111  
Sprigg S. Jacob, M.D.  
Office 332-6848

Poison Treatment Center  
Lansing General Hospital  
2800 Devonshire Ave.  
485-4311, Ext. 254  
John Morgan, R.Ph.

Poison Treatment Center  
Ingham Medical Hospital  
401 W. Greenlawn  
484-2511  
Robert C. Combs, M.D.

#### LINCOLN PARK

Poison Control Center  
Outer Drive Hospital  
26400 Outer Drive  
386-0606  
W. S. Wheeler, Admin.  
Carl A. Gagliardi, M.D.

#### MARQUETTE

Poison Information Center  
St. Luke's Hospital  
West College Ave.  
Canal 6-3511  
Charles King, Pharmacist  
Norman Matthews, M.D.

#### MIDLAND

Poison Control Center  
Midland Hospitals  
4005 Orchard Drive  
TE 5-6771

B. E. Lorimer, M.D.  
D. N. Fields, M.D.  
K. W. Linsenmann, M.D.  
W. E. Thamarus, M.D.

#### MONROE

Poison Control Center  
Memorial Hospital of Monroe  
700 Stewart Road  
241-6500

#### PETOSKEY

Poison Control Center  
Little Traverse Hospital  
416 Connable  
Diamond 7-2551  
Thomas R. Kirk, M.D.

#### PONTIAC

Poison Control Center  
St. Joseph Mercy Hospital  
900 Woodward Ave.  
338-9111  
Robert J. Mason, M.D.

#### PORT HURON

Poison Control Center  
Mercy Hospital  
2601 Electric Ave.  
Yukon 5-9531  
Robert Lugg, M.D.

#### SAGINAW

Poison Control Center  
Saginaw General Hospital  
1447 N. Harrison Rd.  
753-3411  
William G. Mason, M.D.

Poison Treatment Center  
Saginaw Osteopathic Hospital  
515 N. Michigan  
PL 3-7751  
T. D. Webber, D.O.  
C. S. Chicky, D.O.  
W. C. Adams, D.O.

#### ST. JOSEPH

Poison Control Center  
Memorial Hospital  
2611 Morton Ave.

Doctors for poison information in the  
St. Joseph-Benton Harbor area

Marshall J. Feeley, M.D.  
James W. Skinner, M.D.  
2516 Niles St.  
YUkon 3-1674

#### TRAVERSE CITY

Poison Control Center  
Munson Medical Center  
947-6140  
Philip K. Wiley, M.D.  
A. McCrackin, Pharm.

#### WAYNE

Poison Treatment Center  
Annapolis Hospital  
33155 Annapolis  
PA 2-4400  
House Physician on duty

#### YPSILANTI

Poison Treatment Center  
Beyer Memorial Hospital  
28 So. Prospect  
HU 2-6500  
Gust Petropolous, M.D.

#### NEMATODE CONTROL FOR FRUIT CROPS

Nematodes, particularly the dagger, root knot and root lesion nematodes, can cause extensive injury to fruit crops. Research has shown that certain newly set crops, principally tart cherries and strawberries, respond to soil fumigation practices. Where tart cherries are to be replanted in old fruit plantings, fumigation of the soil prior to planting is essential to produce a vigorous and healthy stand of young trees. Likewise, strawberries to be planted in soil infested with root knot or root lesion nematodes will show a response from soil fumigation practices. **Where the need for soil fumigation to control parasitic nematodes has been established, the following soil fumigants are recommended:**

*Plant Parasitic Nematodes and their Control*, Extension Bulletin 571, by P. H. Wooley and J. A. Knierim will be available by early spring 1968.

#### WHEN SETTING STRAWBERRIES

Ethylene dibromide  
(Dowfume W-85) ..... 9 gallons/acre



DD Mixture (dichloropropane-dichloropropenes mixture) .....	40 gallons/acre
Telone (dichloropropenes mixture) .....	32 gallons/acre
Vorlex (DD plus 20% methyl isothiocyanate) .....	10 gallons/acre

#### WHEN SETTING CHERRY AND PEACH TREES

Ethylene dibromide (Dowfume W-85) .....	12 gallons/acre
DD Mixture (dichloropropane-dichloropropenes mixture) .....	40 gallons/acre
Telone (dichloropropenes mixture) .....	40 gallons/acre
Vorlex (DD plus 20% methyl isothiocyanate) .....	12 to 15 gallons/acre

Apply soil fumigants in the fall of the year when the soil temperature is between 50° and 80° F. (normally after Sept. 1). Fall applications are preferred to allow sufficient time for the fumigant to dissipate or escape from the soil prior to planting. For further information on soil fumigation, contact your county agricultural agent.

#### SUPERIOR OIL

For the past several years "superior oil" has been recommended as one of the preventive European red mite control programs. This year only the 70-second viscosity "superior oil" will be recommended for use in Michigan. Based on research information from Michigan we feel the 70-second oil will give better European red mite control than some of the lighter viscosity oils recommended in the past.

The 70-second viscosity oil is not a dormant-type oil. It is lighter and more volatile than the original "superior oil" which was used as a dormant spray. The principal advantage of the lighter 70-second oil is the reduced possibility of plant injury. It is safer because it is more volatile, resulting in less persistence on the tree. It remains on the tree long enough to kill the mites but not so long as to interfere with vital plant processes or oil-incompatible pesticides which may be applied later.

Because of this safety factor, the 70-second oil can be applied between *Green-Tip* and *Pre-Pink* stages of tree development. European red mite eggs are most susceptible to control by oil when they are about to hatch. Under Michigan conditions, the period of egg hatch starts about the time the trees are in the *Pre-Pink* to *Pink* stage. Thus, the closer the application to *Pre-Pink*, the greater the kill of mite eggs. Oil applied earlier than *Green-Tip* is not as effective as later applications. The addition of a phosphate in-

secticide does not increase the miticidal value of oil.

Preventive European red mite control programs are designed to control the mites at an early stage in their development to prevent any build-up through the season. Supplemental measures are usually required in mid- to late-season. Eradicative mite control programs, on the other hand, attempt to control mites after they have increased sufficiently in numbers to damage the crop. During the past few seasons the eradication programs have been expensive but not very successful in controlling established mite populations. *Oil applications have no value in controlling the two-spotted mite.*

The *minimum* specifications for the 70-second viscosity "superior oil" are as follows:

Property <sup>a</sup>	70-second Superior Oil
Saybolt Universal Viscosity at 100° F., Seconds <sup>1</sup> .....	66-74
Gravity <sup>2</sup> API (minimum) .....	33
Unulfonated residue <sup>3</sup> (minimum) .....	92
Pour Point <sup>4</sup> , °F. (maximum) .....	20
Distillation at 10 mm. Hg. 10° F.	
50% point .....	425 ± 12
10%-90% range (maximum) .....	95

<sup>a</sup> The following ASTM methods are to be used:

<sup>1</sup> D445-61 and D446-53; <sup>2</sup> D287-55; <sup>3</sup> D483-61T;

<sup>4</sup> D97-57 and <sup>5</sup> D1160-61.

Recent research indicates that spraying all four sides of the tree with the oil mixture provides better control of red mites than spraying only two sides. Two oil sprays, the first applied during green tip-delayed dormant followed by a second spray in the pre-pink, have given better red mite control than a single pre-bloom spray.

#### EFFECTIVE DILUTE AND CONCENTRATE PESTICIDE APPLICATIONS

Effective pest control is dependent upon (1) proper timing and (2) the correct amount of pesticide per tree or per acre equally distributed throughout all parts of the tree. This applies regardless of the method of application and the concentration of mixture used. In order to achieve coverage of leaves and fruits in the top-center of large trees 18 to 20 feet high, two-thirds of the discharge *must* be directed into the upper one-third of the tree.

One way to set up a sprayer is to assume that the tree to be sprayed is 20 feet high with a 30-foot spread. A tree of this size will require 12 gallons of dilute mixture, six gallons applied to each of two sides to give effective pest control. This amount of pesticide



mixture should be applied with the first application and continued throughout the season.

When spraying smaller trees, one merely cuts off the top nozzles until the desired spray height is achieved. After doing this, if the machine still puts out more material per tree or per acre than desired, increase the rate of travel accordingly.

Concentrate spraying is accomplished by adding to the water in the spray tank 2, 3, 6, 10 or 30 times the amount of pesticide used in dilute application and applying a correspondently less amount per tree or per acre, 1/2, 1/3, 1/6, 1/10 or 1/30. Thus a tree requiring 12 gallons of spray mixture of dilute concentration for complete coverage will require only 2 gallons of 6x concentration or 0.4 of a gallon of 30x concentration.

For concentrate as for dilute spraying, two-thirds of the mixture should be discharged into the upper one-third of a tree 20 feet high with a 30-foot spread. And, when spraying smaller trees, it is necessary only to shut off top nozzles of the sprayer until the desired height of spray is reached. If the quantity of spray should be reduced beyond the amount accomplished by shutting off the top nozzles, the rate of travel while spraying can be increased.

Most of the airblast sprayers currently being used in Michigan can be adapted to apply mixtures up to 10x concentration discharging 1/10 gallonage. It usually requires specially adapted machines for concentrations above 10x. All airblast sprayers will perform equally well using 2x-1/2 gallonage as using dilute mixtures. And, refill down time is cut in half.

It should be remembered that when using concentrated mixtures, the wind must be under 10 miles per hour. And, the larger the airblast capacity of the sprayer the faster one may travel spraying. Concentrate spraying may be used successfully in Michigan and very advantageously, but the sprayer must be set up properly to give the *right* gallons per tree and uniform coverage *throughout* the tree. Using this method of application, it is necessary to do night spraying when there is little to no wind. There is no

greater danger from chemical injury when spraying at night than during the day.

### COMMON (GENERIC) NAMES OF INSECTICIDES AND FUNGICIDES

Many pesticides are know by several trade or brand names. In order to reduce confusion and the use of long and cumbersome chemical names to identify a particular product, common (generic) names have been assigned to most pesticides.

Common names *are required* in the *Ingredient Statement* on all labels of products containing these chemicals. Thus, the actual chemical can be identified regardless of trade or brand names.

The following names have been *accepted as common names* for that particular compon:

**Insecticides:** BHC, DDT, Diazinon, Dieldrin, Endrin, Ethion, Lead Arsenate, Lindane, Malathion, Methoxychlor, Ovex, Parathion, Phosphamidon, TEPP.

**Fungicides:** Botran, Captan, Ferbam, Glyodin, Sulfur, Zineb, Ziram.

Listed below are the *common names* for some of the other registered trade-named insecticides acaricides and fungicides:

COMMON (GENERIC) NAME	TRADE NAME
<b>Insecticides</b>	
Binapacryl .....	Morocide
Carbaryl .....	Sevin
Chloropropylate .....	Acaralate
Dimethoate .....	Cygon
Endosulfan .....	Thiodan
Tetradifon .....	Tedion
TDE .....	DDD
<b>Fungicides</b>	
Dodine .....	Cyprex
Folpet .....	Phaltan
Dinocap .....	Karathane
Thiram .....	Thylate
Dichlone .....	Phygon

A common name could not be found for the following materials: Genite, Morestan, Guthion, Kelthane, Phosdrin.



## ACCESSORY MATERIALS

"Accessory materials" are those materials added to fungicides to make them less injurious to the foliage and fruit or to improve their wetting and adhesive properties, making them more effective in disease and insect control.

### WETTING OR SPREADING AGENTS AND STICKERS

With present pesticides, it is seldom necessary for the orchardist to use wetting agents, spreading agents or adhesive agents. Occasionally—if the water is unusually hard, if hard-to-wet plants, such as plum fruits are involved, or in the case of hard-to-wet insects, such as waxy aphids or mites,—it may be helpful to add a small amount of wetting agent to the tank. Too much may cause excessive runoff or chemical injury to the fruit.

Some materials act as spreading or wetting agents when wet, and as stickers after they dry. Such "materials" usually increase retention or adhesiveness more than they increase deposit. Like wetting agents, stickers are often included by the manufacturer in the formulation of the spray material. Excessive use of stickers may cause *excessive* residues at harvest and should be used with caution.

### LIQUID PESTICIDES AND SURFACTANTS OR WETTING AGENTS

Both liquid (flowable) and wettable formulations of insecticides and acaricides are suggested in the spraying schedules for the various fruits. However, in certain cases the liquid formulations may be more favorable to use because of ease of handling and cost.

The general use of wetting agents and adhesive agents is a questionable practice because of the wide variation in chemical and physical properties of available pesticides. As previously stated, all commercial insecticides and fungicides to be applied as sprays have wetting agents incorporated in their formulations. Also, when pesticides are used in concentrate spraying as in a 2x, 3x or 4x mixture, the amount of wetting agents is 2, 3 or 4 times the amount present in a dilute mixture. The wetting agent affects the surface tension of the water and in turn increases the capacity of the water to wet the fruit and leaves. A commercial wetting agent improperly added to either dilute or concentrated mixtures could result in chemical injury to leaves or fruit. The liquid pesticides, such as liquid parathion and liquid Guthion have higher wetting properties than the wet-

table powder forms. Also, the pesticides Glyodin, and Dodine (Cyprex) are excellent wetting agents and require no commercial wetting agent in a spray mixture.

When using liquid fungicides on apples easily injured by certain pesticides, it is desirable to select an insecticide of wettable powder form rather than liquid form to avoid possible chemical injury. By contrast, when using a liquid insecticide on apples, select a fungicide of wettable powder formulation that does not have the high wetting properties of Glyodin, and Dodine (Cyprex). Remember, too, for apples, that chemicals with a narrow range of safety, such as Dichlone (Phygon), will be more likely to cause injury when used with the liquid pesticide formulations, or when a commercial wetting agent is added to the spray mixture.

Select pesticides carefully for each kind and each variety of fruit and for different times during the growing season. Calibrate your sprayer to deliver the correct amount of pesticide per acre. *Do not over spray or under spray.*

## CORRECTIVES FOR SPRAY INJURY

### Copper Injury

When using copper sulfate (blue vitriol) or "fixed" copper as a fungicide or bactericide, add fresh hydrated lime to the spray mixture to prevent injury to leaves and fruit from any soluble copper in solution.

Hydrated lime added to spray mixtures of copper sulfate, produces Bordeaux designated by such formulas as 2-6-100 or 4-6-100. The first figure refers to pounds of copper sulfate, the second figure to the pounds of fresh hydrate lime and the third figure to 100 gallons of spray, with the liquid always water.

When using "fixed" copper, add one pound of lime to the mixture for every 0.24 to 0.26 pound of *actual* copper. For example, when using 3 pounds of Tennessee 26 per 100 gallons (Tennessee 26 contains 0.26 pound of *actual* copper per pound), you would add 3 pounds of hydrate lime per 100 gallons of spray.

### Arsenical Injury

Bordeaux and fixed copper and lime will safen lead arsenate against arsenical injury to leaves and fruit. Hydrated lime alone, previously used to safen against



arsenical injury, has been replaced by organic fungicides.

The organic fungicides and the minimum amounts necessary for safening against arsenical injury are as follows:

One-fourth pound of Ferbam will safen one pound of Lead Arsenate.

One-half pound of Captan will safen one pound of Lead Arsenate.

One-half pound of Niacide M. will safen one pound of Lead Arsenate.

One-half pound of Ziram will safen one pound of Lead Arsenate.

Glyodin, thiram (Thylate) and Dodine (Cyprex) will *not* safen lead arsenate. When using these fungicides with lead arsenate, reduce the amount suggested per 100 gallons by one-third to one-half and add either Ferbam, Captan, Ziram or Niacide M in quantities required to safen the lead arsenate being used. For example, if using Glyodin at 1½ pints per 100 gallons with 2 pounds of Lead Arsenate, you would reduce the amount of Glyodin to one pint and use with it one-half pound of Ferbam as the arsenical safening agent.

## RUSSETING OF APPLES BY COLD AND CHEMICALS

Golden Delicious, Jonathan and Delicious are the three commercially important apple varieties most easily russeted by certain pesticide chemicals in years when freezing air temperatures (32° F. or lower) occur close to bloom.

The most critical time for pesticide injury is the period, *Full Bloom* through *Second Cover*. The opportunity for russeting is even more acute when cool, humid, rainy weather accompanies or follows freezing temperatures.

**Golden Delicious:**—Ferbam, mercury, Dodine (Cyprex) or Glyodin should *not* be used on this variety during the time *Pink* through *Second Cover*. Wettable Sulfur or Lime-Sulfur may cause unfavorable russeting during this same period when weather conditions are cool, humid and rainy. The most favorable precaution for good finish on Golden Delicious is to use captan, beginning with *Pink* and continue its use through *Second Cover*. Findings in Michigan have shown also that Niacide M and Thiram may be used safely on this variety in a protective schedule against scab.

If "back action" is necessary against possible apple scab infection, Dichlone (Phygon) at ¼ pound, plus

Captan at 1 pound per 100 gallons may be used. Remember, captan alone at 2 pounds per 100 gallons has "back action" of 18 to 24 hours against this organism, frequently eliminating the need for Dichlone (Phygon).

When using spray masts or hand guns, fog the spray into the trees. *Do not* use a coarse stream, because the force of the droplets hitting the fruit will cause russeting. Dust applications on this variety during the critical period of *Pink* through *Second Cover* in place of sprays is a very favorable practice.

Avoid insecticides until *First Cover*, and then use wettable Guthion. If fruit-feeding worms are a historic problem, add 15% wettable Parathion at 1 pound per 100 gallons at the time of *Pink*. *Do not* use Parathion again on Golden Delicious until after *Second Cover*, and then at no higher rate than one pound of 15% wettable or its equivalent per 100 gallons. Any of the pesticide chemicals suggested for apples in Michigan may be used before *Pink* and after *Second Cover* without danger of injury to the fruit.

**Jonathan:**—Although not as easily injured as Golden Delicious, this variety is russeted by certain pesticides when freezing temperatures (32° F. and lower) occur just before, during or shortly after *Bloom*. In years when the air temperature drops to 32° F. or lower at *Bloom* or shortly thereafter, use Captan through *Second Cover*, or Dodine (Cyprex) no higher than ¼ pound per 100 gallons.

Jonathan may be unfavorably russeted from the use of Bordeaux or fixed copper plus hydrated lime during *Bloom* for the control of fireblight when freezing temperatures have occurred any time after *Pink* and before the application is made. See Apple Spray Schedule for timing and materials for fireblight control during and after *Bloom*.

If back action beyond 25 hours is required to control scab, use mercury with half-strength captan providing tree development is no later than *Bloom*. After *Bloom* for "back action", use Dichlone (Phygon) at ¼ pound plus Captan at 1 pound per 100 gallons. If no freezing air temperatures occur at *Pink* or thereafter, any of the fungicides as suggested for apples in Michigan may be used with safety.

The use of parathion at *Petal Fall* following freezing injury close to *Bloom* frequently causes undue stem cavity russeting. Delay the use of an insecticide until *First Cover* and then use wettable Guthion.

Any of the pesticide chemicals suggested for apples in Michigan may be used before *Bloom* and after *Second Cover* without danger of injury to the fruit.

**Delicious:**—Many Michigan growers have experienced unfavorable russeting of Delicious. In every case, these growers had used either wettable Sulfur,



Sulfur paste, Lime-Sulfur or Dichlone (Phygon) as a spray after *Bloom*. If freezing conditions (32° F. or lower) occur close to *Bloom* and/or if humid, rainy, cool conditions prevail after *Bloom*, the use of sulfur pesticides or over-spraying with Dichlone (Phygon) will russet *Delicious*, including the red sports. Avoid the use of these above-mentioned chemicals as a spray in or after *Bloom*, and there should be no problem of russetting of *Delicious* in Michigan.

## CHEMICAL THINNING

### APPLES

High labor costs, the demand for large sized fruits, and the need for thinning during the period *Petal Fall* to 14 days after *Petal Fall* to induce annual bearing have stimulated the practice of thinning with the naphthaleneacetic acid compounds, referred to as NAA, and naphthaleneacetamide, sold as Amid-Thin. NAA is available in acid form and as a sodium salt and is sold under such trade names as Fruitone and Stafast, or as naphthaleneacetic acid.

#### Thinning With NAA

Varieties differ greatly in their response to NAA thinning sprays. On this basis, they are divided into three groups: (1) easy to thin; (2) intermediate; and (3) hard to thin.

Listed below are the varieties and the suggested concentrations of NAA to use 5 to 7 days after *Petal Fall* as a guide when first starting a thinning program:

1. **Varieties Easy to Thin:** McIntosh, *Delicious*, Jonathan, Northern Spy, and Rhode Island Greening: 4 grams of *actual* NAA per 100 gallons (10 parts per million).

2. **Intermediate Group:** Grimes Golden, Oldenburg (Duchess), Fameuse (Snow), Hubbardston, and Wagener: 6 grams of *actual* NAA per 100 gallons (15 parts per million).

3. **Varieties Hard to Thin:** Yellow Transparent, Wealthy, Golden *Delicious*, Rome Beauty, and Baldwin: 8 grams of *actual* NAA per 100 gallons (20 parts per million).

If the first application of NAA (made 5 to 7 days after *Petal Fall*) does not give enough thinning, increase the concentration 2 to 5 parts per million and follow with a second application 7 to 10 days later.

#### Thinning With Amid-thin

Amid-Thin is suggested for use on apples in Michigan at 60 parts per million at *Petal Fall* applying 350

gallons per acre. Concentrations lower than this, as recommended by the manufacturer, have not given adequate thinning. Applying Amid-Thin after *Petal Fall* has resulted in *no* thinning; and it has caused the fruit to stick fast to the tree so that no "June drop" occurred giving a large crop of valueless, small apples.

Amid-Thin is suggested especially for early varieties which ripen before McIntosh, and for varieties likely to be injured by NAA applications. These include Yellow Transparent, Oldenburg (Duchess), Early McIntosh, Wealthy and Northern Spy. Amid-Thin can also be used on most other varieties. However, there are cases where the material did not thin *Delicious*, but instead, led to a large crop of undersized, distorted apples. Be sure to use Amid-Thin *no later than Petal Fall* on this variety.

#### Evaluating Results

The results of the thinning spray (NAA or Amid-Thin) may be determined 7 to 10 days after application, as the affected fruits do not grow but remain the same size as when the spray was applied. Fruits *not affected* will continue to grow and become larger. This makes it possible for you to follow with an added application of NAA, if you desire.

#### Cautions

- As a general rule, apply NAA under fast-drying conditions, when the temperature is between 70 and 75° F. On the other hand, Amid-Thin gives best results when applied under slow-drying conditions. Amid-Thin is often applied in the evening.

- Weak trees are thinned more easily than vigorous ones.

- Thinning with NAA and Amid-Thin is much more excessive when weather conditions during *Bloom* do not favor good pollination and fruit set. However, when fruit set is questionable, but chemical thinning is a "must", use Amid-Thin at 60 parts per million at *Petal Fall*.

- If the weather during the week preceding *Bloom* or the week after *Bloom* is cloudy, wet, and humid, thinning is accomplished more easily than if the weather during these periods has been fair and sunny.

- When freezing temperatures (32° F. and lower) occur after *Pink* and before applying the thinning sprays, NAA may cause excessive thinning. Reduce the concentration by 2 or 3 parts per million.

- Each grower must work out the concentrations of NAA best suited for his orchard conditions. Sprays of NAA will remove all the fruit and severely damage the



leaves if too high concentrations are used. When conditions exist which might result in injury or loss of crop from overthinning with NAA, Amid-Thin applied at *Petal Fall* using 60 parts per million is safer for widespread use. However, these decisions must be made by the grower.

### Sevin as a Thinning Agent

Sevin can cause unfavorable crop reduction when used throughout the season, beginning at *Petal Fall*. Studies have revealed that it was only the use of Sevin during the period of *Petal Fall* through *Second Cover* which caused the reduced yield. Applications at other times in the growing season had no adverse effect.

Sevin may be useful for fruit thinning. However, growers evaluating Sevin for this purpose should do so on a trial basis. The following rates may serve as a guide using Sevin (50-W): (a) McIntosh and Jonathan, 2 pounds per 100 gallons (b) Delicious to include red strains and Northern Spy, 1½ pounds per 100 gallons. The single application of Sevin should be made at *First Cover*, selecting some other insecticide for *Second Cover*. Sevin used at *Second Cover* following thinning applications of NAA can cause overthinning. After *Second Cover*, Sevin may be used as an insecticide without any danger of added thinning.

### Thinning With Concentrated Mixtures

Fruit-thinning sprays can be applied in concentrate form with airblast equipment. A 2x concentration is suggested in the beginning whereby you use one-half the amount of spray per tree that would be used in conventional spraying (See Concentrate Spraying, page 5).

If higher concentrations are tried, a good starting point is a 3x concentration but applying only one-fourth the number of gallons of spray per tree or per acre that you would use in conventional spraying.

Here, also, to obtain the amount of thinning desired, you must work out the concentration and gallonage per tree or per acre best suited to your orchard conditions.

### PEARS

For the past three years, Michigan growers have been using naphthaleneacetamide (NAD) for thinning Bartlett pears with the suggested time of application *Petal Fall*.

Growers should try NAD on a trial basis using the following rates as guides: (a) trees of low vigor 25 parts per million (ppm); (b) trees of medium vigor 35 ppm; and, (c) trees of high vigor 45 ppm. When the thinning spray is applied after *Petal Fall*, leaves are more subject to epinasty.

Bosc pears may be completely defruited with NAD at 25 ppm. No suggestions are available for using NAD for pear thinning purposes other than Bartlett.

### PEACHES

At the present time, no reliable chemicals are available for thinning peaches. Some growers are using DN compounds in early bloom, but results differ so greatly from orchard to orchard and from year to year that they cannot be suggested generally.

N-1-naphthylphthalamic acid sold and Nip-A-Thin has been tried experimentally and by growers in Michigan and in other states. This chemical has performed very erratically under Michigan conditions and thus cannot be suggested for thinning peaches except on a trial basis. The material should be used according to the directions on the label.

### PROTECT THE BEES

The transfer of pollen from one flower to another by bees is a basic requirement for the production of practically all fruit. It is to the fruit grower's benefit to use sprays in such a way that the least possible number of bees are killed. This is a good policy of cooperation with the beekeepers and it also conserves the bumble bee and other wild bee populations that serve you free of charge.

"Do not spray plants in bloom" is the basic rule in protecting bees. This applies not only to the fruit bloom but also to dandelions and clovers that may be reached by the spray. Mowing dandelions, yellow rocket and clovers in the fruit area helps. Also, do not let puddles of spray accumulate on the ground where bees might drink it. If beekeepers supply fresh water near the bee hives, this hazard is reduced. Where there is a choice, use insecticides least harmful to bees.



# Spray Chemicals and Basic Information for the Control of Apple Scab

The key to effective apple scab control is to prohibit the establishment of the fungus during the primary scab infection periods. If this disease is not

controlled at this time, a grower is forced to spray longer into the summer. The table below classifies most of the scab fungicides used in Michigan

## *Classification of Apple Scab Fungicides*

Protective	Eradicative	Mixtures with both eradicative and protective properties	Protectant-eradicants
Lime-sulfur Wettable Sulfur Sulfur paste Ferbam Glyodin Captan Dichlone (Phygon) Dodine (Cyprex)	Lime-sulfur ● Mercurial compounds Dichlone (Phygon) Dodine (Cyprex) Captan	Sulfur, Ferbam, Glyodin, or Captan at half-strength combined with half-strength Dichlone (Phygon). Sulfur, Glyodin, Ferbam or Captan at half-strength combined with ●mercurial compounds.	Lime-Sulfur Dichlone (Phygon) Dodine (Cyprex) Captan

Protectant sprays are applied before infection takes place. They set up a chemical barrier between the susceptible tissue and the germinating spore.

Eradicant sprays "burn" out the fungus within a certain period of time after infection. These include lime-sulfur effective for 72 hours, organic mercuries effective up to 72 hours, Dichlone (Phygon) 40 to 48 hours, Dodine (Cyprex) 30 to 36 hours and Captan 18 to 24 hours after infection at suggested full strengths in the pre-cover sprays.

Half-strength organic mercuries eradicate 40 to 45 hours and half-strength protectant is added to these chemicals.

In recent years, with the introduction of chemicals having both protectant and eradicant properties, many apple growers spray on a 5 to 7 day schedule during the primary infection period. The length of spray interval will depend on the amount of rainfall and expanded new growth during this time. The compounds used this way are Lime-Sulfur, Dichlone, Captan, and Dodine. Half-strength combinations of eradicants (mercuries or Dichlone) plus ½-strength protectants are also used in this manner.

The main disadvantage of this method is that in dry years an excessive number of sprays will be applied as compared to schedules based on rainfall and infection periods.

Growers should keep track of the start of a rain and average temperature and calculate from the following table the length of time it takes for infection to occur.

For example, at an average temperature of 58° F. it takes 9 hours for primary infection to take place after the start of a rain. If a protective spray is not applied before or within this 9-hour period, you must rely on a chemical with eradicative properties. Whether a ½-strength or full-strength eradicant is used will depend on the number of hours after infection you apply the spray.

Most growers consider the start of the rain as the beginning of the "infection period". This allows a leeway of several hours before actual infection takes place.

The approximate number of hours (A) of continuous wet period required for primary apple scab infection during average air temperature (B), and the approximate number of days (C) for conidia (secondary scab) development following infection.

(A) Hours	(B) Degrees F.	(C) Days
48	32-40	17+
30	40-42	17+
20	42-45	17+
14	45-50	17
12	50-53	16
10	53-58	14
9	58-76	9
11	76-	8+



In addition to good timing, the following points must be considered:

1. Thorough coverage. Adequate spray or dust equipment, rate of equipment travel and open trees

all contribute to proper coverage.

2. Proper selection of chemicals. Select spray chemicals that are effective against the apple scab fungus but are still safe to the apple tree.

## *Some Properties of Apple Scab Fungicides*

Fungicide	Rate Per 100 Gallons of Spray	Retention	Redistribution	*Eradication from Beginning of Infection Period
Captan 50% WP	2 lb.	Fair	Fair-Good	18-24 hrs.
Dichlone (Phygon) 50% WP	½ lb.	Fair	Fair	36-48 hrs.
Dodine (Cyprex) 65% WP	½ lb.	Good	Good	30-36 hrs.**
Ferbam 75%	2 lb.	Good	Good	0
Glydine	1 qt.	Good	Poor-Fair	0
• Mercury 10% sol.	½ pint	Good	Poor	60-72 hrs.
Sulfur 95%	5 lb.	Fair	Good	0
Lime Sulfur	2 gal.	Good	Good	60-72 hrs.
• Mercury ½ strength + ½ strength protectant	¼ pt. + (See cal- endar for protectant rates)	Good	Fair-Good	40-45 hrs.

\*Based on average temperatures of 50-60° F. Growers should use beginning of rain as start of infection. If average is 60-75° F, use the lower eradication time figures. For average temperatures lower than 50° F, use higher eradication time figures.

\*\*Our research has shown that Dodine at ½ pound rate will eradicate up to 48 hours after infection. This is suggested on a trial basis until the Dodine (Cyprex) label is changed.

Retention—Ability of a chemical formulation to adhere to leaf and fruit surfaces during a rainy period, in order to continue protection against scab infection for the next infection period.

Redistribution—Ability of a chemical to move during a wet period to give added protection to some of the neighboring unsprayed tissues.

Note: Do not consider redistribution as a substitute for a complete spray application, especially in questionable infection periods.











**APPLES**

**Pre-Pink and Pink  
Non-Oil Schedule**

<b>Scab</b>	<b>European Red Mite, Rosy Aphid, Tarnished Plant Bug, Green Fruitworms, Fruit Tree Leafroller.</b>
DODINE (CYPREX) ..... 3/8 to 1/2 pound	<b>European Red Mite</b>
<i>or</i>	•MORESTAN (25% WP) ..... 1/2 pound
•MERCURY ..... 1/2 strength, <i>plus</i>	<i>or</i>
PROTECTANT ..... 1/2 strength	•GENITE (50% WP) ..... 1 1/2 to 2 pounds
<i>or</i>	<i>or</i>
DICHLONE (PHYGON) ..... 1/4 pound, <i>plus</i>	TEDION (EC 1) ..... 1 quart
PROTECTANT ..... 1/2 strength	<i>or</i>
<i>or</i>	CHLOROPROPYLATE (ACARALATE)
GLYODIN ..... 1 quart	(2 EC) ..... 1 1/2 pint
<i>or</i>	<b>Rosy Aphid, Other Aphids</b>
CAPTAN (50% W.P.) ..... 2 pounds	•PHOSPHAMIDON (8 pounds per gallon) ..... 1/4 pint
<i>or</i>	<i>or</i>
FERBAM ..... 2 pounds	BHC (12% gamma) ..... 2 pounds
<i>or</i>	<i>or</i>
WETTABLE SULFUR ..... 6 pounds	DEMETON (SYSTOX) (26% EC) ..... 3/4 pint
	<i>or</i>
	DIMETHOATE (CYGON) (2.67 EC) ..... 1 pint
	<i>or</i>
	DIMETHOATE (CYGON) (25% WP) ..... 1 pound
	<b>Tarnished Plant Bug, Green Fruitworm, Fruit Tree Leafroller</b>
	DDT (50% WP) ..... 2 pounds
	<i>or</i>
	PARATHION (15% WP) ..... 1 pound
	<i>or</i>
	PARATHION LIQUID ..... 0.15 pounds active ingredient
	<i>or</i>
	GUTHION (25% WP) ..... 1 pound

**NOTE:** SYSTOX IS NOT COMPATIBLE WITH DODINE (CYPREX).

**NOTE:** See Russetting of Golden Delicious when selecting pesticides – page 7.

**Period of Bloom**

**Fire Blight**

On susceptible varieties  
BORDEAUX ..... 2-6-100

*or*

•STREPTOMYCIN ..... 50 to 100 ppm\*

Use streptomycin when the temperature is above 65° F. and humidity 60% or higher or rain. Use 100 ppm in moderate to severe cases. **Dormant pruning out of overwintering cankers 1/2 inch or larger is a must. Prune out all cankers on young trees and lightly infected mature trees.**

\*Generally, 75 ppm or more should be used; use 50 ppm only in mild cases.

(For timing, See bloom schedule under PEARS, page 19.) BORDEAUX also controls scab. Use fog spray and apply only under fast drying conditions. Use protective compatible fungicides in streptomycin schedule if scab infection periods occur (See Page 12).

Do not use mercury or insecticides in bloom as they are toxic to bees. Remove bees from the orchard before applying Petal Fall Spray.

*Do not use chlorinated hydrocarbons where danger of drift onto forage crops exists.*



## **Petal Fall**

(When the last of the blossom petals are falling)

### Fruit Scab and Leaf Scab

### Red-Banded Leaf Roller, Plum Curculio

CAPTAN .....	2 pounds
<i>or</i>	
DODINE (CYPREX) .....	$\frac{3}{8}$ to $\frac{1}{2}$ pound
<i>or</i>	
DICHLONE (PHYGON) .....	$\frac{3}{4}$ pound, <i>plus</i>
PROTECTANT, $\frac{1}{2}$ strength	
<i>or</i>	
GLYODIN .....	1 quart
<i>or</i>	
FERBAM .....	2 pounds
<i>or</i>	
WETTABLE SULFUR .....	6 pounds

GUTHION (25% WP) .....	1 pound
<i>or</i>	
DDD (50% WP) .....	2 pounds, <i>plus</i>
DIELDRIN (50% WP) .....	$\frac{1}{2}$ pound

NOTE: To control White Apple Leafhopper, use  
 •PHOSPHAMIDON (8 pounds/gallon) at  $\frac{1}{4}$  pint *or*  
 DEMETON (SYSTOX) (26% EC) at 1 pint on or about  
 First Cover.

NOTE: See sections on Russetting of Jonathan and  
 Golden Delicious on page 7 and Thinning, pages 8 and 9.

## **First Cover**

(7 to 10 days after Petal Fall)

### Scab

### Red-Banded Leaf Roller, Plum Curculio

Same fungicides as in Petal Fall

Same insecticides as in Petal Fall

## **Second Cover**

(10 to 14 days after First Cover)

### Scab

### Plum Curculio, Codling Moth, Aphids

CAPTAN .....	1 $\frac{1}{2}$ to 2 pounds
<i>or</i>	
DODINE (CYPREX) .....	$\frac{3}{4}$ pound
<i>or</i>	
GLYODIN .....	$\frac{3}{4}$ to 1 quart
<i>or</i>	
FERBAM .....	1 $\frac{1}{2}$ pounds

GUTHION (25% WP) .....	1 pound
<i>or</i>	
DIELDRIN (50% WP) .....	$\frac{1}{2}$ pound, <i>plus</i>
DDT (50% WP) .....	2 pounds
<i>or</i>	
SEVIN (50% WP) .....	2 pounds
<i>or</i>	
SEVIN LIQUID .....	1 pound
	active ingredient
<i>or</i>	
DDT (50% WP) .....	1 pound, <i>plus</i>
PARATHION (15% WP) .....	1 pound, <i>or</i>
PARATHION LIQUID .....	0.15 pounds
	active ingredient

NOTE: Do not extend interval longer than 10 days for  
 curculio with DDT-Parathion, Sevin and Guthion pro-  
 grams.

## **SUMMER MITE PROGRAMS**

Summer mite control is best accomplished by spray-  
 ing before the mites have a chance to build up. Where  
 mites have increased to large numbers, eradication of these  
 populations is extremely difficult. The following "eradi-  
 cative" programs are suggested to reduce populations of  
 European red mite, two-spotted mite and four-spotted mite.  
 Two sprays spaced 7 to 10 days apart required.

KELTHANE (18.5% EC) .....	1 quart
<i>or</i>	
KELTHANE (35% WP) .....	1 $\frac{1}{4}$ pounds

<i>or</i>	
•TEPP (40% EC) .....	$\frac{1}{4}$ pint, <i>plus</i>
TEDION (EC 1) .....	1 quart
<i>or</i>	
•TEPP (20%) .....	$\frac{1}{2}$ pint, <i>plus</i>
TEDION (EC 1) .....	1 quart
<i>or</i>	
•MORESTAN (25% WP) .....	$\frac{1}{2}$ pound
<i>or</i>	
CHLOROPROPYLATE (ACARALATE) .....	2 pints

NOTE: Refer to page 6 on liquid pesticides.



**APPLES**

**Third Cover**

(10 to 14 days after Second Cover)

Scab	Codling Moth, Aphids
CAPTAN ..... 1 to 1½ pounds	GUTHION (25% WP) ..... 1 pound
<i>or</i>	<i>or</i>
DODINE (CYPREX) ..... ¼ pound	*SEVIN (50% WP) ..... 1 pound
<i>or</i>	<i>or</i>
GLYODIN ..... ¾ to 1 quart	*SEVIN LIQUID ..... 0.5 pounds
<i>or</i>	active ingredient
FERBAM ..... 1 to 1½ pounds	<i>or</i>
	DDT (50% WP) ..... 1 pound, <i>plus</i>
	PARATHION (15% WP) ..... 1 pound, <i>or</i>
	PARATHION LIQUID ..... 0.15 pounds
	active ingredient
	<i>or</i>
	DIAZINON (50% WP) ..... 1 pound
	<b>*NOTE:</b> If plum curculio is still a problem increase Sevin to 2 pounds or 1 pound active ingredient (liquid formulations).

**Fourth Cover**

(Time is announced between June 25 to July 15)

Scab	Apple Maggot, Codling Moth, Aphids
DODINE (CYPREX) ..... ¼ pound	GUTHION (25% WP) ..... 1 pound
<i>or</i>	<i>or</i>
CAPTAN ..... 1 pound	SEVIN (50% WP) ..... 2 pounds
<i>or</i>	<i>or</i>
GLYODIN ..... 1 pint	SEVIN LIQUID ..... 1 pound active ingredient
	<i>or</i>
	GUTHION (25% WP) ..... ½ pound, <i>plus</i>
	SEVIN (50% WP) ..... ½ pound, <i>or</i>
	SEVIN LIQUID ..... 0.25 pounds
	active ingredient
	<i>or</i>
	DIAZINON (50% WP) ..... 1 pound
	<i>or</i>
	LEAD ARSENATE ..... 2 pounds, <i>plus</i>
	PARATHION (15% WP) ..... 1 pound, <i>or</i>
	PARATHION LIQUID ..... 0.15 pounds
	active ingredient
	<i>or</i>
	SEVIN (50% WP) ..... 1 pound, <i>or</i>
	SEVIN LIQUID ..... 0.5 pounds
	active ingredient
	<i>or</i>
	PHOSPHAMIDON (8 pounds/gallon) ..... ¼ pint
	<i>or</i>
	DIAZINON (50% WP) ..... ½ pound

**CAUTION:** Use ½ pound FERBAM as an arsenical corrective if GLYODIN or DODINE is used with LEAD ARSENATE.

**Do not use LEAD ARSENATE** on varieties ripening before Wealthy.

*Do not use chlorinated hydrocarbons where danger of drift onto forage crops exists.*



### ***Fifth Cover***

*(12 to 14 days after Fourth Cover)*

Scab

**Codling Moth, Apple Maggot, Red-Banded Leaf Roller, Aphids**

Same fungicides as for Fourth Cover

Same insecticides as for Fourth Cover

### ***Sixth Cover***

*(10 to 14 days after Fifth Cover)*

Scab

**Codling Moth, Apple Maggot, Red-Banded Leaf Roller, Aphids**

Same fungicides as for Fourth Cover

Same insecticides as for Fourth Cover

NOTE: To avoid possible excess residues do not apply lead arsenate after July 25 on varieties to be harvested before September 15, and do not use lead arsenate after August 10 on varieties to be harvested after September 15.

Two-spotted mite may attack in extreme numbers at this time. Adults may over-winter in the calyx end of the fruit. Adults of the European red mite may deposit eggs in the calyx end of fruit. Excessive insects in or on

fruit constitutes an adulteration of food products. To prevent excess insects in or on the fruit at harvest, follow the directions given for the control of mites listed under the Summer Mite Programs on page 15.

### ***Seventh and Eighth Cover***

*(10-14 day intervals after Sixth Cover)*

Scab

**Codling Moth, Apple Maggot, Red-Banded Leaf Roller, Aphids**

Same fungicides as for Fourth Cover

GUTHION (25% WP) .....1 pound

NOTE: For late season apple maggot control, use GUTHION, 1 pound (25% WP). Refer to "Days Between Final Spray and Harvest".



# SPECIAL APPLE DISEASE CONTROLS

(Controls are suggested where these diseases are economic problems)

## Silver Tip to Petal Fall

### Powdery Mildew (on susceptible varieties)

Scab fungicide ..... plus  
WETTABLE SULPHUR ..... 2 pounds

or

Scab fungicide ..... plus  
DINOCAP (KARATHANE) ..... ½ pound

**NOTE:** When LIME SULFUR is used, do not use SULFUR or DINOCAP (KARATHANE). Add wetting agent if necessary to wet fungal growth.

## Cover Sprays Starting at Third Cover

### Sooty Blotch, Fly Speck and Scab

CAPTAN ..... 1 pound, plus  
ZINEB ..... 1 pound

## First Cover to Third Cover (or cessation of terminal growth)

### Powdery Mildew

SCAB FUNGICIDE ..... plus  
WETTABLE SULFUR (325 mesh) ..... 2 pounds

or

SCAB FUNGICIDE ..... plus  
DINOCAP (KARATHANE) ..... ½ pound

## Pink to Third Cover

### Cedar-Apple Rust

FERBAM ..... 2 pounds

or

FERBAM ..... ¾ pound, plus  
SCAB FUNGICIDE ..... ½ strength

or

THIRAM (THYLATE) ..... 2 pounds

Northwestern Anthracnose (Bull's Eye Rot) on Golden Delicious: Where this disease is a problem, use ZIRAM 1½ pounds or CAPTAN 2 pounds in the late cover sprays,

starting in early August until 1 or 2 weeks before harvest at 2-week intervals.

## Days Between Final Spray and Harvest

**Insecticides:** BHC-60; CHLOROPROPYLATE (ACARALATE)-14; CYGON-28; DDT-30; DEMETON (SYSTOX)-21; DIAZINON-14; DIELDRIN-45; GUTHION-15; KELTHANE-7; LEAD ARSENATE-30; •MORESTAN-35; PARATHION-14; •PHOSPHAMIDON-60; SEVIN-1; •TEPP-3; TEDION-apply no more than 4 treatments after petal fall if the rate is either 1 pound of TEDION (25% WP) or 1 quart of TEDION (EC-1) per 100 gallons.

**Fungicides:** CAPTAN-0; DICHLONE (PHYGON)-1; DODINE (CYPREX)-7; GLYODIN-0; DINOCAP (KARATHANE)-21; SULFUR-0; THIRAM (THYLATE)-0; ZINEB-7; •MERCURY and •STREPTOMYCIN-up to petal fall.

Do not use chlorinated hydrocarbons where danger of drift onto forage crops exists.



# PEAR SPRAYING SCHEDULE

**NOTE:** See end of schedule for intervals between final spray and harvest. Chemicals are not necessarily listed in order of preference. Rates of materials listed below are for 100 gallons of spray.

European red mites and two-spotted mites must be controlled to lessen pear leaf scorch. For European red mite control, the preventive schedules give the best control. These schedules include either (1) a superior oil applied

in the delayed-dormant period, or (2) a miticide applied at pre-bloom. For two-spotted mite control, use **two consecutive** applications of a summer miticide sprayed 7 to 10 days apart.

## *Delayed Dormant Oil Schedule*

### DISEASES

Pear Scab, Leaf Spot

FERBAM ..... 1½ pounds

NOTE: Superior oil, 70 sec. vis. *plus* ETHION ¼ pound active ingredient, or FLOWABLE PARATHION 0.15

### INSECTS

European Red Mite (preventive program), San José Scale

SUPERIOR OIL, 70 sec. vis. .... 2 gallons

pound active ingredient has given better control of San José scale than oil applied alone.

## *Pre-Bloom (green tip to bloom) Non-Oil Schedule*

Pear Scab, Leaf Spot

FERBAM ..... 1½ pounds

*or*

BORDEAUX ..... 3-8-100

*or*

CAPTAN (50% WP) ..... 2 pounds

European Red Mite (preventive program)

•GENITE (50% WP) ..... 1½ pounds

*or*

TEDION (EC 1) ..... 1 quart

*or*

•MORESTAN (25% WP) ..... ½ pound

Tarnished Plant Bug, Green Fruit Worms, Leafrollers

DDT (50% WP) ..... 2 pounds

*or*

PARATHION (15% WP) ..... 1 pound, *or*

PARATHION LIQUID ..... 0.15 pounds active ingredient

*or*

GUTHION (25% WP) ..... 1 pound

NOTE: MORESTAN, at 1½ pounds, is effective against pear psylla, including phosphate-resistant psylla.

NOTE: GUTHION will control parathion resistant pear psylla. PARATHION will control populations not resistant to phosphates.

## *Period of Bloom*

*(When first blooms start to open)*

Fireblight

•STREPTOMYCIN\* ..... 50 to 100 p.p.m.\*

*or*

BORDEAUX ..... 2-6-100

NOTE: Dormant pruning out of overwintering cankers is a must.

\*Generally 75 ppm or more should be used; use 50 ppm only in mild cases.



## PEARS

\*Streptomycin sprays: Use STREPTOMYCIN when the maximum temperature is above 65° F. Use 100 parts per million, when moderate to severe conditions occur. Where fireblight is light, use 50 to 60 ppm. STREPTOMYCIN is compatible with FERBAM.

Fireblight development is favored any time during bloom when the temperature is or expected to be 65° F. or higher with rainfall or with relative humidity of 60% or higher.

Apply the first spray when the initial blossoms open; if blossoms open rapidly and above conditions occur, apply second spray when approximately one-half of the bloom is open. This will vary in time; it could be only one day or several days. Then apply the next spray 3 or 4 days after the second or at full bloom.

In some years, only two sprays will be required during a short Bloom period, at first blossom opening and at full bloom, if the above weather conditions do not occur between the 2 sprays.

BORDEAUX-2-6-100 is suggested when the fireblight problem is light and timed as outlined for the STREPTOMYCIN sprays. Do not use STREPTOMYCIN after a BORDEAUX spray. Use Bordeaux for late bloom, summer twig, leaf and fruit infection control.

To avoid fruit russetting, apply BORDEAUX during quick drying conditions and fog the spray into the trees. BORDEAUX controls scab; STREPTOMYCIN does not.

NOTE: Do not encourage excessive growth by fertilization. Insect control is a must in fireblight control.

### *Petal Fall*

*(Three-fourths of the petals fallen)*

1. Pear Scab, Leaf Spot
2. Fireblight, Scab, Leaf Spot

1. FERBAM .....	1½ pounds
<i>or</i>	
CAPTAN .....	2 pounds
2. BORDEAUX .....	2-6-100

- Pear Psylla, Tarnished Plant Bug, Plum Curculio, Green Fruit Worms

GUTHION (25% WP) .....	1 pound
<i>or</i>	
SEVIN (50% WP) .....	2 pounds
<i>or</i>	
SEVIN LIQUID .....	1 pound active ingredient
<i>or</i>	
PARATHION (15% WP) .....	1 pound
<i>or</i>	
PARATHION LIQUID .....	0.15 pounds active ingredient

NOTE: Guthion or Sevin will control Parathion-resistant pear psylla. Sevin will not control 5th instar ("hard shell") nymphs.

### *First Cover*

*(12 to 14 days after Petal Fall)*

1. Pear Scab, Leaf Spot
2. Fireblight, Scab, Leaf Spot

Same fungicides as for Petal Fall

NOTE: If European red mites start to build up, use KELTHANE (35% WP) 1¼ pounds, or TEDION (EC 1) 1 quart, or CHLOROPROPYLATE (ACARALATE (2 EC) 2 pints.

- Pear Psylla, Plum Curculio

Same insecticides as for Petal Fall

More than 1 spray may be required if mites are numerous. NOTE: Sevin will not control 5th instar ("hard shell") nymphs.

### *Second Cover*

*(12 to 14 days after First Cover)*

1. Pear Scab, Leaf Blight (Fabraea)
2. Fireblight, Scab, Leaf Blight

1. FERBAM .....	1½ pounds
<i>or</i>	
CAPTAN .....	2 pounds
2. BORDEAUX .....	2-6-100

- Pear Psylla, Codling Moth, Pear Leaf Blister Mite, Pear Rust Mite, Aphids

SEVIN (50% WP) .....	2 pounds
SEVIN LIQUID .....	1 pound active ingredient

NOTE: If blister mite and pear rust mites are not a problem, GUTHION (25% WP), 1 pound or PARATHION (15% WP), 1 pound, or PARATHION LIQUID, 0.15 pounds active ingredient, may be substituted for SEVIN. KELTHANE, 1¼ pounds or 1½ pints will control pear rust mites and other mites if they are the only problem. For aphids, use either Demeton (Systox) (26% EC) at ¾ pint or Dimethoate (Cygon) (25% WP) at 1 pound or Dimethoate (Cygon) (2.67 EC) at ¾ pint.







# PEACH SPRAYING SCHEDULE

**NOTE:** See end of schedule for intervals between final spray and harvest. Chemicals are not necessarily listed in order of preference in the spraying schedules. Rates of materials listed below are for 100 gallons of spray.

## VALSA CANKER

Delay pruning as close as possible to the beginning of tree growth or later to allow rapid healing. Some fungicidal protection is obtained against valsa infection in

newly exposed cuts from the leaf curl and bloom sprays. For best results time the spray or sprays before rain occurs after pruning.

### Cultural Practices

Cultural practices to reduce cold injury by hardening off the trees by the fall are important. These include late spring pruning, early fertilization and early cover cropping (by July 4) in clean cultivated orchards. Leave no stubs when pruning and remove and burn prunings as soon as possible. Develop trees with wide angle crotches to reduce splitting.

Check trees for dead and diseased wood after growth starts and cut out and burn.

The following is recommended for young trees or where the canker problem is not severe: When cutting out cankers, trim to healthy tissue, tapering cut at top and bottom. Swab wound with BICHLORIDE OF MERCURY solution (1-1000 or ½ gram tablet in pint of water). POISONOUS. Coat wound with grafting compound or black gilsonite-asphalt paint.

**NOTE:** Control of borers is essential.

## PRE-PLANT TREATMENT TO CONTROL PEACH TREE BORER

The use of THIODAN as a pre-plant treatment to control the regular peach tree borer is being withdrawn from the recommendations. During 1965 a high incidence of the aerial form of CROWN GALL was observed in plantings where the THIODAN treatment was used. The bacteria which cause CROWN GALL are easily dissem-

inated in the dipping solution to healthy plants. There is no chemical which can be added to the solution which will control CROWN GALL at the present time. The trunk of young trees should be sprayed with THIODAN (EC-2), 1½ quarts, or THIODAN (50% WP), 1½ pounds, July 15-20.

## *Dormant*

### DISEASES

### INSECTS

#### Peach Leaf Curl

#### Climbing Cutworms

In fall after leaf drop or spring before bud swell  
 FERBAM ..... 1½ to 2 pounds  
 or

PARATHION (15% WP) ..... 2 pounds  
 or  
 PARATHION LIQUID ..... 0.30 pounds  
 active ingredient  
 or

BORDEAUX ..... 6-6-100  
 (Use on bacterial spot susceptible varieties.)

DDT (50% WP) ..... 1 pound, plus  
 PARATHION (15% WP) ..... 1 pound, or  
 PARATHION LIQUID ..... 0.15 pounds  
 active ingredient

#### In the spring only

LIME SULFUR ..... 5 gallons

**NOTE:** When growth starts, spray ground 3 feet from tree trunk plus trunk and main branches thoroughly. Guthion will not control climbing cutworms.

## *Pink*

### Plant Bugs

DDT (50% WP) ..... 2 pounds  
 or  
 PARATHION (15% WP) ..... 1 pound

*Do not use chlorinated hydrocarbons where danger of drift onto forage crops exists.*



**Bloom***(Balloon pink through bloom)***Brown Rot (blossom blight)**


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LIME SULFUR (balloon pink only) .....	2 gallons
<i>or</i>	
DICHLONE (PHYGON) .....	½ pound
<i>or</i>	
SULFUR PASTE .....	6 pounds
<i>or</i>	
WETTABLE SULFUR .....	5 pounds

Continue at 2 to 4 day intervals if wet, rainy weather prevails

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**Petal Fall****Brown Rot, Powdery Mildew**


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WETTABLE SULFUR .....	5 pounds
<i>or</i>	
SULFUR PASTE .....	6 pounds

**NOTE:** Use only if brown rot control is necessary in petal fall or shuck split.

Powdery mildew has been found on fruit in a number of orchards not sprayed with sulfur in the early fruit development period.

**Oriental Fruit Moth, Plant Bugs**


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PARATHION (15% WP) .....	1½ pounds
<i>or</i>	
PARATHION LIQUID .....	0.23 pounds active ingredient
<i>or</i>	
DDT (50% WP) .....	1½ pounds
<i>or</i>	
SEVIN (50% WP) .....	2 pounds
<i>or</i>	
SEVIN LIQUID .....	1 pound active ingredient

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**Shuck Split***(Usually 10 to 12 days after Petal Fall)***Brown Rot\* and Powdery Mildew\*\***


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<b>* Only if necessary</b>	
WETTABLE SULFUR .....	5 pounds
<i>or</i>	
SULFUR PASTE .....	6 pounds

**\*\*** Powdery mildew on infected fruit appears as smooth, leathery, light brown spots.

**NOTE:** Where bacterial spot is a problem, one may try zinc sulfate (36%)—lime spray at the rate of 6-8-100 *or* Dodine (Cyprex) at ½ pound plus Captan at 1 pound, starting at **petal fall**. Repeat at 10-14 day intervals for 5 applications to reduce leaf and fruit infection.

**Plum curculio, Oriental Fruit Moth**


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PARATHION (15% WP) .....	1½ pounds
<i>or</i>	
PARATHION LIQUID .....	0.23 pounds active ingredient
<i>or</i>	
GUTHION (25% WP) .....	1 pound
<i>or</i>	
GUTHION (2#/gal. SC) .....	1 pint
<i>or</i>	
DIELDRIN (50% WP) .....	½ pound, <i>plus</i>
DDT (50% WP) .....	2 pounds
<i>or</i>	
SEVIN (50% WP) .....	2 pounds
<i>or</i>	
SEVIN LIQUID .....	1 pound active ingredient

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**Control Programs for Peach Tree Borers**

Only a low degree of control of the lesser peach tree borer is obtained where phosphate insecticides are used in the regular cover sprays and applied with an air-blast sprayer. Better control may be obtained with phosphates

if applied as a dilute spray.

In orchards where lesser peach tree borer and regular peach tree borer are a problem the following program is suggested:



## PEACHES

Use THIODAN (EC-2), 1½ quarts, or THIODAN (50% WP), 1½ pounds. Apply first spray June 3-10. Apply second spray 3 weeks later.

Lesser peach tree borer is present throughout the season until October. In problem orchards a post-harvest spray of THIODAN can reduce late season infestations.

Make all insecticide applications with a high-pressure gun. Apply as a coarse dilute spray to the entire tree concentrating on the scaffold limbs, crotches, and trunk of the tree to the ground level. Good coverage, particularly of the susceptible areas mentioned above, is a must for good borer control.

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### First Cover

(10 to 12 days after Shuck Split)

Peach Scab and Powdery Mildew

Plum Curculio, Oriental Fruit Moth

WETTABLE SULFUR .....5 pounds  
*or*  
SULFUR PASTE .....6 pounds

Same insecticides as suggested for Shuck Split  
NOTE: DDT (50% WP), 1 pound, *plus* PARTHION (15% WP), 1 pound, or PARTHION LIQUID, 0.15 pounds active ingredient can also be used.

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### Second Cover

(14 days after First Cover)

Powdery Mildew

Oriental Fruit Moth

Same as First Cover. If mildew was severe in 1967 use sulfur in the next two cover sprays.

Same insecticides as suggested for Shuck Split and First Cover, except the DDT-DIELDRIN combination. It should not be used after First Cover.

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### Third Cover

(14 days after Second Cover)

Peach Scab

Oriental Fruit Moth, Mites

WETTABLE SULFUR .....5 pounds  
*or*  
SULFUR PASTE .....6 pounds  
*or*  
CAPTAN .....2 pounds

Same insecticides as suggested for Shuck Split and First Cover, except the DDT-DIELDRIN combination. It should not be used after First Cover.

Mites  
KELTHANE (35% WP) .....1¼ pounds  
*or*  
KELTHANE (18.5 EC) .....1 quart  
*or*  
TEDION (EC 1) .....1 quart

NOTE: Lecanium Scale—Use Parathion or Guthion at rates given under Shuck Split spray. Apply when crawlers are first observed. (June 25 to July 15). Make second application 10 to 14 days later.



### Fourth Cover

(10 to 14 days after Third Cover)

**Brown Rot**

CAPTAN .....	2 pounds
or	
WETTABLE SULFUR .....	5 pounds
or	
SULFUR PASTE .....	6 pounds

**Oriental Fruit Moth**

GUTHION (25% WP) .....	1 pound
or	
GUTHION (2 #/gal. SC) .....	1 pint
or	
SEVIN (50% WP) .....	2 pounds
or	
SEVIN LIQUID .....	1 pound active ingredient
or	
PARATHION (15% WP) .....	1½ pounds
or	
PARATHION LIQUID .....	0.23 pounds active ingredient

### Pre-Harvest Covers

(10 to 14 days after Fourth Cover. Repeat as often as needed until harvest)

1. Brown Rot
2. Brown Rot and Rhizopus Rot

**Oriental Fruit Moth**

1. Same fungicides as for Fourth Cover.
2. CAPTAN .....1 pound  
plus \*BOTRAN (50% WP) .....1 pound

Same insecticides as for Fourth Cover and also later as needed for insect control.

**CAUTION:** Since dates of harvest of peaches will vary considerably depending on variety, special consideration should be given to the interval between final spray and harvest, depending on the chemical used and the peach variety.

\*Compatible with wettable powder insecticides listed in Fourth Cover. Compatibility with liquid formations not known.

### Fall Soil Fumigation

See Nematode Control, page 3

#### Days Between Final Spray and Harvest

**Insecticides:** DDT-30; DIELDRIN-45; GUTHION-21; KELTHANE-14; PARATHION-14; SEVIN-1; TEDION-Not more than 2 applications after shuck-split if 1 pound or 1 quart of TEDION is used per 100 gallons. THIODAN-21 for Peach Tree Borer and 30 for Lesser Peach Tree Borer. Do not make more than 2 applications during fruiting period.

**Fungicides:** BOTRAN-1; Captan-0; Doline (Cyprex)-15; SULFUR-0.



# APRICOT SPRAYING SCHEDULE

**NOTE:** See end of schedule for intervals between final spray and harvest. Chemicals are not necessarily listed in order of preferences in the spraying schedule. Rates of material listed below are for 100 gallons of spray.

## *Period of Bloom* (Balloon Pink Through Bloom)

### DISEASES

### INSECTS

**Brown Rot (blossom blight)**

CAPTAN (50% WP) ..... 2 pounds

Repeat applications at 2-to-4-day intervals if wet, rainy weather prevails.

## *Petal Fall Spray*

### DISEASES

### INSECTS

**Brown Rot, Scab**

CAPTAN (50% WP) ..... 2 pounds

## *Shuck Split Spray*

### DISEASES

### INSECTS

**Brown Rot, Scab**

**Plum Curculio, Oriental Fruit Moth**

CAPTAN (50% WP) ..... 2 pounds

GUTHION (25% WP) ..... 1 pound

*or*

SEVIN (50% WP) ..... 2 pounds

*or*

PARATHION (15% WP) ..... 2 pounds

## *First Cover Spray*

(8-10 Days After Shuck Split)

### DISEASES

### INSECTS

**Apricot Scab**

**Plum Curculio, Oriental Fruit Moth**

Same as Shuck Split Spray

Same as Shuck Split Spray



## *Second Cover Spray*

(8-10 Days After First Cover)

### DISEASES

Apricot Scab

Same as Shuck Split Spray

### INSECTS

Plum Curculio, Oriental Fruit Moth

Same as Shuck Split Spray

## *Summer Sprays*

(Starting End of June)

### DISEASES

Apricot Scab, Brown Rot

CAPTAN (50% WP) ..... 2 pounds

NOTE: Repeat applications if wet, humid conditions prevail (preharvest period).

### INSECTS

Oriental Fruit Moth

SEVIN (50% WP) ..... 2 pounds

NOTE: Three applications at 10-day intervals starting about June 25.

*or*

GUTHION (25% WP) ..... 1 pound

NOTE: Two applications at 14-day intervals. Last application not closer than 21 days before harvest.

## *After-Harvest Spray*

### DISEASES

### INSECTS

Peach Tree Borer

THIODAN (endosulfan) (50% WP) ..... 1½ pounds

NOTE: Thoroughly soak trunk to ground level.

## *Special Problems*

### DISEASES

### INSECTS

European Red Mite

KELTHANE (35% WP) ..... 1¼ pounds

NOTE: Two applications any time from shuck split to end of season. 14 days of harvest.

*or*

TEDION (EC 1) ..... 1 quart

NOTE: One Application after shuck split is permissible.

### Days Between Final Spray and Harvest

**Insecticides:** GUTHION-21; PARATHION-14; TEDION-14; SEVIN-3; THIODAN-21.

**Fungicides:** CAPTAN-0.



# PLUM AND PRUNE SPRAYING SCHEDULE

**NOTE:** See end of schedule for intervals between final spray and harvest. Chemicals are not necessarily listed in order of preference in the spraying schedules. Rates of materials listed below are for 100 gallons of spray.

For European red mite control, the preventive schedules give the best control. These schedules include either

(1) a "superior oil" applied in the Delayed Dormant stage, or (2) a miticide applied at Pink.

## *Delayed Dormant*

### *Oil Schedule*

#### DISEASES

#### INSECTS

Black Knot

European Red Mite (preventive program)  
Lecanium Scale

ZINEB .....2 pounds

Superior Oil, 70 second viscosity .....2 gallons

**NOTE:** Prune out and burn all knots in the dormant season and repeat in early June. Continue to remove knots whenever they are observed.

**NOTE:** Oils applied for the control of European red mite will give some control of lecanium scale. The sprays normally applied in Petal Fall control scale insects.

**Caution:** When using oil, fill tank  $\frac{1}{2}$  full of water, with agitators running, adding Zineb. Add oil after Zineb has been mixed in the spray tank.

See apple schedule, Page 13. See Page 5.

## *Delayed Dormant*

### *Non-Oil Schedule*

Black Knot

LIME SULFUR .....10 gallons

*or*

ZINEB .....2 pounds

## *Pink*

### *Oil Schedule*

Black Knot (problem orchards)

ZINEB .....2 pounds

## *Pink*

### *Non-Oil Schedule*

Black Knot (problem orchards)

European Red Mite (preventive mite program)

ZINEB .....2 pounds

•GENITE (50% WP) .....1½ to 2 pounds

*Do not use chlorinated hydrocarbons where danger of drift onto forage crops exists.*



Pink Non-Oil Schedule (Continued)

	<i>or</i>	
TEDION (EC 1) .....		1 quart
	<i>or</i>	
MORESTAN (25% WP) .....		½ pound

***Bloom***

1. Black Knot, Brown Rot or
2. Black Knot

1. LIME SULFUR (early bloom) .....	2 gallons
	<i>or</i>
DICHLONE (PHYGON) .....	½ pound
	<i>or</i>
WETTABLE SULFUR .....	5 pounds
2. ZINEB .....	2 pounds

***Petal Fall***

**Brown Rot, Leaf Spot**

FERBAM .....	1 pound, <i>plus</i>
WETTABLE SULFUR .....	3 pounds

**Plum Curculio, Leaf Rollers**

GUTHION (25% WP) .....	1 pound
	<i>or</i>
GUTHION (2#/gallon SC) .....	1 pint
	<i>or</i>
DIELDRIN (50% WP) .....	½ pound, <i>plus</i>
PARATHION (15% WP) .....	1 pound, <i>or</i>
PARATHION LIQUID .....	0.15 pounds
	active ingredient

NOTE: Use only DIELDRIN (50% WP), ½ pound, if leaf-rollers are not a problem.

***Shuck Split***

(Usually 10 to 14 days after Petal Fall)

1. Leaf Spot, Brown Rot, Black Knot
2. Black Knot, Leaf Spot

**Plum Curculio**

1. FERBAM .....	1½ to 2 pounds
	<i>or</i>
FERBAM .....	1 pound, <i>plus</i>
WETTABLE SULFUR .....	3 pounds
	<i>or</i>
LIME SULFUR .....	2 gallons
2. ZINEB .....	2 pounds

PARATHION (15% WP) .....	1½ pounds
	<i>or</i>
PARATHION LIQUID .....	0.15 pounds
	active ingredient
	<i>or</i>
GUTHION (25% WP) .....	1 pound
	<i>or</i>
GUTHION (2#/gallon SC) .....	1 pint
	<i>or</i>
DIELDRIN (50% WP) .....	½ pound

NOTE: In orchards with a history of black knot, use Zineb at 2 pounds per 100 gallons in **First** and **Second Cover** sprays.

NOTE: Check compatibility of insecticides with lime sulfur.



**PLUMS AND PRUNES**

**First Cover**  
(10 days after Shuck Split)

<b>Leaf Spot</b>	<b>Plum Curculio</b>
Same fungicides as Shuck Split, except LIME SULFUR	Same insecticides as for Shuck Split
<b>LECANIUM SCALE:</b> The young crawlers can be controlled with PARATHION (15% WP) 1½ pounds, or PARATHION LIQUID, 0.23 pounds active ingredient, or GUTHION (25% WP), 1 pound, or GUTHION (2#/gal. SC), 1	pint, applied when the crawlers are first observed (usually June 25 to July 15). Make a second application 10 to 12 days later.
<b>PEACH TREE BORERS:</b> For peach tree borer control, see section under Peach Spraying Schedule, page 22. Thiodan may be used up to 7 days of harvest.	<b>MITES:</b> If European red mites build up, spray with KELTHANE (18.5% EC), 1 quart, or TEDION (EC 1), 1 quart. Do not repeat KELTHANE application within 30 days of last application.

**Second Cover**  
(10 to 14 days later)

<b>Leaf Spot</b>	<b>Leafhoppers</b>
FERBAM ..... 1½ pounds	DDT (50% WP) ..... 1½ pounds
	<i>or</i>
	PARATHION (15% WP) ..... 1½ pounds
	<i>or</i>
	PARATHION LIQUID ..... 0.23 pounds active ingredient
<b>SPECIAL APPLE MAGGOT SPRAYS:</b> LEAD ARSENATE—2 pounds, or GUTHION (25% WP)—1 pound, or GUTHION (2#/gal. SC)—1 pint. If maggot is a prob-	lem, the timing of sprays is the same as in the apple spraying schedule.

**Third Cover**  
(About 1 month before harvest)

<b>1. Brown Rot, Leaf Spot or 2. Brown Rot only</b>	<b>Apple Maggot</b>
1. CAPTAN ..... 2 pounds	See Special Apple Maggot Sprays under Second Cover.
<i>or</i>	
2. WETTABLE SULFUR ..... 5 pounds	<b>NOTE:</b> See interval to harvest for lead arsenate and DDT.

**Fourth Cover**  
(15 days before harvest)

<b>1. Brown Rot, Leaf Spot or 2. Brown Rot only</b>	<b>Apple Maggot</b>
Same fungicides as Third Cover. (Repeat if necessary near or at harvest. Add spreader if necessary.)	See Special Apple Maggot Sprays under Second Cover.
	<b>NOTE:</b> See interval to harvest for lead arsenate and DDT.

**Days Between Final Spray and Harvest**

**Insecticides:** DDT—30; DIELDRIN—30; GUTHION—15; KELTHANE—7; LEAD ARSENATE—30; MORESTAN—Do not apply after first bloom. PARATHION—14; TEDION—apply no more than 3 applications during fruiting season. THIODAN—7.

**Fungicides:** CAPTAN—0; FERBAM—7; SULFUR—0; ZINEB—30.

*Do not use chlorinated hydrocarbons where danger of drift onto forage crops exists.*



# Red Tart (Sour) Cherry Spraying Schedule

**NOTE:** See end of schedule for intervals between final spray and harvest. Chemicals are not necessarily listed in order of preference in the spraying schedule. Rates listed below are for 100 gallons of spray.

## ***Dormant***

*(1 to 2 weeks before bud break)*

### **DISEASES**

### **INSECTS**

#### **European Brown Rot**

MONOCALCIUM ARSENITE .....3 pounds

**NOTE:** Use only in problem orchards North of Ottawa County along Lake Michigan.

If case-bearers, mineola moth, bud moth, or peach twig borer were a problem the previous season, use one of the following control programs: **Delayed Dormant:** Spray with PARATHION (15% WP), 1 pound; or GUTHION (2#/gal. SC), 1 pint. Timing will be announced by county agricultural agent.

## ***Bloom***

#### **1. European Brown Rot (Problem Orchards)**

#### **2. Common Brown Rot (Blossom Blight)**

1. BORDEAUX .....4-6-100

2. DICHLONE (PHYGON) .....½ pound

*or*

WETTABLE SULFUR .....5 pounds

## ***Petal Fall***

*(or when first leaves unfold)*

#### **Leaf Spot**

DODINE (CYPREX) .....¼ to ⅓ pound

*or*

GLYODIN .....1½ pints, *plus*

FERBAM .....½ pound

\*CYPREX at ¼ pound in most years will control leaf spot when proper timing and thorough coverage is practiced. Increase to ⅓ to ½ pound if necessary.

#### **Plum Curculio, Cherry Fruitworm, Leafrollers, Peach Twig Borer**

PARATHION (15% WP) .....1½ pounds, *or*

PARATHION LIQUID .....0.23 pounds  
active ingredients

*or*

GUTHION (25% WP) .....1 pound

*or*

GUTHION (2#/gallon SC) .....1 pint

**NOTE:** Cyprex may not be compatible with Guthion (SC), particularly under hard water conditions.

## ***First Cover***

*(10 to 14 days after Petal Fall)*

#### **Leaf Spot**

Same fungicides as Petal Fall.

#### **Plum Curculio, Cherry Fruitworm, Mineola Moth\*\***

Same insecticides as Petal Fall.

**NOTE:** DIELDRIN (50% WP) ½ pound, can be used if plum curculio is the only problem. \*\***Mineola moth:** Timing will be announced by your county agricultural agent. Use PARATHION (15% WP) at 1½ pound rate or 0.23 pounds active ingredient (liquid formulation) or GUTHION (2#/gallon SC), 1 pint. Two sprays at 10-day intervals will be necessary to control first brood adult emergence.



## RED TART CHERRIES

### *Second Cover* (10 days after First Cover)

#### Leaf Spot

DODINE (CYPREX) .....	¼ to ½ pound
<i>or</i>	
GLYODIN .....	1½ pints, <i>plus</i>
FERBAM .....	½ pound
<i>or</i>	
FIXED COPPER .....	0.75 pound actual copper, <i>plus</i>
HYDRATED LIME .....	3 pounds

#### Plum Curculio, Mineola Moth\*\*

GUTHION (2#/gallon SC) .....	1 pint
<i>or</i>	
GUTHION (25% WP) .....	1 pound
<i>or</i>	
SEVIN (50% WP) .....	2 pounds
<i>or</i>	
SEVIN LIQUID .....	1 pound
	active ingredient
<i>or</i>	
PARATHION (15% WP) .....	1½ pounds
<i>or</i>	
PARATHION LIQUID .....	0.23 pounds
	active ingredient

**NOTE:** Use ½ pound FERBAM when DODINE (CYPREX) is used with LEAD ARSENATE.

If Diazinon, Guthion, or Sevin are mixed with fixed Copper and Lime, spray immediately, since their effectiveness will be reduced if left standing in the tank.

If lesser peach tree borer and peach tree borer are problems, see Peach Spraying Schedule.

\*\*Third Cover usually coincides with cherry fruit fly emergence. The emergence of cherry fruit flies will be announced by your county agricultural agent. \*\*Timing for mineola moth will be announced by your county agricultural agent.

**Forbes Scale:** Use GUTHION (50% WP)—1¼ pounds or GUTHION (2#/gallon SC), 1¼ pints, or SEVIN (50%

WP)—2 pounds, or SEVIN LIQUID—1 pound active ingredient, in the Second and Third Cover sprays.

### *Third and Fourth Cover* (10-14 day intervals)

#### Leaf Spot

Same fungicides as suggested for Second Cover

#### Cherry Fruit Flies, Mineola Moth

LEAD ARSENATE .....	2 pounds
<i>or</i>	
DIAZINON (50% WP) .....	1 pound
<i>or</i>	
GUTHION (25% WP) .....	1 pound
<i>or</i>	
GUTHION (2#/gallon SC) .....	1 pint
<i>or</i>	
SEVIN (50% WP) .....	2 pounds
<i>or</i>	
SEVIN LIQUID .....	0.5 pounds
	active ingredient
<i>or</i>	
PARATHION (15% WP) .....	1½ pounds
<i>or</i>	
PARATHION LIQUID .....	0.23 pounds
	active ingredient

**NOTE:** Lead arsenate is not effective against mineola moth adults or larvae. Use parathion or guthion (wetttable powder or liquid equivalents).



## After Harvest Cover

### Leaf Spot

---

DODINE (CYPREX) ..... ¼ to ½ pound

---

#### Days Between Final Spray and Harvest

**Insecticides:** DIAZINON-10; DIELDRIN-30; GUTHION-15; LEAD ARSENATE\*-30 (fresh fruit)-14 (processing); PARATHION-14; SEVIN-1; THIODAN-21; Do not make more than two applications of Thiodan after shuck split.

\*30-day interval if sold outside Michigan or for fresh fruit.

**Fungicides:** COPPER-0; DODINE (CYPREX)-0; FER-BAM-7; GLYODIN-7.

*Do not use chlorinated hydrocarbons where danger of drift onto forage crops exists.*



# SWEET CHERRY SPRAYING SCHEDULE

**NOTE:** See end of schedule for intervals between final spray and harvest. Chemicals are not necessarily listed in order of preference. Rates of materials are for 100 gallons of spray.

DISEASES	<i>Bloom</i>	INSECTS
<b>Common Brown Rot (Blossom Blight)</b>		
BORDEAUX (early bloom) .....	4-6-100	
<i>or</i>		
WETTABLE SULFUR .....	5 pounds	
<i>or</i>		
DICHLONE (PHYGON) .....	½ pound	Insecticides should not be used during Bloom.
<i>or</i>		
SULFUR PASTE .....	6 pounds	
If wet weather prevails, additional sprays or dusts of PHYGON or SULFUR will be necessary.		

## *Petal Fall*

1. Leaf Spot, Brown Rot		
2. Leaf Spot		<b>Plum Curculio, Black Cherry Aphid</b>
1. CAPTAN .....	2 pounds	DIELDRIN (50% WP) .....
<i>or</i>		PARATHION (15% WP) .....
FERBAM .....	1 pound, <i>plus</i>	PARATHION LIQUID .....
WETTABLE SULFUR .....	3 pounds	0.15 pounds
2. DODINE (CYPREX) .....	¼ pound	active ingredient
NOTE: Dodine may not be compatible with Guthion emulsion if water is hard.		<i>or</i>
		GUTHION (25% WP) .....
		GUTHION (2#/gallon SC) .....
		1 pound
		1 pint

## *First Cover* (10 to 14 days later)

1. Leaf Spot, Brown Rot		<b>Plum Curculio, Red-Banded Leaf Roller, Black Cherry Aphid Mineola Moth</b>
2. Leaf Spot		
1. Same fungicides as for Petal Fall		Same insecticides as for Petal Fall
2. Same fungicides as for Petal Fall		NOTE: Refer to tart cherry schedule for Mineola Moth Control Programs.

## CONTROL PROGRAM FOR PEACH TREE BORERS

Thiodan has recently been cleared for use on sweet and tart cherries for the control of lesser peach tree borers. Thiodan may be used in two applications during the fruit-

ing season but not within 21 days of harvest. On some varieties of sweet cherries, only one application can be made and still stay within the 21-day interval to harvest.

### REGULAR PEACH TREE BORER

THIODAN (50% WP), 1½ pounds per 100 gallons — Apply 3 weeks before harvest. Apply a post harvest spray if necessary.

Apply with a gun as a coarse dilute spray to the trunk of the tree to the ground line. To avoid excess residues, do not spray the scaffold limbs, fruit or foliage.

### LESSER PEACH TREE BORERS

THIODAN (50% WP), 1½ pounds per 100 gallons. Apply June 3-10 depending on harvest date of that particular variety. Apply a post-harvest spray if needed. Guthion and parathion, when used in the regular spray program, should provide some control of this insect.

and trunk to the ground level. Good coverage, particularly of the susceptible areas mentioned above, is a must for borer control.

Apply with a gun as a coarse dilute spray to the entire tree concentrating on the scaffold limbs, crotches, cankers,

Lesser Peach Borer is present throughout the season until October. In problem orchards, a post-harvest spray of THIODAN will reduce late season infestations. There are no restrictions for post-harvest use of Thiodan on sweet cherries. There is restriction before harvest.



**Second Cover**  
(10 to 14 days later)

1. Leaf Spot, Brown Rot	Plum Curculio, Red-Banded Leaf Roller, Black
2. Leaf Spot	Cherry Aphid
1. CAPTAN ..... 2 pounds	GUTHION (25% WP) ..... 1 pound
<i>or</i>	<i>or</i>
FERBAM ..... 1 pound, <i>plus</i>	GUTHION (2#/gallon SC) ..... 1 pint
WETTABLE SULFUR ..... 3 pounds	<i>or</i>
2. DODINE (CYPREX) ..... ¼ pound	PARATHION (15% WP) ..... 1½ pounds
	<i>or</i>
	PARATHION LIQUID ..... 0.23 pounds active ingredient

**Third Cover**  
(Based on cherry fruit fly emergence)

1. Leaf Spot, Brown Rot	Cherry Fruit Flies**
2. Brown Rot, Rhizopus Rot (Trial Basis)	
3. Leaf Spot	
1. CAPTAN ..... 2 pounds	LEAD ARSENATE ..... 2 pounds
<i>or</i>	<i>or</i>
FERBAM ..... 1 pound, <i>plus</i>	GUTHION (25% WP) ..... 1 pound
WETTABLE SULFUR ..... 3 pounds	<i>or</i>
2. CAPTAN ..... 1 pound, <i>plus</i>	GUTHION (2#/gallon SC) ..... 1 pint
*BOTRAN (50% WP) ..... 1 pound	<i>or</i>
	DIAZINON (50% WP) ..... 1 pound
	<i>or</i>
	SEVIN (50% WP) ..... 2 pounds
	<i>or</i>
3. DODINE (CYPREX) ..... ¼ pound	SEVIN LIQUID ..... 1 pound active ingredient

\*\*The timing of spray applications for cherry fruit fly will be announced by your county agricultural agent.

**Fourth Cover**  
(12 to 14 days after Third Cover)

1. Leaf Spot, Brown Rot	Cherry Fruit Flies
2. Brown Rot and Rhizopus Rot	
3. Leaf Spot	
Same fungicides as for Third Cover.	Same insecticides as for Third Cover.
<b>NOTE:</b> Use CAPTAN (2 pounds) during harvest, if necessary. CAPTAN <i>plus</i> BOTRAN should be applied in pre-harvest and, if necessary, in harvest sprays. BOTRAN may leave a yellow residue on fruit.	See "Days Between Final Spray and Harvest" when using LEAD ARSENATE.

**Post Harvest**

Leaf Spot	Peach Tree Borer, Lesser Peach Tree Borer
DODINE (CYPREX) ..... ¼ to ⅜ pound	See section on borer control, pages 23 and 24.

**Days Between Final Spray and Harvest**

**Insecticides:** DIAZINON-10; DIELDRIN-30; GUTHION -15; LEAD ARSENATE\*-14 or 30; PARATHION-14; SEVIN -1; THIODAN-21; Do not make more than 2 applications after shuck-split.

\*30-day interval if sold outside Michigan or for fresh fruit.

**Fungicides:** BOTRAN-0; CAPTAN-0; DODINE (CYPREX) -0; FERBAM-0; SULFURS-0.

Do not use chlorinated hydrocarbons where danger of drift onto forage crops exists.



# GRAPE SPRAYING SCHEDULE

**NOTE:** See end of schedule for intervals between final spray and harvest. Chemicals are not necessarily listed in order of preference. Rates of materials are for 100 gallons of spray.

## *Bud Swell*

DISEASES	INSECTS
<b>Dead Arm (Problem Vineyards)</b>	<b>Grape flea beetle, Climbing cutworms</b>
CAPTAN ..... 2 pounds	DDT (50% WP) ..... 2 pounds
<i>or</i>	<i>or</i>
FOLPET (PHALTAN) ..... 2 pounds	DDT (50% WP) ..... 1 pound, <i>plus</i>
When shoot growth is 1 to 2 inches, and repeat when shoot growth is 4 to 6 inches.	PARATHION (15% WP) ..... 1 pound, <i>or</i>
	PARATHION LIQUID ..... 0.15 pounds active ingredient
	<i>or</i>
	PARATHION (15% WP) ..... 2 pounds
	<i>or</i>
	PARATHION LIQUID ..... 0.3 pounds active ingredient
	<b>NOTE:</b> Use parathion if there is danger of spray drift on- to forage crops.

## *First Cover* (Shoots 4 to 8 inches long)

<b>Black Rot</b>	
FERBAM ..... 1½ pounds	No insecticides recommended in this spray.
<i>or</i>	
ZINEB ..... 1½ pounds	
<b>NOTE:</b> Not needed if second Dead Arm spray is applied.	

## *Second Cover* (Blossom Opening)

1. Black Rot	Grape Berry Moth
<b>2. Black Rot, Powdery and Downy Mildew</b>	
1. FERBAM ..... 1½ pounds	GUTHION (25% WP) ..... 1 pound
<i>or</i>	<i>or</i>
ZINEB ..... 1½ pounds	GUTHION (2#/gallon SC) ..... 1 pint
<i>or</i>	<i>or</i>
2. FIXED COPPER (actual) ..... 1½ pounds, <i>plus</i>	SEVIN (50% WP) ..... 2 pounds
HYDRATED LIME ..... 6 pounds	<i>or</i>
<i>or</i>	SEVIN LIQUID ..... 1 pound active ingredient
BORDEAUX ..... 4-4-100	<i>or</i>
<i>or</i>	DDT (50% WP) ..... 2 pounds
*FOLPET (PHALTAN) ..... 2 pounds	<i>or</i>
	DDT (50% WP) ..... 1 pound, <i>plus</i>
	PARATHION (15% WP) ..... 1 pound, <i>or</i>
	PARATHION LIQUID ..... 0.15 pounds active ingredient

If FIXED COPPER or BORDEAUX are used with PARATHION, GUTHION or SEVIN, spray immediately

as these materials may lose some insecticidal effectiveness when combined with LIME or in alkaline solutions.

## *Third Cover* (Immediately after bloom)

<b>1. Black Rot</b>	<b>Grape Berry Moth, Grape Leafhopper, Rose Chafer*</b>
<b>2. Black Rot, Powdery and Downy Mildew</b>	
1. Same fungicides as for Second Cover	Same insecticides as for Second Cover
2. Same fungicides as for Second Cover	

\*For Black Rot and Powdery and Downy Mildew control, use FOLPET (PHALTAN) on trial basis. Read the label for compatibility and cautions.

**NOTE:** Do not use Guthion more than three times during the growing season.

\*If rose chafers are a problem, use DDT (50% WP)—2 pounds, plus PARATHION (15% WP)—1 pound or PARATHION LIQUID—0.15 pounds active ingredient. SEVIN (50% WP)—2 pounds or SEVIN LIQUID, 1 pound active ingredient, will also give control.

Timing for second brood berry moth is announced by your county agricultural agent.



**Fourth Cover**

*(10 to 14 days after Third Cover)*

- |  |  |
|--|--|
| 1. Black Rot                           | Grape Berry Moth, Grape Leafhopper, Rose |
| 2. Black Rot, Powdery and Downy Mildew | Chafer                                   |

- |  |                                       |
|--|---------------------------------------|
| 1. Same fungicides as for Second Cover | Same insecticides as for Second Cover |
| 2. Same fungicides as for Second Cover |                                       |

**Fifth Cover**

*(Time to be announced)*

- |  |                                    |
|--|------------------------------------|
| 1. Black Rot                           | Grape Berry Moth, Grape Leafhopper |
| 2. Black Rot, Powdery and Downy Mildew |                                    |

- |  |  |
|--|--|
| 1. Same fungicides as for Second Cover | Same insecticides as for Second Cover. |
| 2. Same fungicides as for Second Cover |  |

**Sixth Cover**

*(10 to 14 days after Fifth Cover)*

**Grape Berry Moth**

Same insecticides as for Second Cover with the exception of DDT. Do not use DDT within 40 days of harvest.

**Seventh Cover\***

*(about Aug. 7)*

**Grape Berry Moth**

Same insecticides as for Sixth Cover.

**Eighth Cover\***

*(about Aug. 20)*

**Grape Berry Moth**

Same insecticides as for Sixth Cover.

\*Seventh and eighth cover sprays are necessary only when third berry moth is present. Check vineyard for this

brood. Need for these covers will be announced by your county agricultural agent.

**Days Between Last Spray and Harvest**

**Insecticides:** DDT-40; GUTHION-0; PARATHION-14; SEVIN-0.

**Fungicides:** FERBAM-7; COPPERS-0; ZINEB-7; FOLPET (PHALTAN)-0.

*Do not use chlorinated hydrocarbons where danger of drift onto forage crops exists.*







## Second Cover

(pre-bloom—just as flowers start to open)

- |   |   |
|---|---|
| 1. Gray Mold, Stem-End Fruit Rot, Leaf Blight | Spittlebug, Tarnished Plant Bug, Strawberry |
| 2. Gray Mold                                  | Leafroller                                  |

- |                           |           |                                 |
|---------------------------|-----------|---------------------------------|
| 1. CAPTAN .....           | 2 pounds  | See schedule under First Cover. |
|                           | <i>or</i> |                                 |
| 2. THIRAM (THYLATE) ..... | 2 pounds  |                                 |

## Third Cover

(Berries one-half grown)

1. Gray Mold, Stem-End Fruit Rot, Leaf Blight
2. Gray Mold

Same fungicides as for Second Cover.

If insects are present in troublesome numbers, include DIAZINON (50% WP) at 1 pound GUTHION (25% WP) at 1 pound or GUTHION (2#/gallon SC) at 1 pint per 100 gallons in this application.

## Pre-Harvest

(At least 10 days before harvest)

(Up to beginning of harvest)

1. Gray Mold, Stem-End Fruit Rot, Leaf Blight
2. Gray Mold

Strawberry Sap Beetle

- |  |                    |
|--|--------------------|
| 1. CAPTAN .....                            | 2 pounds           |
|  | <i>or</i>          |
| CAPTAN DUST (7.5% CAPTAN) .....            | 40 pounds/A        |
| 2. THIRAM (THYLATE) .....                  | 2 pounds           |
|  | <i>or</i>          |
| THIRAM (THYLATE) DUST (7.5% THYLATE) ..... | 40 pounds per acre |

CORN COB-MOLASSES-GUTHION (1.25%)  
 BAIT .....

40 pounds/acre  
 Apply bait when beetles are first noticed migrating into the planting or when first injury is noticed. Repeat treatment as necessary. **Do not apply closer than 5 days of harvest.**

## During Harvest Period

1. Gray Mold, Stem-End Fruit Rot, Leaf Diseases
2. Gray Mold Fruit Rot

For 1 and 2, same fungicides as in Pre-Harvest sprays.

**NOTE:** During harvest, rainy periods are conducive to gray mold fruit rot development. If THIRAM is applied within three days of harvest, residues must be removed by washing. CAPTAN may be used up to harvest.

The need for an After-Harvest insecticide application is determined by observation. If leafrollers are present in damaging numbers, use DDD (50% wettable) at 2 pounds per 100 gallons.

### Control of Cyclamen Mites

Under certain circumstances, cyclamen mites may become established in a planting. Usually, the infestation is limited to small areas in the field. These areas may be spot treated with one of the following programs: THIODAN (2 EC), at the rate of 1 quart/100 gallons, applied

at Early Blossom or in multiple applications during the fruiting season, but no closer than 4 days to harvest. KELTHANE (35% WP), at the rate of 1¼ pounds/100 gallons, applied at any time during the season, but not closer than 2 days before harvest. KELTHANE should be applied so the plants are thoroughly drenched. The addition of a wetting agent will improve control.



**Days Between Final Spray and Harvest**

**Insecticides:** DDD-5; DIELDRIN-Use only before Bloom or after harvest in bearing plantings; DIAZINON-5; GUTHION-5; KELTHANE-2; SEVIN-1; THIODAN-4.

**Fungicides:** CAPTAN-0; THIRAM (THYLATE)-3; Remove residues of THIRAM from strawberries by washing if application is made within 3 days of harvest.

**BRAMBLE SPRAYING SCHEDULE**

*(Red Raspberries, Black Raspberries, Dewberries and Blackberries)*

**NOTE:** See end of schedule for intervals between final spray and harvest. Chemicals are not necessarily listed in order of preference. Rates of materials are for 100 gallons of spray.

***Delayed Dormant***

**DISEASES**

**INSECTS**

1. Anthracnose (when first leaves are exposed 1/4 to 3/4 inch)
2. Anthracnose (when a few leaves have unfolded)

- |                      |            |
|----------------------|------------|
| 1. LIME SULFUR ..... | 10 gallons |
| <i>or</i>            |            |
| 2. LIME SULFUR ..... | 5 gallons  |

No insecticides recommended in this spray.

**CAUTION:** If unable to apply the first-mentioned eradicated spray for Anthracnose, a LIME-SULFUR spray at 5 gallons per 100 when a few leaves have unfolded from

buds will give effective control. There is a greater risk of LIME-SULFUR burn, however, by spraying at this later date.

***Pre-Blossom***

*(When blossom buds are breaking or new canes 6 to 8 inches long)*

1. Anthracnose  
*or*
2. Spur Blight (Red Raspberry)

Leafroller, Raspberry Sawfly, Raspberry Fruit Worm and Raspberry Cane Borers

- |                   |          |
|-------------------|----------|
| 1. CAPTAN .....   | 2 pounds |
| <i>or</i>         |          |
| 2. BORDEAUX ..... | 3-3-100  |
- (Repeat BORDEAUX 10 to 14 days later.)

- |                              |          |
|------------------------------|----------|
| GUTHION (25% WP) .....       | 1 pound  |
| <i>or</i>                    |          |
| GUTHION (2#/gallon SC) ..... | 1 pint   |
| <i>or</i>                    |          |
| DDT (50% WP) .....           | 2 pounds |

**NOTE:** If GUTHION is used with BORDEAUX, spray out tank without delay.



***First Cover***

*(At Petal Fall)*

**Anthracnose**

**Aphids, Leafrollers, Cane Borers**

CAPTAN ..... 2 pounds

GUTHION (25% WP) ..... 1 pound

GUTHION (2#/gallon SC) ..... 1 pint

MALATHION (50% WP) ..... 2 pounds

***Pre-Harvest***

*(15 days before harvest)*

**Aphids, Mites (See Mite section below)**

PARATHION (15% WP) ..... 2 pounds

PARATHION LIQUID ..... 0.3 pounds  
active ingredient

**MITES**

Where mites are a problem use KELTHANE (35% WP), 1¼ pounds, or KELTHANE (18.5% EC), 2 quarts *plus*

•TEPP (40% EC), ¼ pint, or •TEPP (20% EC), ½ pint.

**RASPBERRY ROOT BORER**

**NOTE:** Where raspberry root borers are a major problem apply a drenching crown spray using DIAZINON (EC) — 2 pints for each 100 gallons of spray. Use 400 - 500 gal-

lons of spray per acre. Apply the spray any time from November to April to kill the overwintering stage which is found on the plant crown just below the ground line.

**Days Between Final Spray and Harvest**

**Insecticides:** DDT—Do not use after fruit begins to form. Use pre-bloom only. DIAZINON—7; GUTHION—14; KELTHANE—2; MALATHION—1; PARATHION—15; •TEPP—3.

**Fungicides:** CAPTAN—0.

*Do not use chlorinated hydrocarbons where danger of drift onto forage crops exists.*



# Currant and Gooseberry Spraying Schedule

**NOTE:** See end of schedule for intervals between final spray and harvest. Chemicals are not necessarily listed in order of preference. Rates of materials listed below are for 100 gallons of spray.

## *Dormant*

(For both currants and gooseberries)

### DISEASES

### INSECTS

Currant Aphid

•ELGETOL 318 ..... 1 quart

## *Green Tip*

Powdery Mildew (Gooseberries only)

LIME SULFUR ..... 5 gallons

Thorough coverage is essential.

## *First Cover*

(As soon as the fruit has set)

Powdery Mildew (Gooseberries only)

Currantworm, Currant Aphid

LIME SULFUR ..... 2½ gallons

PARATHION (15% WP) ..... 1½ pounds

*or*

PARATHION LIQUID ..... 0.23 pounds  
active ingredient

*or*

MALATHION (25% WP) ..... 2 pounds

## *Second Cover*

(2 to 3 weeks after bloom)

Leaf Spot (Currants and Gooseberries)\*

Currantworm, Aphids

FERBAM ..... 2 pounds

MALATHION (25% WP) ..... 2 pounds

\*The timing of the spray for leaf spot varies with the individual planting. However, for best disease control, spray when leaf spot is first noticed. Generally, it is observed first on the lower leaves of the bushes.

If leaf spot is present at harvest time, spray immediately after harvest with the fungicide suggested for second cover.

### Days Between Final Spray and Harvest

**Insecticides:** MALATHION—1; PARATHION—30 for currants; 15 for gooseberries.

**Fungicides:** FERBAM—14.



# BLUEBERRY SPRAYING SCHEDULE

**NOTE:** See end of schedule for intervals between final spray and harvest.  
 Chemicals are not necessarily listed in order of preference in the spraying schedule.  
 Rates of materials listed below are for 100 gallons of spray.

## *Dormant* (When buds begin to swell)

### DISEASES

### INSECTS

#### Mummy Berry

PREMERGE .....1½ quarts  
*or*

Rake and cultivate planting floor to cover the mummified berries, or broadcast AERO CALCIUM CYANAMID (57% special grade) 150 to 200 pounds per acre. Apply

spray or dust over entire plantation area, including plant crowns.

**Important:** If plants have broken dormancy and green tips are showing, do not use AERO CALCIUM CYANAMID dust.

## *First Cover*

*(Immediately after bloom or as soon as Curculio is active)*

### Plum Curculio, Blueberry Tip Borer

GUTHION (25% WP) .....	1 pound
<i>or</i>	
GUTHION (2#/gallon SC) .....	1 pint
<i>or</i>	
PARATHION (15% WP) .....	1½ pounds
<i>or</i>	
SEVIN (50% WP) .....	2 pounds
<i>or</i>	
SEVIN 4 FLOWABLE .....	1 quart
<i>or</i>	
MALATHION DUST (4%) .....	40 pounds/acre
<i>or</i>	
SEVIN DUST (5%) .....	40 pounds/acre
<i>or</i>	
METHOXYCHLOR DUST (5%) .....	40 pounds/acre

## *Second Cover*

*(10 days after First Cover)*

### Plum Curculio, Cranberry Fruitworm, Blueberry Tip Borer

Same insecticides as for First Cover.

**NOTE:** Guthion is more effective against Cranberry Fruitworm and Blueberry Tip Borer than the other listed insecticides. For the White Tussock Moth—Use Sevin at 2 pounds per 100 gallons when the larvae are observed.

## *Third Cover*

*(10 days after Second Cover)*

### Cranberry Fruitworm

Same insecticides as for First Cover.

**NOTE:** If lecanium scale is a problem, use SEVIN at

rates suggested in First Cover. Apply when crawlers are first observed and repeat 10 days later.

*Do not use chlorinated hydrocarbons where danger of drift onto forage crops exists.*



## ***Fourth and Subsequent Covers***

*(During Blueberry Maggot Fly emergence)*

### **Blueberry Maggot**

Same insecticides as for First Cover

**NOTE:** ROTENONE DUST (2½%) at 25 lb/A or 2% at 30 lbs. can also be used.

The time to make the fourth cover application will be announced by your county agricultural agent. Additional applications of the same materials suggested for Fourth Cover should continue at 10-day intervals until the fruit is harvested. Extending the intervals between applications or using less than the recommended rate per acre

may not give control of the blueberry maggot. The interval between applications should be reduced if rainfall occurs within a few days of the dust application. Guthion Dust (2%) at 30 pounds per acre may also be used. Only two applications of dust may be made in the 14-day period before harvest.

The insect known as the Blueberry Borer has recently been identified as the Dogwood Borer. Within the past few years, this insect has become a major problem in some southwest Michigan blueberry plantings. PARATHION (15% WP), 1½ pounds, or equivalent in flowable

or EC formulations, per 100 gallons applied at rate of 250 gallons per acre will control the Dogwood Borer. Apply spray July 1 in the Benton Harbor area; July 15 in the Grand Haven area. Thorough coverage of the base of the plant is necessary for control.

### **Days Between Final Spray or Dust and Harvest**

**Insecticides:** GUTHION-14; MALATHION-0; METHOXY-CHLOR-14; PARATHION-14; ROTENONE-1; SEVIN-0.

Guthion Dust (2%) at 30 pounds per acre - 4 hours of harvest.

### **RESIDUE TOLERANCE OF PESTICIDES ON FRUITS**

According to regulations established under "the Miller Bill", certain small amounts (tolerances) of pesticides may legally remain on harvested fruits. You, as a grower, are responsible for producing legally marketable fruit.

By following three rules, you can be reasonably sure your harvested fruit will be "within the limits of the law":

#### **Rule No. 1**

Do not use dosage rates above those suggested in the spraying schedule for the specific fruits.

#### **Rule No. 2**

Do not use pesticides and growth regulators on crops not cleared by the Food and Drug Administration.

#### **Rule No. 3**

Do not use pesticides closer to harvest than

suggested in the spraying schedules for specific fruits or in the table on page 45.

Information on materials used in the dormant, pre-bloom, and post-harvest periods has been omitted. Ordinarily, materials used at these times do not present a residue problem on harvested fruits.

The information found in Table 1 on page 45 is up-to-date as of Jan. 1, 1968. Minor changes may occur during the growing season. County agricultural agents will be notified when these occur.

It is not safe to feed apple pomace treated with certain pesticides (especially chlorinated hydrocarbons) to livestock. DDT, TEDION, and CY-PRX, for example, have definite label restrictions against this use. **Be sure to check the label restrictions for all the chemicals you use on fruit crops.**



Table 1. — DAYS BETWEEN FINAL SPRAY AND HARVEST

Listed below are some of the commonly used pesticides and the intervals from last application to harvest for each crop. See spray schedules for recommended materials.

Fungicides	Apples	Pears	Peaches	Plums and Prunes	Cherries	Grapes	Strawberries	Raspberries	Currants and Gooseberries	Blueberries	Apricot
Acti-dione					4(Sour)						
Botran			1		0(Sweet)						
Captan	0	0	0	0	0	0	0	0			0
Copper (copper-lime mixtures)	h	h			h	h	h	h			
Dodine (Cyprex)	7		15		0		14				
Dichlone (Phygon)	1		7	3	3						
Ferbam	7	7		7	0	7			14		
Folpet (Phaltan)					0	0					
Glyodin	0e				7(Sour)						
Dinocap (Karathane)	21						21	7			
Mercuries	● f						● af				
Streptomycin	● a	● a									
Sulfurs	h		h	h	h						
Thiram (Thylate)	0		7				3e				
Zineb	0			30		7					
Ziram	0										
<b>Insecticides</b>											
BHC	60a	60a	60	60a	a	a	a		a	a	
Chloropropylate	14	14	●	●	●	●	●	●	●	●	●
Cygon	28	28	●	●	●	●	●	●	●	●	●
DDD	30	30	30	30	30	40f	5	14	a	14	30
DDT	30	30	30	30	30	40f	c	a	a	c	42
Demeton (Systox)	21f	21f	30f	30f	● f	21	21	d	d	●	30
Diazinon	14	14	20	10	10	10	5	7	●	●	10
Dieldrin	45	35	45	30	30	14	a,c	f	●	●	45
Endrin	● f	● f	●	● f	● f	● 30,46f	● f	●	●	●	●
Ethion	60f	60f	30f	21f	● f	30f	2	●	●	●	● f
Genite	● e	● e	● e	● e	● e	●	●	●	●	●	●
Guthion	15	15	21	15	15	0	5	14	●	14i	21
Kelthane	7	7	14	7b	7b	7	2	2	●	●	14
Lead Arsenate	30g	30g		30g	14g,30g	a	a	a	●	a	30
Lindane	60	60	60	60	a,f	f	a	●	●	a	60
Malathion	3	1	7	3	3	3	3	1	1,3f	0-1f	7
Methoxychlor	7	7	21	7	7	14	3	3	14g	14	21
Morestan	● 35f	● 35f	● a,e	● a,e	● a,e	●	●	●	●	●	● a
Ovex	30	30	30	30	c	●	a	●	●	●	●
Parathion	14	14	14	14	14	14	14	15	30,15f	14	14
Phosdrin	1	1	1	1	2	2	1	3	●	●	●
Phosphamidon	● 60	●	●	●	● f	●	●	●	●	●	●
Sevin	1	1	1	1	1	0	1	7	●	0	3
Superior oil	e	e	e	e	e	e	e	e	e	e	e
Tedion	f	f	f	f	f	f	3f	f	●	f	f
TEPP	● 3	● 3	● 3	● 3	● 3	● 3	● 3	● 3	● 3	● 3	● 3
Thiodan	30f	30f	21f	21f	21f	7	4f	●	●	●	21f

Legend: a = Not after fruit begins to form. f = See label restrictions on use.  
 b = Do not repeat application within 30 days. g = Remove excess residues at harvest.  
 c = Pre-bloom or Post-harvest application only. h = Sulfurs and copper plus lime mixtures are exempt if used as recommended.  
 d = Post-harvest application only. i = 4 hours of harvest using 2% dust at 30 pounds per acre.  
 e = No residue if used according to recommendations. ● = Since December 31, 1967 growers should consult County Agriculture Extension Agents to determine if a finite tolerance has been established, or if a label extension has been granted.

Do not use chlorinated hydrocarbons where danger of drift onto forage crops exists.



## MOUSE CONTROL IN ORCHARDS

**Protective Wire Guards** — The use of small mesh wire guards of ½-inch mesh or smaller around the base of newly planted trees will give protection against mice for 5 to 7 years. The wire should be cut 18 inches by 24 inches to give a wire height of 18 inches. Imbed the wire in the ground 1 inch. Be sure in November there is no pocket around the trunk of the wired tree, as water accumulating in such pockets when changed to ice could girdle the tree.

**Broadcasting Bait** — A 2% zinc phosphide-treated cracked corn and oats or cracked corn alone broadcast by airplane or with a whirligig fertilizer spreader has been a very effective and easy means of mouse control. Use the material at the rate of 10 pounds per acre. Make the first application during the first or second week in October and follow with a second application two to three weeks later in areas of heavy mouse population or where the ground cover is dense. Do not forget to treat the border areas to prevent migration of mice into treated areas.

**Endrin Ground Sprays** — The use of Endrin as a ground spray to control mice is hazardous and very expensive, but it has been effective. This method of mouse control should never be used if even the slightest trace of Endrin could drain into or be washed by rains into streams or lakes inhabited by fish. As little as 5 parts per billion will kill fish.

Endrin for mouse control is used at the rate of 350 gallons of mixture per acre of ground area actu-

ally sprayed, using 0.5 to 0.6 pound of actual Endrin per 100 gallons. Either a boom no higher than 18 inches above the ground or a spray gun with a "driving" type of discharge should be used to make the application. An operating pressure of 500 to 600 pounds is necessary to drive the spray mixture through the grass cover into the runways. Usually a 6-foot swath sprayed on one side of each row of trees and extending under the branches 2 to 3 feet is considered sufficient ground coverage for good protection.

### Warning

(a) Endrin is highly toxic. The person making the application should be extremely careful not to come in contact with the Endrin spray mixture.

(b) Treated areas must be posted for at least 30 days after application stating that the orchard has been treated with a poison Endrin spray.

(c) Endrin ground sprays must never be applied until after harvest and after all dropped fruit has been removed from the orchard.

(d) Unless properly applied, Endrin is very ineffective in controlling mice.

(e) Because of the hazard to fish, **do not** wash containers or pails which have contained Endrin or **do not** flush out a spray tank contaminated with Endrin in an area that may drain into a stream or lake.















## SPECIAL WARNING

### PESTICIDE DRIFT AND CONTAMINATION OF FOOD AND FEED CROPS

There is always a possibility of drift and injury to neighboring crops and premises from both aircraft and conventional ground spray and dust applications. Hay and pasture crops, for example, grown near orchards treated with pesticides may contain illegal chemical residues, particularly chlorinated hydrocarbons. Since few chemicals have a tolerance established for hay crops and there is a **zero tolerance** for any pesticide in milk, extreme caution must be exercised to avoid pesticide contamination of forage and pasture crops. DDT and other chlorinated hydrocarbons are particularly hazardous since they are stored in animal fat and are secreted in the milk. Chlorinated hydrocarbon insecticides include: BHC, DDT, DDD, chlorobenzilate, dieldrin, kelthane, methoxychlor and thiodan.

Where the possibility of pesticide drift is present, growers should use phosphate or carbamate insecticides in their spray program but only those registered for use on forage and pasture crops.