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Fruit Spraying Calendar For Commercial Fruit Growers

Michigan State University Extension Service

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**For Commercial Fruit Growers**

# 1966 FRUIT SPRAYING CALENDAR

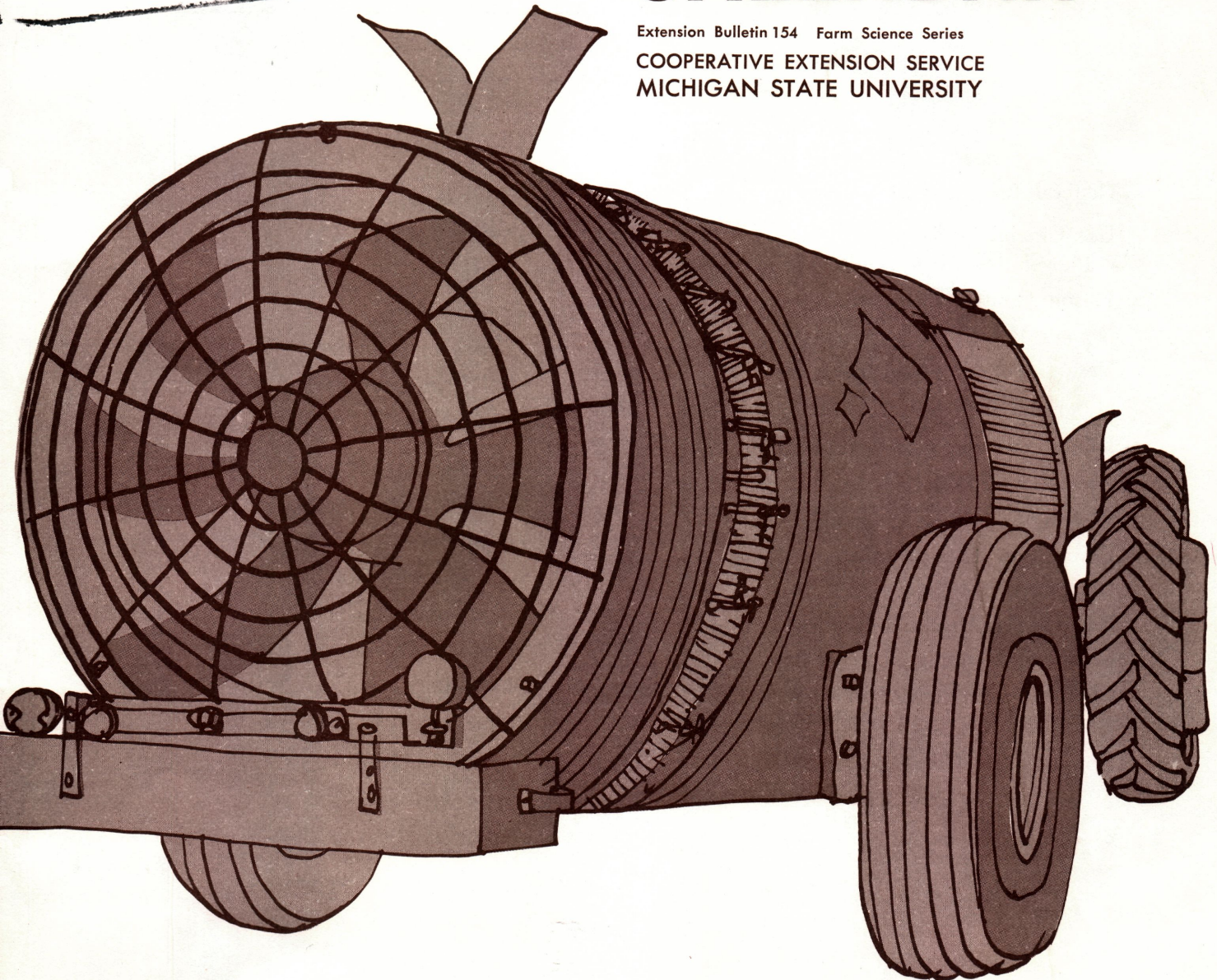
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## SPECIAL WARNING

### 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.

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# 1966 FRUIT SPRAYING CALENDAR

PREPARED BY P. H. WOOLEY<sup>1</sup>, E. J. KLOS<sup>2</sup>, A. E. MITCHELL<sup>3</sup>, and A. J. HOWITT<sup>1</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 spray 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 1966.
4. *Chemical Weed Control for Horticultural Crops* by S. K. Ries, H. K. Bell, H. D. Davidson, R. P. Larsen, Extension Bulletin E-433.

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 41 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 sprays or dusts. Note warnings and cautions each time before opening the container.
2. Keep sprays and dusts 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 sprays and dusts in original containers and keep them tightly closed. Never keep them in anything but the original container.
4. Never smoke while spraying or dusting.
5. Avoid inhaling sprays or dusts. When directed on the label, wear protective clothing and masks.
6. Do not spill 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  
Colfax 5-6161  
Robert Greiner, M.D.

#### ANN ARBOR

Poison Control Center\*  
University Hospital  
1313 E. Ann St.  
Normandy 31531, Ext. 589  
George H. Lowrey, M.D.

#### BATTLE CREEK

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

#### BAD AXE

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

#### BAY CITY

Poison Treatment Center  
Bay City Osteopathic Hospital  
300 Mulholland St.  
TWInbrook 3-9554

(Emergency Room under charge of Floor Supervisor)

Poison Control Center  
Mercy Hospital  
100 15th St.  
TWInbrook 3-9554  
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.  
Temple 3-1000  
Paul V. Wooley, Jr., M.D.; Rosalyn Weintraub, M.D.

Poison Information Center  
Registrar's Office  
Herman Kiefer Hospital  
1151 Taylor Avenue  
Trinity 2-3334  
Paul T. Salchow, 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  
300 Bostwick, N. E.  
Glendale 1-3591  
John R. Wilson, M.D.  
Poison Control Center  
Blodgett Memorial Hospital  
1800 Wealthy, S. E.  
Glendale 6-5301  
John Montgomery, M.D.  
Poison Control Center  
St. Mary's Hospital  
201 Lafayette, S.E.  
Glendale 9-3131  
Craig E. Booher, M.D.

#### 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.  
Fireside 2-9821  
H. Sidney Heersma, M.D.; Wm. E. Johnson, Asst. Dir.

#### LANSING

Poison Control Center  
St. Lawrence Hospital  
1210 W. Saginaw St.  
372-3610  
Robert F. Thimmig, M.D.  
Poison Treatment Center  
Edw. W. Sparrow Hospital  
1215 E. Michigan Ave.  
Ivanhoe 4-7721  
Harry C. George, M.D.

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

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

#### LINCOLN PARK

Poison Control Center  
Outer Drive Hospital  
26400 Outer Drive  
386-0606  
W. S. Wheeler

#### MARQUETTE

Poison Information Center  
St. Luke's Hospital  
West College Ave.  
Canal 6-3511  
R. Mick, Pharmacist  
Thomas Bell

#### MIDLAND

Poison Control Center  
Midland Hospital  
4005 Orchard Drive  
TE 5-6771  
B. E. Lorimer; D. N. Fields, M.D.

#### MONROE

Poison Control Center  
Memorial Hospital of Monroe  
700 Stewart Road  
241-6509

#### PETOSKEY

Poison Control Center  
Little Traverse Hospital  
416 Connable  
Diamond 7-2551  
Norbert R. Wegemer, Chief Pharmacist

#### PONTIAC

Poison Control Center  
St. Joseph Mercy Hospital  
900 Woodward Ave.  
Federal 4-3511  
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.  
PL 3-3411  
Wm. G. Mason, M.D.

Poison Treatment Center  
Saginaw Osteopathic Hospital  
515 N. Michigan  
Pl 3-7751  
Nicholas Latkovic, M.D.

#### 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

#### 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  
Emergency Room Residents

2. For poisons spilled on the skin: Wash thoroughly with large amounts of soap and warm water. Particles in the eyes may be removed by thorough flushing with plain water. For phosphate materials absorbed through the skin, give atropine by injection or in tablet form.

3. For poisons that have been inhaled: Place the patient in the open air. Give atropine as directed above if a phosphate material was inhaled. Administer artificial respiration when necessary.

4. For poisons that have been swallowed, induce vomiting as soon as possible: Gently stroke the inside of the throat and/or give an emetic such as warm salt water (1 tablespoon in a glass of water). Repeat until the vomit fluid is clear. After the stomach has been emptied, give a demulcent, such as raw egg white mixed with water.

5. Physician may inject 1/30 to 1/60 of a grain of atropine sulfate at hourly intervals for phosphate materials, or phenobarbital for chlorinated hydrocarbon chemicals.

#### 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:**

#### 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

#### WHEN SETTING CHERRY TREES

Ethylene dibromide (Dowfume W-85) .....	12 gallons/acre
--	-----------------



DD Mixture (dichloropropane-dichloropropenes mixture) ..... 40 gallons/acre

Telone (dichloropropenes mixture) ..... 40 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.

## NEW INSECTICIDES AND THEIR USE

**Chlorobenzilate** is classed as one of the chlorinated hydrocarbons. There was evidence of injury on apple in the form of lenticel enlargement. Chlorobenzilate may still be used on pears for mite control as no injury has been observed. Use after *Third Cover*. Do not use chlorobenzilate on stone fruits.

**Cygon**, a member of the phosphate group of insecticides, has given excellent control of European red mite and apple aphids when used in the pink spray. Cygon is a 30.5% emulsifiable liquid containing 2.67 pounds of actual cygon per gallon. Cygon has been satisfactorily mixed with oil, lead arsenate, Sevin, diazinon, Guthion, Tedion, Kelthane, Cyprex, captan, zineb, and thiram.

**Morestan** is a new miticide of the heterocyclic carbonate class of pesticides. When applied at the time of *Pink* for European red mite, it has controlled this pest until the middle of July. Morestan, in 1963 and 1964 research plots, gave excellent control of phosphate-resistant pear psylla in addition to European red mite when applied in the *Pink* spray. Morestan is labelled for use as a pre-bloom acaricide and should not be used after *Petal Fall*. It is recommended for use in Michigan on apples, pears, plums and prunes. Do not use Morestan in oil or within 4 weeks after oil, if the oil was applied when green tissue was showing.

## SUPERIOR OILS

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

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 viscosity oils is the reduced possibility of plant injury. They are safer because they are more volatile, resulting in less persistence on the tree. They remain 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 oils can be applied between *Green-Tip*, *Delayed Dormant*, and *Pre-Pink* stages of tree development. European red mite eggs are most susceptible to control by oils 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. Oils applied earlier than *Green-Tip* are not as effective as those applied later. The addition of a phosphate insecticide 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
Unsulfonated residue <sup>3</sup> (minimum) .....	92
Pour Point <sup>4</sup> , °F. (maximum) .....	
Distillation at 10mm. Hg, 5° 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.



During the 1965 spraying season several brands of "superior oils" sold in Michigan did not meet the specifications of "superior oils." Laboratory analyses showed them to have an unsulfonated residue (U.R.) range of between 77-92 and a 10-90% distillation range of 135-168°F. The U.R. is a measure of the purity of the oil, the lower the U.R. the more aromatic compounds present in the oil. The aromatic compounds are usually the agents responsible for plant injury. The distillation range indicates whether or not oils of different viscosities are blended to produce a specific viscosity. A wide distillation range indicates a blend. In general, low viscosity oils have very little, if any, insecticidal effectiveness while the heavier fractions in the oil blend may persist for a long time and cause injury to the tree or result in incompatibilities when other insecticides or fungicides are applied over the oil deposit.

In order to provide effective mite control and reduce the possibility of injury to the tree, growers should insist that the spray oils meet the specifications listed above.

## EFFECTIVE DILUTE AND CONCENTRATE PESTICIDE APPLICATION

In addition to timing, effective pest control is dependent upon proper application, which includes the correct amount of chemical per tree or per acre and equal distribution of the chemical throughout the tree (or area to be covered). Studies have shown that equal distribution is accomplished on commercially bearing trees for both dilute and concentrate spraying by setting up the sprayer discharge unit so that two-thirds of the chemical mixture discharged is dispersed into the upper one-third of the tree. This is particularly important for poorly pruned trees and those 16 feet or higher.

For mature plantings of tree fruits, 300 to 400 gallons of conventional dilute spray mixture are usually required per acre to achieve adequate pest control. This applies for all tree fruits.

When using concentrated mixtures, the amount of actual pesticide per tree or per acre is the same as for conventional dilute applications. Thus, concentrate spraying is accomplished by adding to the water in the spray tank 2, 3, 4 or 5 times more of a given pesticide than is used in conventional spraying and applying  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$  or  $\frac{1}{5}$  of the concentrated mixture per tree or per acre. Thus, for a 2x spray mixture, use  $\frac{1}{2}$  gallonage per tree or per acre, for a 3x mixture, use  $\frac{1}{3}$  gallonage per tree or per acre, etc. With this procedure, whether using dilute or concentrated mixtures, the amount of actual pesticide applied per tree or per acre is the same.

**Note:** the quantities of pesticides suggested in the Fruit Spraying Schedules (pages 12 through 41) are for conventional dilute spray mixtures. However, *except for oils*, spray applications can be made using 2x, 3x, 4x or 5x spray mixtures applying the correspondingly reduced gallonage per tree or per acre.

## SETTING UP SPRAYER FOR CONCENTRATE APPLICATION

To set up a sprayer for concentrate spraying of tree fruits, you must know:

- (A) the gallons of spray applied per tree using conventional dilute spraying;
- (B) the rate of travel to be used while spraying, in feet per minute (One mile per hour equals 88 feet a minute.)
- (C) the concentrated mixture to be used;
- (D) the average spread in feet of the tree.

Here is a practical example. A grower wishes to set up an airblast spray for well-pruned, mature apple trees and needs to know the delivery rate for each side of the sprayer. He plans to use 4x concentration applying  $\frac{1}{4}$  gallonage while traveling 3 miles per hour. The spread of the trees is 30 feet. He applied 12 gallons per tree using conventional dilute applications.

Use the following formula to determine the gallons per minute to be delivered by *one side* of the sprayer (E) for the concentrated mixture to be used. The "2" is included because only one side of the tree is covered as the sprayer passes.

$$E = \frac{A \times B}{2 \times C \times D}$$

"E" is the unknown, the delivery rate to be determined.

"A" is 12, the gallons per tree of dilute mixture previously used.

"B" is rate of travel, 88 feet a minute x 3 (3 miles per hour) or 264 feet a minute.

"2" is always the same, as the sprayer is covering only one-half of the tree as it passes.

"C" is 4 as the concentration is "4x".

"D" is 30 as the spread of each tree to be sprayed is 30 feet.

$$\text{Thus "E"} = \frac{12 \times 264}{2 \times 4 \times 30} = \frac{3,168}{240} = 13.2 \text{ gallons per}$$

minute.

Set up the sprayer so that each side of the machine delivers 13.2 gallons a minute when traveling 3 miles per hour. This would make a total 2-side delivery of 26.4 gallons a minute. Also, arrange the nozzles



on each manifold so that two-thirds of the spray discharged is directed into the upper one-third of the tree.

If you plan to use concentrate spraying, be prepared to spray either day or night, since best results are obtained when the wind is less than 10 miles per hour.

## 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 wettable powder forms. Also, the pesticides Glyodin, Glyoxide and 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, Glyoxide and Cyprex. Remember, too, for apples, that chemicals with a narrow range of safety, such as Phygon XL, 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 safely lead arsenate against arsenical injury to leaves and fruit. Hydrated lime alone, previously used to safely lead



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.

Add  $\frac{1}{2}$  pound of Ferbam when 2 pounds of lead arsenate are used with  $\frac{1}{4}$  pound of Cyprex.

Glyodin, Thylate (Thiram) and Cyprex ( $\frac{1}{4}$  pound) 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  $1\frac{1}{2}$  pints per 100 gallons with 2 pounds of lead arsenate, you could 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 ( $32^{\circ}$  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, Cyprex, Glyodin or Glyoxide 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 Thylate may be used safely on this variety in a protective schedule against scab.

If "back action" is necessary against possible apple scab infection, Phygon XL at  $\frac{1}{4}$  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 Phygon XL.

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*, if possible, and then use wettable Guthion. If plum curculio or red-banded leaf roller are problems, the Guthion program should be started at *Petal Fall*. Do not use Parathion 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 ( $32^{\circ}$  F. and lower) occur just before, during or shortly after *Bloom*. In years when the air temperature drops to  $32^{\circ}$  F. or lower at *Bloom* or shortly thereafter, use Captan through *Second Cover*.

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 bloom schedule on page 13, for timing and materials for fireblight control.

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 Phygon XL at  $\frac{1}{4}$  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* except when necessary for the control of curculio or red-banded leaf roller. At *First Cover* use wettable Guthion.

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.

**Delicious:**—Many Michigan growers experienced unfavorable russeting of Delicious in 1959, 1960 and some in 1961. In every case, these growers had used



either Wettable Sulfur, Sulfur Paste, Lime-Sulfur or Phygon XL 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 Phygon XL will russet *Delicious*, including the red sports. Avoid the use of these above-mentioned chemicals applied as a spray in or after *Bloom*, and there will be no problem of russetting of *Delicious* in Michigan.

## CHEMICAL THINNING

### APPLES

The continued demand for apples of certain varieties with a minimum acceptable size of 2½ inches has made blossom and fruit thinning a "must" in Michigan. High labor costs 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 chemicals.

The two chemicals currently suggested for use in Michigan are 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 all 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.

### 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 as you would use in conventional spraying (See Concentrate Spraying, page 4).

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.

### Sevin as a Thinning Agent

Sevin has been used as an insecticide on apples in Michigan since 1957 and it was not until 1959 that a reduction in crop yield was noted when this

chemical was used throughout the season, beginning at *Petal Fall*. Subsequent studies 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*. (See Apply Spraying Schedule, 14). After *Second Cover*, Sevin may be used without any danger of added thinning.

### 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 as Peach-Thin 322 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.

## 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	Lime-sulfur	Sulfur, Ferbam, Glyodin, Glyoxide or	Lime-Sulfur
Wettable sulfur	Mercurial compounds	Captan at half-strength combined with	Phygon XL (dichlone)
Sulfur paste	Phygon XL (dichlone)	half-strength Phygon XL (dichlone).	Cyprex (dodine)
Ferbam	Cyprex (dodine)	Sulfur, Glyodin, Gloxide, Ferbam or	Captan
Glyodin	Captan	Captan at half-strength combined with	
Captan		mercurial compounds.	
Phygon XL (dichlone)			
Cyprex (dodine)			



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, Phygon XL (dichlone) 40 to 48 hours, 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, Phygon XL, Captan, and Cyprex. Half-strength combinations of eradicants (mercuries or Phygon) 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 eradivative 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.
Phygon (Dichlone) 50% WP	½ lb.	Fair	Fair	36-48 hrs.
Cyprex (Dodine) 65% WP	½ lb.	Good	Good	30-36 hrs.**
Ferbam 75%	2 lb.	Good	Good	0
Glydine 30%	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 Cyprex at ½ pound rate will eradicate up to 48 hours after infection. This is suggested on a trial basis until the 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.



# Compatibility Chart

	Lead Arsenate	DDT, DDD, TDE	Methoxychlor	BHC, Lindane	Dieldrin	Kelthane	Genite	Chlorobenzilate	Parathion, Ethion	Systox (demeton)	Malathion, Trithion	Diazinon, Guthion	Captan	Glyodin	Phygon XL (dichlone)	Mercuries	Bordeaux	Fixed Copper	Lime sulfur	Elemental sulfur	Ferbam, Thiram	Ziram, Zineb	Niacide M	Lime	Karathane	Rotenone	Actidione	Sevin	Tedion	Cyprex	Superior Oil	Morestan	Thiodan	Phosphamidon	Cygon	
Lead Arsenate		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	N	+	+	+	+	
DDT, DDD, TDE	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Q	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Methoxychlor	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Q	+	+	+	+	Q	+	+	+	+	+	+	+	+	+	+	+	
BHC, Lindane	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	N	N	N	+	+	+	+	N	+	+	+	+	+	+	+	+	+	+	+	
Dieldrin	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Kelthane	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	N	N	N	+	+	+	+	N	+	+	+	+	+	+	+	+	+	+	+	
Genite	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Q	+	Q	Q	N	+	+	+	+	
Chlorobenzilate	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	N	N	Q	+	+	+	+	N	+	+	Q	+	Q	Q	N	+	+	+	+	
Parathion, Ethion	+	+	+	+	+	+	+	+		+	+	+	+	+	+	Q	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Systox (demeton)	+	+	+	+	+	+	+	+	+		+	+	+	+	+	Q	Q	Q	Q	+	+	+	+	+	+	+	+	+	Q	+	+	+	+	+	+	
Malathion, Trithion	+	+	+	+	+	+	+	+	+	+		+	+	+	+	Q	+	+	+	+	+	+	+	+	Q	+	+	+	+	+	+	+	+	+	+	
Diazinon, Guthion	+	+	+	+	+	+	+	+	+	+	+		+	+	+	Q	Q	Q	Q	+	+	+	+	+	+	+	Q	+	+	+	+	+	+	+	+	
Captan	+	+	+	+	+	+	+	+	+	+	+	+		+	+	N	N	N	N	+	+	+	N	+	+	+	+	+	+	+	+	N	+	+	+	
Glyodin	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	Q	+	+	Q	+	+	+	+	+	+	
Phygon XL (dichlone)	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	Q	Q	Q	+	+	+	+	Q	+	+	+	+	Q	+	N	+	+	+	+	
Mercuries	+	+	+	+	+	+	+	Q	Q	Q	+	+	+	+	+		Q	Q	N	+	+	+	+	Q	+	+	Q	N	+	+	N	+	+	+	+	
Bordeaux	+	+	+	N	+	N	+	N	+	Q	+	Q	N	+	Q	Q		+	N	+	Q	Q	Q	+	Q	N	N	N	Q	N	+	+	+	Q	+	
Fixed Copper	+	+	+	N	+	N	+	N	+	Q	+	Q	N	+	Q	Q	+		N	+	Q	Q	Q	+	Q	N	N	+	Q	N	+	+	+	+	+	
Lime sulfur	+	Q	Q	N	+	N	+	Q	+	Q	+	Q	N	+	Q	N	N	N		+	Q	Q	Q	+	Q	N	N	N	+	N	N	+	+	+	+	
Elemental sulfur	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	N	+	+	+
Ferbam, Thiram	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Q	Q	Q	+		+	+	N	+	+	+	+	+	+	+	+	+	+	+	+
Ziram, Zineb	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Q	Q	Q	+	+		+	N	+	+	+	Q	+	+	+	+	+	+	+	+
Niacide M	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Q	Q	Q	+	+	+		N	+	+	+	+	+	+	+	+	+	+	+	+
Lime	+	+	Q	N	+	N	+	N	+	+	+	+	N	+	Q	Q	+	+	+	+	N	N	N	Q	N	N	N	Q	N	+	+	+	+	+	+	
Karathane	+	+	+	+	+	+	+	+	+	+	Q	+	+	+	+	+	Q	Q	Q	+	+	+	+	Q		+	+	+	+	+	+	N	+	+	+	
Rotenone	+	+	+	+	+	+	+	+	+	+	+	+	Q	+	+	N	N	N	+	+	+	+	N	+		+	Q	Q	+	N	+	+	+	+	+	
Actidione	+	+	+	+	+	Q	Q	+	+	+	Q	+	+	+	Q	N	N	N	+	+	+	+	N	+	+		Q	Q	+	N	+	+	+	+	+	
Sevin	+	+	+	+	+	+	+	+	+	+	+	+	+	+	N	N	+	N	+	+	+	+	N	+	Q	Q		+	+	+	+	+	+	+	+	
Tedion	+	+	+	+	+	Q	Q	+	Q	+	+	+	Q	Q	+	Q	Q	+	+	+	Q	+	Q	+	Q	Q	+	+	+	+	N	+	+	+	+	
Cyprex	+	+	+	+	+	Q	Q	+	+	+	+	+	+	+	+	N	N	N	+	+	+	+	N	+	+	+	+	+	+	+	+	+	+	+	+	
Superior Oil	N	+	+	+	+	N	N	+	+	+	+	N	+	N	N	+	+	N	N	+	+	+	+	N	N	N	+	N	+		N	+	+	+	+	
Morestan	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	N		+	+	+	
Thiodan	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+
Phosphamidon	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Q	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+
Cygon	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	

Q = Questionable; compatibility not clear.

N = Not compatible.

+ = Decomposes on standing; residual action reduced.

++ = Materials compatible.

\*Compatible materials are those which can be mixed together in a spray tank without: (1) loss of effectiveness of the materials, or (2) unfavorable chemical reactions between the materials which might harm the plants.

Streptomycin is most favorably applied as a separate application.

Urea formulated for foliar applications is compatible with the commonly used pesticides.

However, it doesn't seem to be compatible with fixed copper or Bordeaux.



# APPLE 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.

## *Silver Tip to Pre-Pink*

### *Non-Oil Schedule*

#### DISEASES

**Sepal and Leaf Scab only**

(Powdery Mildew and other diseases—see pages 16 and 17.)

LIME SULFUR .....	2 gallons
<i>or</i>	
DODINE (CYPREX)* .....	$\frac{3}{8}$ to $\frac{1}{2}$ pound
<i>or</i>	
MERCURY .....	$\frac{1}{2}$ strength, <i>plus</i>
PROTECTANT .....	$\frac{1}{2}$ strength
<i>or</i>	
DICHLONE (PHYGON XL) .....	$\frac{1}{4}$ pound, <i>plus</i>
PROTECTANT .....	$\frac{1}{2}$ strength
<i>or</i>	
GLYODIN .....	1 quart
<i>or</i>	
CAPTAN (50% W.P.) .....	2 pounds
<i>or</i>	
FERBAM .....	2 pounds
<i>or</i>	
WETTABLE SULFUR .....	6 pounds

#### INSECTS

See Oil Schedule — *Green Tip to Pre-Pink*

## *Green Tip to Pre-Pink*

### *Oil Schedule†*

**Scab\*\***

**European Red Mite (preventive program)**

**San Jose Scale, Aphids, Tarnished Plant Bug, Leafroller**

CYPREX .....	$\frac{3}{8}$ to $\frac{1}{2}$ pound
<i>or</i>	
GLYODIN .....	1 quart
<i>or</i>	
FERBAM .....	2 pounds

Superior Oil, 70 sec. vis. .... 2 gallons  
NOTE: Superior oil, 70 sec. vis. *plus* ETHION  $\frac{1}{4}$  pound actual, *or* FLOWABLE PARATHION 0.15 pound actual, has given better control of San Jose scale than oil applied alone.

**Rosy apple aphid, other aphids\***

BHC (12% gamma WP) ..... 2 pounds  
**Tarnished Plant Bug, Green Fruit Worms, Leafrollers**  
DDT (50% WP) ..... 2 pounds

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

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

NOTE: Do not use DDT where danger of drift onto forage crops exists.

\*Cyprex  $\frac{3}{8}$  pound will control scab in most years. Use  $\frac{1}{2}$  pound for longer back action.

\*\*Scab spray may be necessary if infection period occurs from Silver Tip to Green Tip.

NOTE: Do not use SULFUR compounds, DICHLONE, CAPTAN or PHYBAM S with oil.

Cyprex  $\frac{1}{4}$  pound has given satisfactory scab control, recommended for use on a limited trial basis.

†CAUTION — Fill tank  $\frac{1}{2}$  full of water, with agitators running, adding the fungicide and BHC. Add oil after the fungicide and BHC have been mixed in the spray tank.



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

### Scab

DODINE (CYPREX) .....	3/8 to 1/2 pound
<i>or</i>	
MERCURY .....	1/2 strength, plus
PROTECTANT .....	1/2 strength
<i>or</i>	
DICHLONE (PHYGON XL) .....	1/4 pound, plus
PROTECTANT .....	1/2 strength
<i>or</i>	
GLYODIN .....	1 quart
<i>or</i>	
CAPTAN (50% W.P.) .....	2 pounds
<i>or</i>	
FERBAM .....	2 pounds
<i>or</i>	
WETTABLE SULFUR .....	6 pounds

**NOTE:** SYSTOX IS NOT COMPATIBLE WITH CYPREX.

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

### European Red Mite, Rosy Aphid, Tarnished Plant Bug, Green Fruitworms, Fruit Tree Leafroller.

#### European Red Mite

GENITE (50% WP) .....	1 1/2 pounds
<i>or</i>	
TEDION (EC 1) .....	1 quart
<i>or</i>	
CYGON (2.67 EC) .....	3/4 pint
<i>or</i>	
MORESTAN (25% WP) .....	1/2 pound

#### Rosy Aphid, Other Aphids

PHOSPHAMIDON (8 spray) .....	1/4 pint
<i>or</i>	
BHC (12% gamma) .....	2 pounds
<i>or</i>	
DEMETON (SYSTOX) (26% EC) .....	3/4 pint
<i>or</i>	
CYGON (2.67 EC) .....	3/4 pint

#### Tarnished Plant Bug, Green Fruitworm, Fruit Tree Leafroller

DDT (50% WP) .....	2 pounds
<i>or</i>	
PARATHION (15% WP) .....	1 pound
<i>or</i>	
GUTHION (25% WP) .....	1 pound

**NOTE:** Demeton, 3/4 pint, will also control red mites: Do not use DDT where danger of drift onto forage crops exists.

## *Period of Bloom*

### Fire Blight

On susceptible varieties

BORDEAUX .....	2-6-100
<i>or</i>	
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 larger overwintering cankers 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 18.) 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.

Do not use mercury in **bloom** as it is toxic to bees.



*(When the last of the blossom petals are falling)*

## Red-Banded Leaf Roller, Plum Curculio

GUTHION (25% WP) .....1 pound  
or  
DDD (50% WP) .....2 pounds, *plus*  
DIELDRIN (50% WP) .....½ pound

### Petal Fall (Continued)

**NOTE:** Mercury is not suggested after **Bloom** due to possible residue at harvest, even though it still has F.D.A. clearance at this time (January 1965).

**NOTE:** See section on Russetting of Jonathan and Golden Delicious on page 7.

*(7 to 10 days after Petal Fall)*

## Red-Banded Leaf Roller, Plum Curculio

Same insecticides as in Petal Fall

*(10 to 14 days after First Cover)*

## Plum Curculio, Codling Moth, Aphids

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 4 FLOWABLE .....	1 quart
<i>or</i>	
DDT (50% WP) .....	1 pound, <i>plus</i>
PARATHION (15% WP) .....	1 pound, <i>or</i>
FLOWABLE PARATHION at equivalent rate active ingredient.	

**NOTE:** Do not extend interval longer than 10 days for curculio with DDT-parathion program.

Summer mite control is best accomplished by spraying **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 “**eradication**” 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.**

*or*

KELTHANE (18.5% WP)	.....2 pounds
---------------------	---------------

*or*

TEPP (40% EC)	..... $\frac{1}{4}$ pint, <i>plus</i>
TEDION (EC 1)	.....1 quart

*or*

TEPP (20%)	..... $\frac{1}{2}$ pint, <i>plus</i>
TEDION (EC 1)	.....1 quart



## Third Cover

(10 to 14 days after Second Cover)

Scab		Codling Moth, Aphids
CAPTAN .....	1-1½ pounds	GUTHION (25% WP) .....1 pound
	<i>or</i>	
CYPREX .....	¼ pound	*SEVIN (50% WP) .....1 pound
	<i>or</i>	
GLYODIN .....	¾ to 1 quart	*SEVIN 4 FLOWABLE .....1 pint
	<i>or</i>	
FERBAM .....	1 to 1½ pounds	DDT (50% WP) .....1 pound, <i>plus</i>
		PARATHION (15% WP) .....1 pound
		<i>or</i>
		PARATHION FLOWABLE ..... equivalent rate
		active ingredient
		<i>or</i>
		DIAZINON (50% WP) .....1 pound
		*NOTE: If plum curculio is still a problem increase
		Sevin to 2 pounds or 1 quart.

## Fourth Cover

(Time is announced between June 25 to July 15)

Scab		Apple Maggot, Codling Moth, Aphids
CYPREX .....	¼ pound	GUTHION (25% WP) .....1 pound
	<i>or</i>	
CAPTAN .....	1 pound	SEVIN (50% WP) .....2 pounds
	<i>or</i>	
GLYODIN .....	1 pint	SEVIN 4 FLOWABLE .....1 quart
		<i>or</i>
		GUTHION (25% WP) .....½ pound, <i>plus</i>
		SEVIN (50% WP) .....½ pound, <i>or</i>
		SEVIN 4 FLOWABLE .....½ pint
		<i>or</i>
		LEAD ARSENATE .....2 pounds, <i>plus</i>
		PARATHION (15% WP) .....1 pound, <i>or</i>
		PARATHION FLOWABLE ..... equivalent rate
		active ingredient
		<i>or</i>
		DIAZINON (50% WP) .....1 pound

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

Do not use LEAD ARSENATE on varieties ripening before Wealthy.

**NOTE:** Sevin at 1 pound or 1 pint, Diazinon at ½ pound or Phosphamidon 8 Spray at ¼ pint **plus** 2 pounds of Lead Arsenate will give commercial control of codling moth and apple maggot when used in summer sprays.



## APPLES

### ***Fifth Cover***

*(12 to 14 days after Fourth Cover)*

Scab

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

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Same fungicides as for Fourth Cover

Same insecticides as for Fourth Cover

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### ***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 Second Cover Spray.

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### ***Seventh Cover***

*(10 to 14 days after Sixth Cover)*

Scab

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

---

Same fungicides as for Fourth Cover

Same insecticides as for Fourth Cover

**NOTE:** Follow label restrictions for LEAD ARSENATE and other insecticides.

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# SPECIAL APPLE DISEASE CONTROLS

(Controls are suggested where these diseases are economic problems)

## *Silver Tip to Pedal Fall*

### **Powdery Mildew (on susceptible varieties)**

Scab fungicide ..... *plus*  
 WETTABLE SULPHUR ..... 2 pounds  
*or*  
 Scab fungicide ..... *plus*  
 KARATHANE ..... ½ pound

NOTE: If LIME SULFUR is used, do not use SULFUR or 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*  
 KARATHANE ..... ½ pound

## *Pink to Third Cover*

### **Cedar-Apple Rust**

FERBAM ..... 2 pounds  
*or*  
 FERBAM ..... ¾ pound, *plus*  
 SCAB FUNGICIDE ..... ½ strength  
*or*  
 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:** DDD-30; DEMETON (SYSTOX)-21; DIELDRIN-45; GUTHION-15; KELTHANE-7; LEAD ARSENATE-30; 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; CYPREX-5; FERBAM-7; GLYODIN-0; KARATHANE-21; SULFUR-0; THYLATE-0; ZINEB-7; MERCURY and STREPTOMYCIN-up to *petal fall*.



# 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

### INSECTS

European Red Mite (preventive program)

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

**NOTE:** Oil may give some degree of control of pear psylla at this time. Normal populations of pear psylla are easily

controlled by sprays, starting at Petal Fall.

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

Pear Scab, Leaf Spot

FERBAM .....1½ pounds

*or*

BORDEAUX .....3-8-100

European Red Mite (preventive program)

GENITE (50% WP) .....1½ pounds

*or*

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

*or*

MORESTAN (25% WP) .....½ pound

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

**NOTE:** If plant bugs, green fruitworms, or leaf rollers are a problem, add DDT (50% WP) — 2 pounds, parathion (15% WP) — 1 pound, or guthion (25% WP) — 1 pound

per 100 gallons in the Pre-Bloom spray.

## *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.



**\*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.

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 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

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

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

- |                          |          |
|--------------------------|----------|
| GUTHION (25% WP) .....   | 1 pound  |
| <i>or</i>                |          |
| SEVIN (50% WP) .....     | 2 pounds |
| <i>or</i>                |          |
| SEVIN (4 Flowable) ..... | 1 quart  |
| <i>or</i>                |          |
| PARATHION (15% WP) ..... | 1 pound  |

**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

Pear Psylla, Plum Curculio

Same fungicides as for Petal Fall

Same insecticides as for Petal Fall

**NOTE:** If European red mites start to build up, use KELTHANE (18.5% WP) 2 pounds, or TEDION (EC 1) 1 quart, or CHLOROBENZILATE (25% WP) 2 pounds.

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

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

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

- |                        |          |
|------------------------|----------|
| SEVIN (50% WP) .....   | 2 pounds |
| <i>or</i>              |          |
| SEVIN 4 FLOWABLE ..... | 1 quart  |

**NOTE:** If blister mite and pear rust mites are not a problem, GUTHION (25% WP), 1 pound, or PARATHION (15% WP), 1 pound, may be substituted for SEVIN. KELTHANE, 1½ pounds or 1½ pints will control pear rust mites and other mites if they are the only problem.



**Third Cover***(10 to 14 days after Second Cover)*

1. Pear Scab, Leaf Blight
2. Fireblight

**Pear Psylla, Codling Moth**

1. BORDEAUX .....2-6-100  

*or*

FERBAM .....1½ pounds
2. BORDEAUX .....2-6-100

**NOTE:** Continue Bordeaux in subsequent sprays if fire-blight is not controlled.

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

*or*

PARATHION (15% WP) .....1 pound, *plus*  
DDT (50% WP) .....1 pound

**NOTE:** SEVIN is not effective against pear psylla when the young psylla are nearly full grown. This is the "hard shell stage", which can be readily identified, since the young psylla have developed small wing pads.

**Fourth Cover***(10 to 14 days after Third Cover)***Pear Scab, Leaf Blight****Codling Moth**

- BORDEAUX .....2-6-100  

*or*

FERBAM .....1½ pounds

**NOTE:** Fungicides are not necessary in Late Cover sprays when good early control of scab and blight has been achieved.

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

*or*

SEVIN (50% WP) .....1 pound  

*or*

SEVIN 4 FLOWABLE .....1 pint  

*or*

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

**Fifth Cover***(Time to be announced — based on second brood codling moth emergence)***Pear Scab, Leaf Blight****Codling Moth**

Same fungicides as for Fourth Cover

Same insecticides as for Fourth Cover

**Days Between Final Spray and Harvest**

**Insecticides:** CHLOROBENZILATE-14; DDT-30; GUTHION-15; KELTHANE-7; PARATHION-14; SEVIN-1; TEDION—not more than 4 applications after Petal Fall if 1 pound or 1 quart of TEDION is used per 100 gallons.

**Fungicides:** FERBAM-7; COPPER-0; STREPTOMYCIN up to Petal Fall.



# 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.

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## VALSA CANKER

Delay pruning as close as possible to the beginning of tree growth or later to allow rapid healing and to obtain fungical protection from either the leaf curl and/or

bloom sprays against Valsa infection in the newly exposed cuts. 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.

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## 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.

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## *Dormant*

### DISEASES

#### Peach Leaf Curl

In fall after leaf drop or spring before bud swell

FERBAM ..... 1½ to 2 pounds

*or*

BORDEAUX ..... 6-6-100

(Use on bacterial spot susceptible varieties.)

In the spring only

LIME SULFUR ..... 5 gallons

### INSECTS

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## *Pink*

### Plant Bugs

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

*or*

PARATHION (15% WP) ..... 1 pound

*or*

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

**NOTE:** Do not use DDT where danger of drift onto forage crops exists.



## PEACHES

### ***Bloom***

*(Balloon pink through bloom)*

#### **Brown Rot (blossom blight)**

LIME SULFUR (balloon pink only) .....2 gallons

*or*

PHYGON XL .....½ pound

*or*

SULFUR PASTE .....6 pounds

*or*

WETTABLE SULFUR .....5 pounds

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

### ***Petal Fall***

#### **Brown Rot**

WETTABLE SULFUR .....5 pounds

*or*

SULFUR PASTE .....6 pounds

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

#### **Oriental Fruit Moth, Plant Bugs**

PARATHION (15% WP) .....1½ pounds

*or*

PARATHION FLOWABLE .....at equivalent active ingredient

*or*

DDT (50% WP) .....1½ pounds

*or*

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

*or*

SEVIN 4 FLOWABLE .....1 quart

### ***Shuck Split***

*(Usually 10 to 12 days after Petal Fall)*

#### **Brown Rot**

Only if necessary

WETTABLE SULFUR .....5 pounds

*or*

SULFUR PASTE .....6 pounds

#### **Plum curculio, Oriental Fruit Moth**

PARATHION (15% WP) .....1½ pounds

*or*

PARATHION FLOWABLE .....at equivalent active ingredient

*or*

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

*or*

GUTHION (2 lb./gal. SC) .....1 pint

*or*

DIELDRIN (50% WP) .....½ pound, *plus*  
DDT (50% WP) .....2 pounds

*or*

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

*or*

SEVIN 4 FLOWABLE .....1 quart

### **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**

**Plum Curculio, Oriental Fruit Moth**

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WETTABLE SULFUR .....5 pounds

*or*

SULFUR PASTE .....6 pounds

Same insecticides as suggested for Shuck Split

**NOTE:** DDT (50% WP), 1 pound, *plus* PARATHION (15% WP), 1 pound, or PARATHION FLOWABLE at equivalent active ingredient can also be used.

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### ***Second Cover***

*(14 days after First Cover)*

**Oriental Fruit Moth**

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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**

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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.



## PEACHES

### *Fourth Cover*

*(10 to 14 days after Third Cover)*

#### Brown Rot

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

or

or

#### Oriental Fruit Moth

GUTHION (25% WP) .....	1 pound
GUTHION (2 lb./gal. SC) .....	1 pint
SEVIN (50% WP) .....	2 pounds
SEVIN 4 FLOWABLE .....	1 quart
PARATHION (15% WP) .....	1½ pounds
PARATHION FLOWABLE at equivalent 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

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

#### Oriental Fruit Moth

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-30; GUTHION-21; PARATHION-14; SEVIN-1; 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; SULFUR-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

##### Black Knot

ZINEB ..... 2 pounds

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

**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.

#### INSECTS

##### European Red Mite (preventive program) Lecanium Scale

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

**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.

## *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 pounds



## PLUMS AND PRUNES

### Pink Non-Oil Schedule (Continued)

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>	
PHYGON XL	.....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 pounds per gallon SC)	.....1 pint
<i>or</i>	
DIELDRIN (50% WP)	.....½ pound, <i>plus</i>
PARATHION (15% WP)	.....1 pound, <i>or</i>
PARATHION FLOWABLE	.....at equivalent 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

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

PARATHION (15% WP)	.....1½ pounds
<i>or</i>	
PARATHION FLOWABLE	.....at equivalent active ingredient
<i>or</i>	
GUTHION (25% WP)	.....1 pound
<i>or</i>	
GUTHION (2 pounds per gallon SC)	.....1 pint
<i>or</i>	
DIELDRIN (50% WP)	.....½ pound

NOTE: Check compatibility of insecticides with lime sulfur.

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

Same fungicides as Shuck Split, except LIME SULFUR

**Plum Curculio**

Same insecticides as for Shuck Split

**LECANIUM SCALE:** The young crawlers can be controlled with PARATHION (15% WP) 1½ pounds, or GUTHION (25% WP), 1 pound, or GUTHION (2 lb. 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.

**PEACH TREE BORERS:** For peach tree borer control, see section under Peach Spraying Schedule, page 22. Thiodan may be used up to 7 days of harvest.

**MITES:** If European red mites build up, spray with KELTHANE (18.5% EC), 1 quart, or TEDION (EC 1), 1 pound, or TEDION (EC 1), 1 quart. Do not repeat KELTHANE application within 30 days of last application.

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

FERBAM ..... 1½ pounds

**Leafhoppers**

DDT (50% WP) ..... 1½ pounds

*or*

PARATHION (15% WP) ..... 1½ pounds

*or*

PARATHION FLOWABLE ..... at equivalent active ingredient

**SPECIAL APPLE MAGGOT SPRAYS:** LEAD ARSENATE—2 pounds, or GUTHION (25% WP)—1 pound, or GUTHION (2 lb./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)***1. Brown Rot, Leaf Spot or****2. Brown Rot only****Apple Maggot**

1. CAPTAN ..... 2 pounds

See Special Apple Maggot Sprays under Second Cover.

*or*

2. WETTABLE SULFUR ..... 5 pounds

NOTE: See interval to harvest for lead arsenate and DDT.

**Fourth Cover***(15 days before harvest)***1. Brown Rot, Leaf Spot or****2. Brown Rot only****Apple Maggot**

Same fungicides as Third Cover. (Repeat if necessary near or at harvest. Add spreader if necessary.)

See Special Apple Maggot Sprays under Second Cover.

NOTE: 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; PARATHION—14; TEDION—apply no more than 3 applications during fruiting season. THIODAN—7.

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



# 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: (1) **Dormant:** Spray with DN-289, 2 quarts, or ELGETOL 318, 2 quarts; (2) **Delayed Dormant:** Spray with PARATHION (15% WP), 1 pound; or GUTHION (2 lb./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. PHYGON XL ..... ½ pound

*or*

WETTABLE SULFUR ..... 5 pounds

## ***Petal Fall***

*(or when first leaves unfold)*

### **Leaf Spot**

CYPREX ..... ¼ to ¾ 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 ¾ to ½ pound if necessary.

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

PARATHION (15% WP) ..... 1½ pounds, *or*  
PARATHION FLOWABLE at equivalent active rate.

*or*

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

*or*

GUTHION (2 pounds per 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 equivalent formulation.

**Second Cover**

(10 days after First Cover)

**Leaf Spot**

CYPREX .....	¼ to ¾ pound
<i>or</i>	
GLYODIN .....	1½ pints, plus
FERBAM .....	½ pound
<i>or</i>	
FIXED COPPER .....	0.75 pound actual copper, plus
HYDRATED LIME .....	3 pounds
<i>or</i>	
*ACTIDIONE .....	1 part per million

**Plum Curculio, Cherry Fruitflies\*\*, 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>	
SEVIN (50% WP) .....	2 pounds
<i>or</i>	
SEVIN 4 FLOWABLE .....	1 quart
<i>or</i>	
PARATHION (15% WP) .....	1½ pounds

NOTE: \*Actidione is an eradicant chiefly, do not use until fruit is ¾-inch in diameter. Use ½ pound FERBAM when ACTIDIONE or 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.

Forbes Scale: Use GUTHION (50% WP)—1¼ pounds, or SEVIN (50% WP)—2 pounds, or SEVIN 4 FLOWABLE

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

\*\*Second 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.

— 1 quart in the Second and Third Cover sprays.

**Third Cover****Leaf Spot****Cherry Fruit Flies**

Same fungicides as suggested for Second Cover

Same insecticides as suggested for Second Cover

Do not use LEAD ARSENATE within 30 days of harvest for cherries to be sold on the fresh market or to be transported outside Michigan. Cherries processed in Michigan may be sprayed with LEAD ARSENATE as late as

14 days before harvest. Cherries sold as fresh fruit that have been treated with LEAD ARSENATE 30 days before harvest may have to be washed to comply with the established tolerance.

**After Harvest Cover****Leaf Spot**

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:** ACTIDIONE—4; COPPER—0; CYPREX—0; FERBAM—7; GLYODIN—7.



# 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.

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

<i>Petal Fall</i>		
Leaf Spot, Brown Rot		Plum Curculio, Black Cherry Aphid
CAPTAN .....	2 pounds	DIELDRIN (50% WP) ..... ½ pound, <i>plus</i>
or		PARATHION (15% WP) ..... 1 pound
FERBAM .....	1 pound, <i>plus</i>	or
WETTABLE SULFUR .....	3 pounds	GUTHION (25% WP) ..... 1 pound

<i>First Cover</i> (10 to 14 days later)		
Leaf Spot, Brown Rot		Plum Curculio, Red-Banded Leaf Roller, Black Cherry Aphid
Same fungicides as for Petal Fall		Same insecticides as for Petal Fall

## 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.**

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)*

Leaf Spot, Brown Rot

Plum Curculio, Red-Banded Leaf Roller, Black  
Cherry Aphid

CAPTAN ..... 2 pounds

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

*or**or*FERBAM ..... 1 pound, *plus*

PARATHION (15% WP) ..... 1½ pounds

WETTABLE SULFUR ..... 3 pounds

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

1. Leaf Spot, Brown Rot

2. Brown Rot, Rhizopus Rot (Trial Basis)

Cherry Fruit Flies\*\*

1. CAPTAN ..... 2 pounds

LEAD ARSENATE ..... 2 pounds

*or**or*FERBAM ..... 1 pound, *plus*

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

WETTABLE SULFUR ..... 3 pounds

*or*2. CAPTAN ..... 1 pound, *plus*

\*BOTRAN (50% WP) ..... 1 pound

DIAZINON (50% WP) ..... 1 pound

\*Botran is compatible with wettable powder insecticides  
listed under Third Cover.\*\*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

2. Brown Rot and Rhizopus Rot

Cherry Fruit Flies

Same fungicides as for Third Cover.

Same insecticides as for Third Cover.

NOTE: Use CAPTAN (2 pounds) during harvest, if  
necessary. CAPTAN *plus* BOTRAN should be applied  
in pre-harvest and, if necessary, in harvest sprays. BOT-  
RAN may leave a yellow residue on fruit.See "Days Between Final Spray and Harvest" when  
using LEAD ARSENATE.**Post Harvest**

1. Leaf Spot, Brown Rot

2. Brown Rot and Rhizopus Rot

Peach Tree Borer, Lesser Peach Tree Borer

CYPREX ..... ¼ to ¾ pound

See section on borer control.

**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; FERBAM-0; SUL-  
FURS-0.



# 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

#### Dead Arm (Problem Vineyards)

CAPTAN ..... 2 pounds  
*or*  
 PHALTAN (FOLPET) ..... 2 pounds

When shoot growth is 1 to 2 inches, and repeat when shoot growth is 4 to 6 inches.

### INSECTS

#### Grape flea beetle, Climbing cutworms

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

## *First Cover*

(Shoots 4 to 8 inches long)

### Black Rot

FERBAM ..... 1½ pounds  
*or*  
 ZINEB ..... 1½ pounds

No insecticides recommended in this spray.

**NOTE:** Not needed if second Dead Arm spray is applied.

## *Second Cover*

(Blossom Opening)

### 1. Black Rot

### 2. Black Rot, Powdery and Downy Mildew

1. FERBAM ..... 1½ pounds  
*or*  
 ZINEB ..... 1½ pounds  
 2. FIXED COPPER (actual) ..... 1½ pounds, *plus*  
 HYDRATED LIME ..... 6 pounds  
*or*  
 BORDEAUX ..... 4-4-100  
*or*  
 \*PHALTAN ..... 2 pounds

### Grape Berry Moth

GUTHION (25% WP) ..... 1 pound  
*or*  
 SEVIN (50% WP) ..... 2 pounds  
*or*  
 DDT (50% WP) ..... 1 pound, *plus*  
 PARATHION (15% WP) ..... 1 pound

If using FIXED COPPER or BORDEAUX, increase DDT (50% WP) to 2 pounds and **eliminate** PARATHION, GUTHION, or SEVIN from the spray mixture. All these

materials lose some insecticidal effectiveness, up to 50% in the case of GUTHION, when combined with LIME or in alkaline solutions.

## *Third Cover*

(Immediately after bloom)

### 1. Black Rot

### 2. Black Rot, Powdery and Downy Mildew

1. Same fungicides as for Second Cover  
 2. Same fungicides as for Second Cover

### Grape Berry Moth, Grape Leafhopper, Rose Chafer\*

Same insecticides as for Second Cover

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

\*If rose chafers are a problem, use DDT (50% WP)—2 pounds, *plus* PARATHION (15% WP)—1 pound. SEVIN (50% WP)—2 pounds, 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)*

- |                  |   |
|------------------|---|
| <b>Black Rot</b> | <b>Grape Berry Moth, Grape Leafhopper</b> |
|------------------|---|
- 
- |                        |   |
|------------------------|---|
| FERBAM ..... 1½ pounds | Same insecticides as for Second Cover. SEVIN 4 FLOW-  |
| <i>or</i>              | ABLE, 1 quart, or GUTHION (2 lb./gal. SC) 1 pint, can |
| ZINEB ..... 1½ pounds  | be substituted for the wettable powder formulations.  |
| <i>or</i>              |   |
| PHALTAN ..... 2 pounds |   |
- 

**Sixth Cover***(10 to 14 days after Fifth Cover)***Grape Berry Moth**

- |                                   |           |   |
|-----------------------------------|-----------|---|
| GUTHION (2#/gal. SC) ..... 1 pint | <i>or</i> | SEVIN 4 FLOWABLE ..... 1 quart                |
| <i>or</i>                         |           |   |
| GUTHION (25% WP) ..... 1 pound    | <i>or</i> | PARATHION (15% WP) ..... 1½ pounds            |
| <i>or</i>                         |           |   |
| SEVIN (50% WP) ..... 2 pounds     | <i>or</i> | FLOWABLE PARATHION at equivalent active rate. |
- 

**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 brood berry moth is present. Check vine-

yard for this brood. Need for these covers will be announced by your county agricultural agents.

**Days Between Last Spray and Harvest**

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

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



# STRAWBERRY 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.

## PRE-PLANT TREATMENT FOR WHITE GRUBS, ROOT WEEVILS, AND STRAWBERRY ROOT APHIDS

To reduce white grub and root weevil injury and to avoid root aphid injury in strawberry plantings:—Just before planting, treat the upper 3 inches of soil with CHLORDANE, at the rate of 10 pounds actual CHLORDANE per acre. These insecticides may be applied as

dusts, sprays, or granular formulations. The chemical should be broadcast (sprayed, dusted or drilled) and thoroughly mixed with the soil immediately after application. About 40 percent of the effectiveness may be lost in 5 hours if the chemical remains exposed on the surface of the soil. This treatment is effective against white grub and root weevil for about 3 years. Where sod has been turned under, this treatment is very necessary before planting.

## Fall

### DISEASES

**Stem-end Fruit Rot, Leaf Blight**

Mercury fungicide at manufacturer's full strength rate for apple scab control.

Susceptible varieties: Dunlap, Fairland, Jersey-Belle, Redcrop, Redglow, Robinson and Sparkle (Paymaster).

### INSECTS

**Nematode Control — See page 3.**

**NOTE:** Apply when plants are completely dormant and before mulching. Thorough coverage is essential—use 200 gallons per acre.

## Spring

**Stem-end Fruit Rot, Leaf Blight, Leaf Spot**

Use Mercury Fungicide as suggested for fall application. (A spring application is not necessary if applied in the fall.)

**NOTE:** Use on unmulched plantings when dormancy is broken and new growth is just visible in crown.

## First Cover

*(New leaves expanded and blossom buds visible)*

**Stem-end Fruit Rot, Leaf Blight, Leaf Spot**

**Spittlebug, Tarnished Plant Bug, Strawberry Leaf Roller**

CAPTAN ..... 2 pounds

or

FIXED COPPER (actual copper) ..... 1½ pounds, plus  
HYDRATED LIME ..... 6 pounds

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

or

DDD (50% WP) ..... 2 pounds, plus  
DIELDRIN (50% WP) ..... ½ pound

Do not use Guthion with fixed copper and lime. The insecticidal effectiveness of GUTHION is reduced 50% when mixed with lime or in an alkaline solution.

**NOTE:** For fruit rot control apply 5-6 pounds of CAPTAN or THYLATE per acre.

If two-spotted mites are a problem, include KELTHANE (18.5% WP), 2 pounds or KELTHANE (18.5% EC), 2 pints per 100 gallons.

If insects were controlled in the First Cover, an insecticide may not be necessary in the Second Cover.

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

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

Spittlebug, Tarnished Plant Bug, Strawberry  
Leafroller

1. CAPTAN ..... 2 pounds

THIODAN (2 EC) ..... 1 quart

*or*

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

2. THYLATE ..... 2 pounds

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

*or*

SEVIN 4 FLOWABLE ..... 1 quart

NOTE: Thiodan is not effective against strawberry leaf roller.

**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 or GUTHION (25% WP) at 1 pound per 100 gallons in this application.

**Pre-Harvest Cover***(At least 10 days before harvest)*

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

1. CAPTAN ..... 2 pounds

*or*

CAPTAN DUST (7.5% CAPTAN) ..... 40 pounds/A

2. THYLATE ..... 2 pounds

*or*

THYLATE DUST (7.5% THYLATE)  
..... 40 pounds per acre

**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 THYLATE is applied within three days of harvest, residues must be removed by washing. CAPTAN may be used up to harvest.

**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

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.

at Early Blossom or in multiple applications during the fruiting season, but no closer than 4 days to harvest. KELTHANE (18.5% WP), at the rate of 2 pounds/100 gallons, applied at any time during the season, but not closer than 2 days before harvest. KELTHANE should be applied at the rate of 400 gallons of spray solution per acre.



### 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; THYLATE-3; Remove residues of THYLATE 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*

1. *(First leaves exposed ¼ to ¾ inch)*

*or*

2. *(When a few leaves have unfolded from the buds)*

#### DISEASES

#### INSECTS

##### Anthracnose

1. LIME SULFUR .....10 gallons

*or*

2. LIME SULFUR .....5 gallons

No insecticides recommended in this spray.

**CAUTION:** If unable to apply the first-mentioned eradicative 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

*or*

2. BORDEAUX .....3-3-100

(Repeat BORDEAUX 10 to 14 days later.)

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

**NOTE:** If GUTHION is used with BORDEAUX, spray immediately.

***First Cover****(At Petal Fall)***Anthracnose****Aphids, Leafrollers, Cane Borers**

CAPTAN .....2 pounds

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

*or*

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

***Pre-Harvest****(15 days before harvest)***Aphids, Mites**

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

*or*

PARATHION FLOWABLE at equivalent active rate

***Post Harvest****(15 days before harvest)***Aphid, Mites**

Sprays at this time to control anthracnose are of no value.

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

*or*

PARATHION FLOWABLE at equivalent active ingredient

**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:** GUTHION—14; MALATHION—1; PARATHION—15.**Fungicides:** CAPTAN—0.



# 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

DN-289 .....1 quart

*or*

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*

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.

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## ***Dormant***

*(When buds begin to swell)*

### **DISEASES**

### **INSECTS**

#### **Mummy Berry**

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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.

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## ***First Cover***

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

### **Plum Curculio, Blueberry Tip Borer**

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

*or*

PARATHION (15% WP) .....1½ pounds

*or*

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

*or*

SEVIN 4 FLOWABLE .....1 quart

*or*

MALATHION DUST (4%) .....40 pounds/acre

*or*

SEVIN DUST (5%) .....40 pounds/acre

*or*

METHOXYCHLOR DUST (5%) .....40 pounds/acre

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## ***Second Cover***

*(10 days after First Cover)*

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

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Same insecticides as for First Cover.

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## ***Third Cover***

*(10 days after Second Cover)*

### **Cranberry Fruitworm**

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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.

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## ***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 TOLERANCES 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 41.

**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 41 is up-to-date as of Jan. 1, 1965. 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 CYPREX, 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. The bold face type denotes those materials recommended in Michigan for disease or insect control on that particular crop. Although the interval to harvest for pesticides on other crops is given in regular type **No Recommendations are Intended or Implied.** See spray schedules for recommended materials.

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

Legend: a=Not after fruit begins to form.

b=Do not repeat application within 30 days.

c=Pre-bloom or Post-harvest application only.

d=Post-harvest application only.

e=No residue if used according to recommendations.

f=See label restrictions on use.

g=Remove excess residues at harvest.

h=Sulfurs and copper plus lime mixtures are  
exempt if used as recommended.

i=4 hours of harvest using 2% dust at 30 pounds per acre.



## 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.

# SPRAY RECORD SHEET

GROWER	YEAR
	19
CROP	HARVEST DATE

[illegible]



## SPRAY RECORD SHEET

GROWER	YEAR
	19
CROP	HARVEST DATE

[illegible]

**tear out along this line**

# SPRAY RECORD SHEET

GROWER	YEAR
	19
CROP	HARVEST DATE

[illegible]

**Tear out along this line**



## SPRAY RECORD SHEET

GROWER	YEAR
	19
CROP	HARVEST DATE

[illegible]

**Peel out along this line**