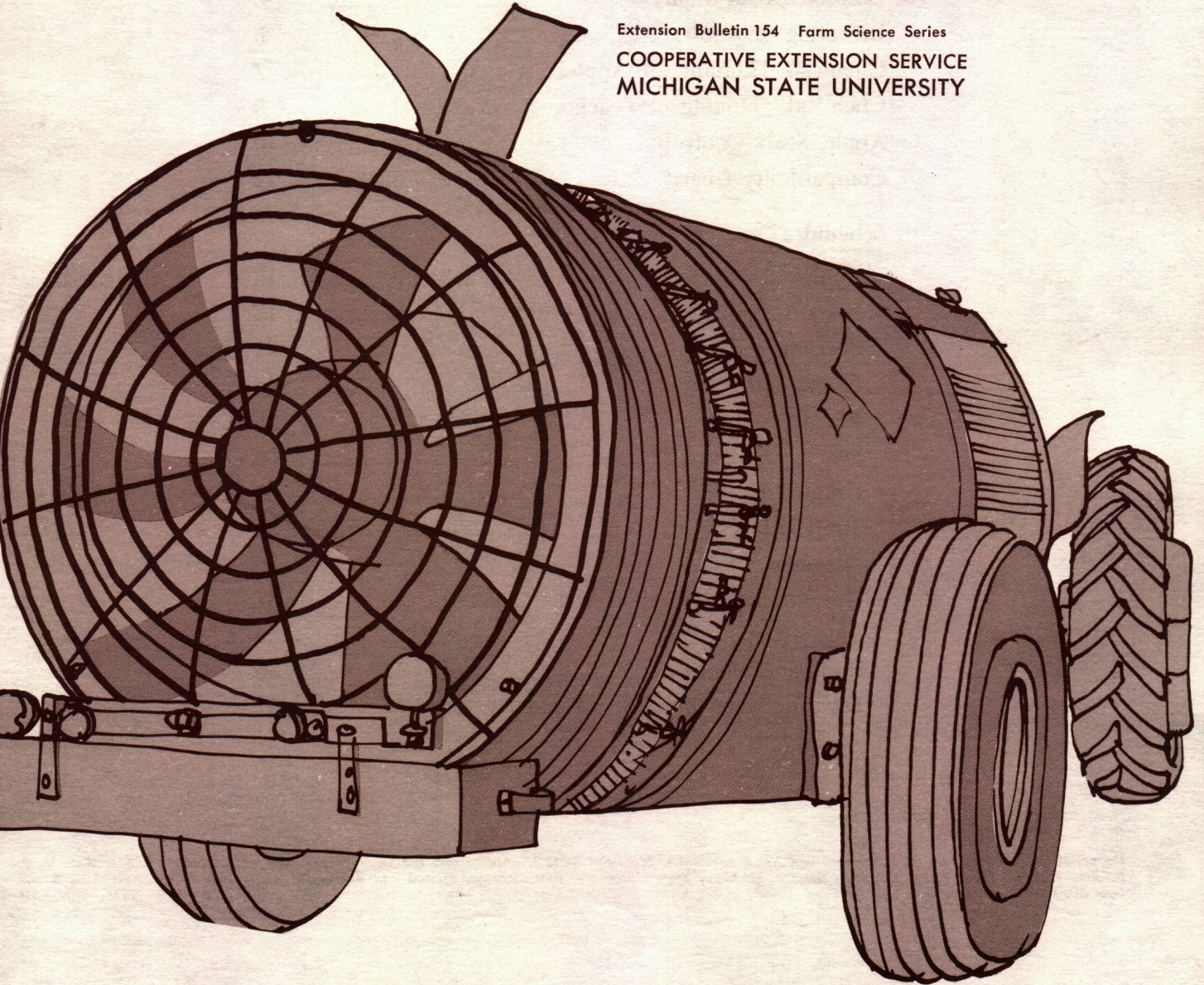


1964

FRUIT SPRAYING CALENDAR

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Extension Bulletin 154 Farm Science Series
COOPERATIVE EXTENSION SERVICE
MICHIGAN STATE UNIVERSITY



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1964 FRUIT SPRAYING CALENDAR

PREPARED BY E. J. KLOS¹, A. E. MITCHELL², A. J. HOWITT³, AND P. H. WOOLEY³

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. *Fruit Insects in Michigan* by A. C. Dowdy, Extension Bulletin E-372.

4. *Chemical Weed Control for Horticultural Crops* by S. K. Ries, H. K. Bell, H. D. Davidson, R. P. Larsen, Extension Bulletin F-241.

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.

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.

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

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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.

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.

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
CO 9-6444
Alice J. Shoemaker, R.Ph.

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

COLDWATER

Poison Control Center
Branch County Community Health Center
274 E. Chicago St.
Broadway 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.; Emily Meginnity, 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
Donald F. Waterman, 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
250 Cherry, 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, Chief Pharmacist

LANSING

Poison Treatment Center
St. Lawrence Hospital
1210 W. Saginaw St.
Ivanhoe 7-5451
Robert F. Thimmig, M.D.

Poison Treatment Center
Edw. W. Sparrow Hospital
1215 E. Michigan Ave.
Ivanhoe 4-7721
Harry C. George, M.D.

Poison Treatment Center
Lansing General Hospital
2800 Devonshire Ave.
Ivanhoe 5-4311
Agnes Taft, Chief Pharmacist

Poison Treatment Center
 Ingham Medical Hospital
 401 W. Greenlawn
 Ivanhoe 5-2511
 Robert C. Combs, M.D.

PETOSKEY

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

Poison Treatment Center
 Saginaw Osteopathic Hospital
 515 N. Michigan
 Pl 3-7751
 I. W. Graw, Chairman, M.D.;
 M. M. Mayne, M.D.; L. W.
 Pettygrew, M.D.

LINCOLN PARK

Poison Control Center
 Outer Drive Hospital
 26400 Outer Drive
 Dunkirk 6-0606
 W. S. Wheeler

PONTIAC

Poison Control Center
 St. Joseph Mercy Hospital
 900 Woodward Ave.
 Federal 4-3511
 Robert J. Mason, M.D.

WAYNE

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

MARQUETTE

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

PORT HURON

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

YPSILANTI

Poison Treatment Center
 Beyer Memorial Hospital
 28 So. Prospect
 HU 2-6500
 Emergency Room Residents

MIDLAND

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

SAGINAW

Poison Control Center
 Saginaw General Hospital
 1447 N. Harrison Rd.
 PL 3-3411
 Wm. G. Mason, M.D.

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 CHERRIES

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. In 1962 and 1963 trials, it was one of the most effective summer miticides tested. There was no evidence of injury caused by this compound under the conditions present in Michigan in 1962 or 1963. However, in Michigan, in the past, it has caused leaf and fruit injury. In the Pacific Northwest it has caused an enlargement and blackening of the lenticels of Red and Golden Delicious. The label states that it should not be used in Petal Fall or First Cover applications. It is being recommended in Michigan for use anytime from Third Cover on.

Guthion Spray Concentrate is a new emulsifiable formulation of Guthion, containing 2 pounds active ingredient per gallon. The emulsifiable formulation has performed well in the control of many insects on different fruit crops. To date, it is not cleared for use on apples or pears, but has been cleared for use on certain stone fruit and small fruit crops. See specific recommendations for use in the spray schedules.

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 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.

SUPERIOR OILS

Two types of "Superior Oils" are recommended as one of the preventive European red mite control programs this year — a 70 second and a 60 second viscosity oil. Research in Michigan and other Eastern fruit growing areas has shown that mite control is comparable with either viscosity oil.

The 60 and 70 second viscosity oils are not dormant-type oils. They are lighter and more volatile than the original "superior oil" which was used as a dormant spray. Their principal advantage is the reduction in possibility of plant injury. They are safer because they are more volatile, resulting in less persistence. 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 60 and 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 specifications for the 60 and 70 second viscosity superior oil are as follows:

Property	70-second Superior Oil	60-second Superior Oil
Saybolt Universal Viscosity at 100° F., Seconds	66-74	56-62
Gravity, API (minimum)	33°	34°
Unulfonated residue	92%	92%
Pour Point, °F. (maximum)	20°F.	20°F.
Distillation ASTM D447-59T		
50% point	670±10°F.	655±8°F.
10%–90% range (maximum)	90°F.	75°F.

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 is 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 fungicides on apples, a fruit 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 safen lead arsenate against arsenical injury to leaves and fruit. Hydrated lime alone, previously used to safen against arsenical injury, has been replaced by organic fungicides.

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

One-fourth pound of Ferbam will safen one pound of lead arsenate.

One-half pound of Captan will safen one pound of lead arsenate.

One-half pound of Niacide M. will safen one pound of lead arsenate.

One-half pound of Ziram will safen one pound of lead arsenate.

One-half pound of Cyprex will safen two pounds 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° 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 russetting 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 russetting. 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° F. and lower) occur just before, during or shortly after *Bloom*. In years when the air temperature drops to 32° F. or lower at *Bloom* or shortly thereafter, use Captan through *Second Cover*.

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 *Petal Fall*. After *Petal Fall* 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 russetting. Delay the use of wettable Guthion 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 russetting 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 2 $\frac{1}{2}$ 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

Under Michigan conditions, Amid-Thin is suggested for use at 60 parts per million at *Petal Fall*. 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. When this happens, there is nothing but 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 — applying only one-fourth the amount of spray per tree 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	
Glyoxide		mercurial compounds.	
Captan			
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 1/2-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 1/2-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.

Compatibility Chart

	Lead Arsenate	DDT, DDD, TDE	Methoxychlor	BHC, Lindane	Dieldrin	Kelthane	Ovex, Genite, Mitox	Chlorobenzilate	Parathion, Ethion	Systox (demeton)	Malathion, Trithion	Diazinon, Guthion	Captan	Glyodin, Glyoxide	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	
Lead Arsenate		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	N
DDT, DDD, TDE	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Q	+	+	+	+	+	+	+	+	+	+	+	+	+
Methoxychlor	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Q	+	+	+	+	Q	+	+	+	+	+	+	+	+
BHC, Lindane	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	N	N	N	+	+	+	+	N	+	+	+	+	+	+	+	+
Dieldrin	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Kelthane	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	N	N	N	+	+	+	+	N	+	+	+	+	+	+	+	+
Ovex, Genite, Mitox	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	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	+	+	+	+	+	+	+	+
Glyodin, Glyoxide	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	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	+	
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	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	+	+	+	+	+	+	+	N
Rotenone	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Q	+	N	N	N	+	+	+	N	+	+	Q	Q	+	N	+	
Actidione	+	+	+	+	+	+	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	+	+	+	

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

INSECTS

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>
GLYOXIDE	10 ounces
	<i>or</i>
FERBAM	2 pounds
	<i>or</i>
WETTABIE SULFUR	6 pounds

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

Green Tip to Pre-Pink

Oil Schedule

Scab**

European Red Mite (preventive program)

San Jose' scale

CYPREX	$\frac{3}{8}$ to $\frac{1}{2}$ pound
	<i>or</i>
GLYDIN	1 quart
	<i>or</i>
GLYOXIDE	10 ounces
	<i>or</i>
FERBAM	2 pounds

Superior Oil, 70 sec. vis. or 60 sec. vis. 2 gallons

Note: Superior oil, 70 sec. vis. or 60 sec. vis. *plus* ETHION $\frac{1}{4}$ pound actual, has given better control of San Jose' scale than oil applied alone.

Rosy apple aphid, other aphids*

BHC (11.8% gamma EC)	1 quart
BHC (12% gamma WP)	2 pounds

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

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

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

*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.

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

Pre-Pink and Pink

Non-Oil Schedule

Scab	European Red Mite (Preventive mite program)
DODINE (CYPREX) 3/8 to 1/2 pound	GENITE (50% EC) 1 1/2 pints
<i>or</i>	<i>or</i>
MERCURY 1/2 strength, <i>plus</i>	GENITE (50% WP) 1 1/2 pounds
PROTECTANT 1/2 strength	<i>or</i>
<i>or</i>	<i>or</i>
DICHLONE (PHYGON XL) 1/4 pound, <i>plus</i>	TEDION (25% EC) 1 quart
PROTECTANT 1/2 strength	<i>or</i>
<i>or</i>	<i>or</i>
GLYODIN 1 quart	MITOX (40% WP) 1 pound
<i>or</i>	<i>or</i>
GLYOXIDE 10 ounces	MORESTAN (25% WP) 1/2 pound
<i>or</i>	Rosy aphid, other aphids
FERBAM 2 pounds	PHOSPHAMIDON (49% EC) 1/2 pint
<i>or</i>	<i>or</i>
WETTABLE SULFUR 6 pounds	BHC (12% gamma) 2 pounds
	<i>or</i>
	DEMETON (SYSTOX) (26% EC) 1/2 pint

NOTE: GENITE (50% EC) AND SYSTOX ARE NOT COMPATIBLE WITH CYPREX.

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

NOTE: If green fruitworms, fruit tree leafrollers or plant bugs are a problem, add DDT (50% WP) - 2 pounds at the time of Pre-Pink.

Period of Bloom

Fire Blight

On susceptible varieties

BORDEAUX 2-6-100
<i>or</i>
STREPTOMYCIN 50 to 100 ppm

Use streptomycin when maximum 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.** (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.

Petal Fall

(When the last of the blossom petals are falling)

Fruit Scab and Leaf Scab

CAPTAIN 2 pounds
<i>or</i>
CYPREX 3/8 to 1/2 pound
<i>or</i>
MERCURY + 1/2 STRENGTH PROTECTANT
<i>or</i>
MERCURY - FULL STRENGTH (emergency), <i>plus</i> PROTECTANT, 1/2 strength

Red-Banded Leaf Roller, Plum Curculio

GUTHION (25% WP) 1 pound
<i>or</i>
DDD (50% WP) 2 pounds, <i>plus</i>
DIELDRIN (50% WP) 1/2 pound

APPLES

Petal Fall (Continued)

PHYGON XL	<i>or</i>	¼ pound, <i>plus</i>
PROTECTANT, ½ strength		
GLYODIN	<i>or</i>	1 quart
GLYOXIDE	<i>or</i>	10 ounces
FERBAM	<i>or</i>	2 pounds
WETTABLE SULFUR	<i>or</i>	6 pounds

NOTE: Extra scab spray may be needed between Petal Fall and First Cover sprays. DO NOT use MERCURY compounds after Petal Fall.

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

First Cover

(7 to 10 days after Petal Fall)

Scab

Red-Banded Leaf Roller, Plum Curculio

Same fungicides as in Petal Fall, *except* MERCURIES

Same insecticides as in Petal Fall

Second Cover

(10 to 14 days after First Cover)

Scab

Plum Curculio, Codling Moth, Aphids

CAPTAN	<i>or</i>	1½ to 2 pounds
CYPREX	<i>or</i>	¼ pound
GLYODIN	<i>or</i>	¾ to 1 quart
GLYOXIDE	<i>or</i>	8 to 10 ounces
FERBAM		1½ pounds

GUTHION (25% WP)	<i>or</i>	1 pound
DIELDRIN (50% WP)		½ pound, <i>plus</i>
DDT (50% WP)	<i>or</i>	2 pounds
SEVIN (50% WP)	<i>or</i>	2 pounds
SEVIN 4 FLOWABLE	<i>or</i>	1 quart
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 PROGRAMS

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.

KELTHANE (18.5% EC)	<i>or</i>	1 quart
KELTHANE (18.5% WP)		2 pounds

CHLOROBENZILATE* (25% WP)*	<i>or</i>	2 pounds
TEPP (40% EC)		¼ pint, <i>plus</i>
TEDION (25% EC)	<i>or</i>	1 quart
TEPP (20% EC)		½ pint, <i>plus</i>
TEDION (25% EC)		1 quart

*See New Insecticides section, page 4.

Third Cover

(10 to 14 days after Second Cover)

Scab	Codling Moth, Plum Curculio, Aphids
CAPTAN 1-1½ pounds	GUTHION (25% WP) 1 pound
<i>or</i>	<i>or</i>
CYPREX ¼ pound	SEVIN (50% WP) 2 pounds
<i>or</i>	<i>or</i>
GLYODIN ¾-1 quart	SEVIN 4 FLOWABLE 1 quart
<i>or</i>	<i>or</i>
GLYOXIDE 8 to 10 ounces	DDT (50% WP) 1 pound, <i>plus</i>
<i>or</i>	PARATHION (15% WP) 1 pound
FERBAM 1 to 1½ pounds	<i>or</i>
	PARATHION FLOWABLE equivalent rate
	active ingredient
	<i>or</i>
	DIAZINON (50% WP) 1 pound

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>	<i>or</i>
CAPTAN 1 pound	SEVIN (50% WP) 2 pounds
<i>or</i>	<i>or</i>
GLYODIN 1 pint	SEVIN 4 FLOWABLE 1 quart
<i>or</i>	<i>or</i>
GLYOXIDE 5 ounces	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

NOTE: Timing for apple maggot and second brood codling moth is announced by your county agricultural agent.

CAUTION: Do not use LEAD ARSENATE on varieties ripening before Wealthy. Use ½ pound FERBAM as an arsenical corrective if GLYODIN, GLYOXIDE or CYPREX is used with LEAD ARSENATE.

Fifth Cover

(12 to 14 days after Fourth Cover)

Scab	Codling Moth, Apple Maggot, Red-Banded Leaf Roller, Aphids
Same fungicides as for Fourth Cover	Same insecticides as for Fourth Cover

APPLES

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: LEAD ARSENATE 30-day interval between final spray and harvest.

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.

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.

SPECIAL APPLE DISEASE CONTROLS

(Controls are suggested where these diseases are economic problems)

Silver Tip to Pedal Fall

Cover Sprays Starting at Third Cover

Powdery Mildew (on susceptible varieties)

Sooty Blotch, Fly Speck and Scab

Scab fungicide plus
WETTABLE SULPHUR 2 pounds

CAPTAN 1 pound, plus
ZINEB 1 pound

or

Scab fungicide plus
KARATHANE 1/2 pound

NOTE: If LIME SULFUR is used, do not use SULFUR or KARATHANE. Add wetting agent if necessary to wet fungal growth.

Special Apple Disease Controls

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: CHLOROBENZILATE-14; 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 (25% EC) per 100 gallons.

Fungicides: CAPTAN-0; CYPREX-5; FERBAM-7; GLYODIN-0; GLYOXIDE-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

INSECTS

Pear Scab, Leaf Spot

European Red Mite (preventive program)

FERBAM1½ pounds

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

*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

European Red Mite (preventive program)

FERBAM1½ pounds

GENITE (50% EC)1½ pints

or

or

BORDEAUX3-8-100

GENITE (50% WP)1½ pounds

or

TEDION (25% EC)1 quart

or

MITOX (40% WP)1 pound

or

MORESTAN (25% WP)½ pound

NOTE: MORESTAN, at one pound, is effective against pear psylla, including phosphate-resistant psylla.

If plant bugs, green fruitworms, or leaf rollers are a problem, add DDT (50% WP)—2 pounds per 100 gallons

in the Pre-Bloom spray.

Period of Bloom

(When first blooms start to open)

Fireblight

STREPTOMYCIN*50 to 100

or

BORDEAUX2-6-100

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

*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 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)

Pear Scab, Leaf Spot

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

BORDEAUX 2-6-100
or
 FERBAM 1½ pounds

PARATHION (15% WP) 1 pound
or
 GUTHION (25% WP) 1 pound

First Cover

(12 to 14 days after Petal Fall)

Pear Scab, Leaf Spot

Pear Psylla, Plum Curculio

Same fungicides as for Petal Fall

Same insecticides as for Petal Fall

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

More than 1 spray may be required if mites are numerous.

Second Cover

(12 to 14 days after First Cover)

Pear Scab, Leaf Blight (*Fabraea*)

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

BORDEAUX 2-6-100
or
 FERBAM 1½ pounds

SEVIN (50% WP) 2 pounds
or
 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.

PEARS

Third Cover

(10 to 14 days after Second Cover)

Pear Scab, Leaf Blight

Pear Psylla, Codling Moth

BORDEAUX2-6-100
or
FERBAM1½ pounds

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

BORDEAUX2-6-100
or
FERBAM1½ pounds

DDT (50% WP)2 pounds
or
SEVIN (50% WP)1 pound
or
SEVIN 4 FLOWABLE1 pint
or
GUTHION (25% WP)1 pound

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

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: 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.

VALSA CANKER

Delay pruning as close as possible to the beginning of tree growth or later to allow rapid healing and to obtain fungal 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.

Pre-Plant Treatment to Control Peach Tree Borer

THIODAN (ENDOSULFAN) used as a pre-plant root and crown dip of seedling peach trees prior to planting has given complete control of peach tree borers for one season and a high degree of control during the second season. THIODAN, the only material labelled and registered for use as a pre-plant treatment is recommended in the following manner: In the spring of the year, dip individual trees or bundles of trees in a solution of THIODAN EC used at a rate of 5 pounds actual THIODAN per 100 gal-

lons. Trees should be dipped to a point several inches above the bud scar. Allow trees to dry thoroughly before planting or returning to storage. Use the emulsifiable concentrate formulation of THIODAN, as it stays in solution and does not require constant agitation as does the wettable powder. Wear gloves and avoid exposing the skin to the insecticide mixture. THIODAN is extremely toxic to fish and wildlife, so use extreme care when disposing of the excess insecticide solution.

Dormant

DISEASES

INSECTS

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

Pink

Plant Bugs

DDT (50% WP) 2 pounds

PEACHES

Bloom

(Balloon pink through bloom)

Brown Rot (blossom blight)

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

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

Petal Fall

Brown Rot

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

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

Oriental Fruit Moth, Plant Bugs

PARATHION (15% WP)	1½ pounds
..... <i>or</i>	
PARATHION FLOWABLE	at equivalent active ingredient
..... <i>or</i>	
DDT (50% WP)	1½ pounds
..... <i>or</i>	
SEVIN (50% WP)	2 pounds
..... <i>or</i>	
SEVIN 4 FLOWABLE	1 quart

Shuck Split

(Usually 10 to 12 days after Petal Fall)

Brown Rot

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

Plum curculio, Oriental Fruit Moth

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# gal. SC)	1 pint
..... <i>or</i>	
DIELDRIN (50% WP)	½ pound, plus
DDT (50% WP)	2 pounds
..... <i>or</i>	
SEVIN (50% WP)	2 pounds
..... <i>or</i>	
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.

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

PROGRAM NO. 1:—Use THIODAN (25% EC), 1½ quarts, or THIODAN (50% WP), 1½ pounds, 10 days after shuck-split, the second 3 weeks later.

PROGRAM NO. 2:—If only one spray is to be made for borer control, use THIODAN (50% WP), 3 pounds or THIODAN (25% EC), 3 quarts. Make application 5 weeks after shuck split.

Make all insecticide applications listed under the two

programs with a gun. Apply as a coarse dilute spray to the lower parts of 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.**

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.

First Cover

(10 to 12 days after Shuck Split)

Peach Scab

Plum Curculio, Oriental Fruit Moth

WETTABLE SULFUR5 pounds
or
 SULFUR PASTE6 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.

Second Cover

(14 days after First Cover)

Oriental Fruit Moth

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

Third Cover

(14 days after Second Cover)

Peach Scab

Oriental Fruit Moth

WETTABLE SULFUR5 pounds
or
 SULFUR PASTE6 pounds
or
 CAPTAN2 pounds

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

Caution: Use only one application of DDT within 6 weeks of harvest. Do not use DDT within 30 days of

harvest if peaches are to be sold as fresh fruit or are to be transported outside the state of Michigan.

PEACHES

Fourth Cover

(10 to 14 days after Third Cover)

Brown Rot

CAPTAN	2 pounds
WETTABLE SULFUR	5 pounds
SULFUR PASTE	6 pounds

Oriental Fruit Moth

GUTHION (25% WP)	1 pound
GUTHION (2# 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)

Brown Rot

Same fungicides as for Fourth Cover.

Oriental Fruit Moth

Same insecticides as for Fourth Cover.

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.

Fall Soil Fumigation

See Nematode Control, page 3

Days Between Final Spray and Harvest

Insecticides: DDT-30; DIELDRIN-30; GUTHION-21; PARATHION^o-14; SEVIN-1; THIODAN-21. Do not make more than 2 applications during fruiting period.

Parathion may be used as late as 7 days before harvest on Amber Gem and other varieties grown for processing, if the peaches are not transported outside Michigan to be processed.

Fungicides: 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

ZINEB2 pounds

NOTE: Prune out and burn all knots in the dormant season and repeat in early June.

Caution: Fill tank ½ 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 sec. vis. or

60 sec. vis.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 SULFUR10 gallons

or

ZINEB2 pounds

Pink

Oil Schedule

Black Knot (problem orchards)

ZINEB2 pounds

Pink

Non-Oil Schedule

Black Knot (problem orchards)

ZINEB2 pounds

European Red Mite (preventive mite program)

GENITE (50% WP)1½ pounds

or

GENITE (50% EC)1½ pints

PLUMS AND PRUNES

Pink Non-Oil Schedule (Continued)

	<i>or</i>	
TEDION (25% EC)		1 quart
	<i>or</i>	
MITOX (40% WP)		1 pound
	<i>or</i>	
MORESTAN (25% WP)		½ pound

NOTE: Use one of above schedules if superior oil was not used in Delayed Dormant.

Bloom

Black Knot, Brown Rot

LIME SULFUR (early bloom)	2 gallons
<i>or</i>	
PHYGON XL	½ pound
<i>or</i>	
WETTABLE SULFUR	5 pounds

Petal Fall

Brown Rot, Leaf Spot

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

Plum Curculio, Leaf Rollers

DIELDRIN (50% WP)	½ pound, <i>plus</i>
PARATHION (15% WP)	1 pound, <i>or</i>
PARATHION FLOWABLE	at equivalent active ingredient

or

GUTHION (25% WP)	1 pound
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or

GUTHION (2# gal. SC)	1 pint
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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)

Leaf Spot, Brown Rot, Black Knot

FERBAM	1½-2 pounds
<i>or</i>	
FERBAM	1 pound, <i>plus</i>
WETTABLE SULFUR	3 pounds

or

LIME SULFUR	2 gallons
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NOTE: Check compatibility for LIME SULFUR with insecticides.

Plum Curculio

PARATHION (15% WP)	1½ pounds
<i>or</i>	
PARATHION FLOWABLE	at equivalent active ingredient

or

GUTHION (25% WP)	1 pound
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or

GUTHION (2# gal. SC)	1 pint
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or

DIELDRIN (50% WP)	½ pound
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First Cover

(10 days after Shuck Split)

Leaf Spot

Same fungicides as Shuck Split, except LIME SULFUR

SCALE INSECTS: If lecanium scale is a problem, the young crawlers can be controlled with PARATHION (15% WP) 1½ pounds, or GUTHION (25% WP), 1 pound, or

PEACH TREE BORERS: For peach tree borer control, see section under Peach Spraying Schedule, page 23.

MITES: If European red mites build up, spray with

Plum Curculio

Same insecticides as for Shuck Split

GUTHION (2# gal. SC), 1 pint, applied when the crawlers are first observed (usually June 25 to July 15). Make a second application 10 to 12 days later.

KELTHANE (18.5% EC), 1 quart, or TEDION (25% WP), 1 pound, or TEDION (25% EC), 1 quart. Do not repeat KELTHANE application within 30 days.

Second Cover

(10 to 14 days later)

Leaf Spot

FERBAM1½ pounds

Leafhoppers

DDT (50% WP)1½ pounds

or

PARATHION (15% WP)1½ pounds

or

PARATHION FLOWABLEat equivalent active ingredient

SPECIAL APPLE MAGGOT SPRAYS: LEAD ARSENATE—2 pounds, or GUTHION (25% WP)—1 pound, or GUTHION (2#/gal. SC)—1 pint. If maggot is a prob-

lem, the timing of sprays is the same as in the apple spraying schedule.

Third Cover

(About 1 month before harvest)

- 1. Brown Rot, Leaf Spot or
- 2. Brown Rot only

Apple Maggot

1. CAPTAN2 pounds

See Special Apple Maggot Sprays under Second Cover.

or

2. WETTABLE SULFUR5 pounds

Fourth Cover

(10 to 14 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.

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 4 applications after Petal Fall if the rate is 1 pound of TEDION (25% WP) or 1 quart of TEDION (25% EC) per 100 gallons.

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) Delayed Dormant, spray with PARATHION (15% WP), 1 pound or GUTHION (25% WP), 1 pound, or DIAZINON (50% WP), 1 pound; (2) Dormant, spray with DN-289, 2 quarts, or ELGETOL 318, 2 quarts.

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 ½ pound*

or

GLYODIN 1½ pints, plus

FERBAM ½ pound

or

GLYOXIDE ½ pound, 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 ⅜ to ½ pound if necessary.

Plum Curculio, Cherry Fruitworm, Leafrollers, Peach Twig Borer

GUTHION (25% WP) 1 pound

or

GUTHION (2# gal. SC) 1 pint

or

DIELDRIN (50% WP) ½ pound, plus

PARATHION (15% WP) 1½ pounds, or

PARATHION FLOWABLE at equivalent active rate.

NOTE: Where plum curculio is the only insect problem, DIELDRIN (50% WP), ½ pound, can be substituted in the Petal Fall Spray.

First Cover

(10 to 14 days after Petal Fall)

Leaf Spot

Same fungicides as Petal Fall.

Plum Curculio

Same insecticides as Petal Fall.

NOTE: DIELDRIN (50% WP) ½ pound, can be used if plum curculio is the only problem.

Second Cover

(10 days after First Cover)

Leaf Spot	Plum Curculio, Cherry Fruit Flies**
CYPREX ¼-½ pound	LEAD ARSENATE 2 pounds
<i>or</i>	<i>or</i>
GLYODIN 1½ pints, <i>plus</i>	DIAZINON (50% WP) 1 pound
FERBAM ½ pound	<i>or</i>
<i>or</i>	GUTHION (25% WP) 1 pound
GLYOXIDE ½ pound, <i>plus</i>	<i>or</i>
FERBAM ½ pound	SEVIN (50% WP) 2 pounds
<i>or</i>	<i>or</i>
FIXED COPPER 0.75 pound actual copper, <i>plus</i>	SEVIN 4 FLOWABLE 1 quart
HYDRATED LIME 3 pounds	
<i>or</i>	
Actidione 1 part per million	

NOTE: Actidione is an eradicant chiefly, do not use until fruit is ¾-inch in diameter. Use ½ pound FERBAM when ACTIDIONE or ¼ pound of CYPREX is used with LEAD ARSENATE.

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

If lesser peach tree borer and peach tree borer are problems, see Sweet Cherry 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.

If Forbes scale is a problem, use GUTHION (50% WP) -1¼ pounds, or SEVIN (50% WP) - 2 pounds, or SEVIN

4 FLOWABLE - 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; GLYOXIDE-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.

Bloom

DISEASES

INSECTS

Common Brown Rot (Blossom Blight)

BORDEAUX (early bloom)	4-6-100
<i>or</i>	
WETTABLE SULFUR	5 pounds
<i>or</i>	
PHYGON XL	½ pound
<i>or</i>	
SULFUR PASTE	6 pounds

Insecticides should not be used during Bloom.

If wet weather prevails, additional sprays or dusts of PHYGON or SULFUR will be necessary.

Petal Fall

Leaf Spot, Brown Rot

Plum Curculio, Black Cherry Aphid

CAPTAN	2 pounds	DIELDRIN (50% WP)	½ pound, <i>plus</i>
<i>or</i>		PARATHION (15% WP)	1 pound
FERBAM	1 pound, <i>plus</i>	<i>or</i>	
WETTABLE SULFUR	3 pounds	GUTHION (25% WP)	1 pound

First Cover

(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 LESSER PEACH TREE BORER

Lesser peach tree borer causes serious injury to cherry trees. Treatment is complicated because of the reduced interval between treatment dates and harvest. The following control programs are suggested:

PROGRAM NO. 1—THIODAN (50% WP), 1½ pounds, applied 6 weeks before harvest and repeated 3 weeks before harvest.

PROGRAM NO. 2—GUTHION (25% WP), 1 pound, or PARATHION (15% WP), 2 pounds, applied 4 weeks before harvest and repeated 2 weeks later (See intervals to harvest.)

PROGRAM NO. 3 — THIODAN (50% WP), 3 pounds, applied 4 weeks before harvest. This program is followed where only a single application of insecticide is to be made for lesser borer control.

Apply with a gun as a coarse dilute spray to the lower parts of the scaffold limbs, crotches, cankers, 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 can reduce late season infestations.

Second Cover

(10 to 14 days later)

Leaf Spot, Brown Rot

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

CAPTAN 2 pounds
or
 FERBAM 1 pound, *plus*
 WETTABLE SULFUR 3 pounds

GUTHION (25% WP) 1 pound
or
 PARATHION (15% WP) 1½ pounds

Third Cover

(Based on cherry fruit fly emergence)

Leaf Spot, Brown Rot

Cherry Fruit Flies**

CAPTAN 2 pounds
or
 FERBAM 1 pound, *plus*
 WETTABLE SULFUR 3 pounds

LEAD ARSENATE 2 pounds
or
 GUTHION (25% WP) 1 pound
or
 DIAZINON (50% WP) 1 pound

**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)

Leaf Spot, Brown 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.

See "Days Between Final Spray and Harvest" when using LEAD ARSENATE.

Post Harvest

Leaf Spot

Peach Tree Borer, Lesser Peach Tree Borer

CYPREX ¼ to ½ 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: SULFURS-0; CAPTAN-0; FERBAM-0.

Fourth Cover

(10 to 14 days after Third Cover)

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

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

Fifth Cover

(Time to be announced)

- | | |
|-----------|------------------------------------|
| Black Rot | Grape Berry Moth, Grape Leafhopper |
|-----------|------------------------------------|

- | | | |
|------------------------|-----------|--|
| FERBAM 1½ pounds | <i>or</i> | Same insecticides as for Second Cover. SEVIN 4 FLOWABLE, 1 quart, or GUTHION (2# gal/SC), can be substituted for the wettable powder formulations. |
| ZINEB 1½ pounds | | |
| 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 |
| GUTHION (25% WP) 1 pound | <i>or</i> | PARATHION (15% WP) 1½ pounds |
| 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-10; 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 ALDRIN, CHLORDANE or DIELDRIN, at the rate of 5 pounds actual ALDRIN, DIELDRIN, or 10 pounds

actual CHLORDANE per acre. These insecticides may be applied as dusts, sprays, granular formulations or insecticide-fertilizer mixtures. 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

CAPTAN2 pounds
or
 FIXED COPPER (actual copper)1½ pounds, *plus*
 HYDRATED LIME6 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.

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

(4 to 5 days after spittlebug hatch)

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

Spittlebug, Tarnished Plant Bug, Strawberry
Leafroller

1. CAPTAN 2 pounds

GUTHION (25% WP) 1 pound

or

or

2. THYLATE 2 pounds

SEVIN (50% WP) 2 pounds

or

SEVIN 4 FLOWABLE 1 quart

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.

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

Control of Cyclamen Mites

Under certain circumstances, cyclamen mites may become established in a planting. Usually, the infestation is limited to small areas in the field. These areas may be spot treated with one of the following programs: THIODAN (24% EC), at the rate of 1 quart/100 gallons, applied

at Early Blossom or in multiple applications during the fruiting season, but no closer than 4 days to harvest. KELTHANE (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 1/4 to 3/4 inch)*

or

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

DISEASES

INSECTS

Anthracnose

- 1. LIME SULFUR10 gallons
- or
- 2. LIME SULFUR5 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, Raspberry Cane Borers and Raspberry Root Borer

- 1. CAPTAN2 pounds
- or
- 2. BORDEAUX3-3-100
(Repeat BORDEAUX 10 to 14 days later.)

GUTHION (25% WP)1 pound

NOTE: Where root borers are a problem, apply a crown spray using GUTHION, 3 pounds per 100 gallons. Spray crown area to the point of run-off.

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

First Cover

(At Petal Fall)

Anthracnose

Aphids, Leafrollers, Cane Borers

CAPTAN2 pounds

GUTHION (25% WP)1 pound

or

MALATHION (50% WP)2 pounds

Pre-Harvest

(10 to 15 days before harvest)

Aphids, Mites

PARATHION (15% WP)2 pounds

or

PARATHION FLOWABLE at equivalent active rate

Post Harvest

(5 to 10 days after 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

Days Between Final Spray and Harvest

Insecticides: GUTHION-14; MALATHION-1.

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-2891 quart

or

ELGETOL 3181 quart

CURRENTS AND GOOSEBERRIES

Green Tip

Powdery Mildew (Gooseberries only)

LIME SULFUR5 gallons

Thorough coverage is essential.

First Cover

(As soon as the fruit has set)

Powdery Mildew (Gooseberries only)

Currantworm, Currant Aphid

LIME SULFUR2½ 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

FERBAM2 pounds

MALATHION (25% WP)2 pounds

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

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

Days Between Final Spray and Harvest

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

Fungicides: FERBAM-14.

BLUEBERRY SPRAYING SCHEDULE

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

Dormant

(When buds begin to swell)

DISEASES

INSECTS

Mummy Berry

PREMERGE1½ quarts
or

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

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

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

First Cover

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

Plum Curculio, Blueberry Tip Borer

GUTHION (25% WP)1 pound

or

PARATHION (15% WP)1½ pounds

or

SEVIN (50% WP)2 pounds

or

SEVIN 4 FLOWABLE1 quart

or

MALATHION DUST (4%)40 pounds/acre

or

SEVIN DUST (5%)40 pounds/acre

or

METHOXYCHLOR DUST (5%)40 pounds/acre

Second Cover

(10 days after First Cover)

Plum Curculio, Cranberry Fruitworm, Blueberry Tip Borer

Same insecticides as for First Cover.

Third Cover

(10 days after Second Cover)

Cranberry Fruitworm

Same insecticides as for First Cover.

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

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

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 appli-

cations 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.

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. Although

extensive research has been undertaken on the control of this insect, recommendations for control cannot be made at this date.

Days Between Final Spray or Dust and Harvest

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

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, 1964. 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.**

POSSIBLE DANGER FROM PESTICIDES DRIFT

There is possible danger of drift and injury to neighboring crops and premises from both airplane and conventional ground dust and spray applications. Hay and pasture crops, for example, grown near orchards treated with pesticides may contain illegal chemical residues. Since few chemicals have tolerances established for hay crops and there are **no tolerances** permitted in milk, extreme caution must be exercised in this regard. DDT and other chlorinated hydrocarbons are especially hazardous, since they are stored in animal fat and secreted in milk.

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	Strawberries	Raspberries	Currants and Gooseberries	Blueberries
Acti-dione					4(Sour)					
Captan	0	0	0	0	0	0	0	0		
Copper (copper-lime mixtures)	h	h			h	h	h	h		
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)					
Glyoxide					7(Sour)					
Karathane	21						21	7		
Mercuries	nf						af			
Streptomycin	a	a								
Sulfurs	h		h	h	h					
Thiram (Thylate)	0		7				3e			
Zineb	0			30		7				
Ziram	0									
Insecticides										
BHC	60a		60	a	a	a	a		a	a
Chlorobenzilate	14	7	30		d					
DDD	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			
Dieldrin	45	35	30	30	30	14	a	f	f	
Endrin	f					f	f			
Ethion	f	f	30f	21f		f	2			
Genite	e	e	e	e	e					
Guthion	15	15	21	15	15	10	5	14		14
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	a,f	f	a		a	a
Malathion	3	1	7	3	3	3	3	1	1,3f	1
Methoxychlor	7	7	21	7	7	14	3	3	14g	14
Mitox	7	7	7	7		c		c		
Morestan	a,e	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	e	e	e	e	e	e	e	e	e	e
Tedion	f	f	f	f	f	f	f	f		f
TEPP	3	3	3	3	3	3	3	3	3	3
Thiodan	30f	30f	21f	21f	21f		4f			
Trithion	30	30	30	30	30	30	3	d	d	

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.

