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Spraying Calendar - Supplement

Michigan State University Extension Service

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Revised February 1956

23 pages

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Extension Bulletin 154 (Supplement)

Spraying Calendar

1956 SUPPLEMENT



*By A. E. Mitchell, Alfred C. Dowdy, Donald Cation,
and Robert H. Fulton*



MICHIGAN STATE UNIVERSITY
COOPERATIVE EXTENSION SERVICE
EAST LANSING

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Spraying Calendar

1956 Supplement

*By: A. E. Mitchell¹, Alfred C. Dowdy²,
Donald Cation³, and Robert H. Fulton⁴*

The information in this supplement should be used with the 1955 Spraying Calendar, Michigan State University Extension Bulletin 154. There have been very few changes in pest control chemicals since 1955, and the information contained in the 1955 Spraying Calendar is still correct.

Many users of this calendar did not like the presentation of the spraying schedules in the 1955 publication; therefore, the method of presenting these spraying schedules has been changed to a more popular form in this supplement.

The major change from the 1955 growing season was the approval of the Miller Pesticide Residue Amendment, Public Law 518, as part of the Food, Drug and Cosmetic Act of 1938. Raising fruit to conform with the Law should not cause a hardship to the grower. It appears now that the established residue tolerances are fair to the producer yet protect the consumer.

The help and suggestions received from the Extension and Research personnel in the Departments of Horticulture, Entomology, and Botany and Plant Pathology in preparing these spraying schedules have been very valuable and are gratefully acknowledged.

TO AVOID EXCESSIVE RESIDUES ON HARVESTED FRUIT

In the interest of public health, maximum amounts of chemicals applied as dusts or sprays (residue tolerances) that may be present on harvested fruits have been established by the Federal Government in compliance with Public Law 518, the Miller Amendment to the Food, Drug and Cosmetic Act of 1938. These tolerances vary considerably for the different chemicals used by the fruit industry.

Care has been taken in the preparation of this supplement to the

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Spraying Calendar, Extension Bulletin 154, to avoid suggesting the use of any chemical that will lead to prohibitive residues (exceeded tolerances) on fruit harvested for fresh market or on fruit after processing.

However, the grower himself is responsible for the fruit he produces. Thus, growers should seriously consider the following two precautions:

1. **Use spray and dust chemicals as directed by the label.** This is important because spray chemicals vary considerably from each other in effectiveness, dosage rates, required frequency of application, toxicity to warm-blooded animals, and rate of chemical breakdown under varying weather conditions.

Labels state time of application, amounts to use per 100 gallons, and crops on which the chemical has been approved for use. It is important that the user conform with these instructions.

2. **Know and regulate the amount of spray and dust chemicals being applied per tree or per acre.**

Dosage rates given on the label of the container must not be doubled or otherwise increased. These dosage rates regulate the amount of chemical that may be used per tree or per acre without danger of excessive residue on the harvested fruit.

In concentrate spraying, the amount of water applied per tree or per acre is reduced, but the amount of chemical applied per tree or per acre is much the same as that for dilute conventional spraying. Therefore, be very careful in setting the rate at which the machine is to discharge the spray in gallons per minute and the rate of travel while spraying. These two factors must conform with the concentration of spray materials being used in order to avoid excessive residues on the fruit at harvest time.

RELATIVELY NEW CHEMICALS FOR USE IN 1956

Insecticides

Malathion (S-(1,2-dicarbethoxyethyl)-O, O-dimethyl dithiophosphate) —Malathion, a relatively new phosphate insecticide, differs from parathion in its low toxicity to warm-blooded animals, including man. This insecticide is specific for aphids and is effective against such pests as mites, curculio, oriental fruit moth, grape berry moth and crawlers of scale insects. It has little value against red-banded leafroller and spittlebug. The effective life of malathion is approximately one-half that of parathion. It may be used up to 3 days be-

fore harvest on all fruits for which it has been labelled except peaches. On this crop, do not use it later than 7 days before harvest. Follow the directions on the label closely.

Demeton (0-(2-(ethylmercapto) ethyl)-0, 0-diethyl thiophosphate)—Demeton, commonly called Systox, is a systemic aphicide and miticide which is formulated as an emulsion concentrate. Do not use demeton more than three times during the growing season and not within 21 days of harvest. The material has an effective period of approximately 21 days. At present, the only fruit crops for which demeton has been cleared are apples, pears and strawberries. Like parathion this chemical is highly toxic to man; read the label carefully for directions and precautions.

Fungicides

Coro-SDD (sodium dimethyl dithiocarbamate)—Coro-SDD, a product of Corona Chemical Company, is used with ferric sulfate to make a tank-mix ferbam. In several years of field tests, this mixture has given control of black rot on grapes comparable to the wettable powder forms of ferbam. It will be labelled and available for use on grapes in 1956.

Bacterial Spot on Peaches

Bacterial spot on peaches has become increasingly serious during the past few years in certain peach-growing areas of the state. Trees of both good and poor vigor have been hit by this disease, and fruit infections caused serious losses in 1955.

Dr. Edward Klos of the department of botany and plant pathology, Michigan State University, is following this disease closely and has set up plots in peach orchards in southwestern Michigan where this disease is heavily established. Results of his studies will be announced after the growing season of 1956.

The only currently known means of control is the application of five or six sprays of zinc sulfate and lime in the proportion of 8-8-100, beginning with Petal Fall and continuing at intervals of 10 to 14 days. Nu-Z* at the rate of 3 to 4 pounds in 100 gallons may be substituted for zinc-sulfate lime if used no more often than every other spray. Since lime is omitted when using Nu-Z, it is possible to use DDT, parathion or dieldrin in the same spray mixture with Nu-Z for the control of insects without decreasing the effectiveness of these organic insecticides.

*Nu-Z (50-55 percent metallic zinc)—A product of the Tennessee Corporation, Atlanta, Georgia.

SPRAY CHEMICALS FOR THE CONTROL OF APPLE SCAB

<i>Protective fungicides</i>	<i>Eradicative fungicides</i>	<i>Fungicide mixtures with both eradivative and protective properties</i>
Lime-sulfur	Lime-sulfur	Sulfur, Ferbam or Captan at half-strength combined with $\frac{1}{4}$ pound of Phygon.
Copper compounds	Mercurial compounds	
Wettable sulfur		
Sulfur paste	Phygon (dichlone)	
Ferbam		Sulfur, Glyodin, Ferbam or Captan at half-strength may be combined with mercurial compounds.
Glyodin		
Captan		
Phygon (dichlone)		

Precautions in Selecting Chemicals to Control Apple Scab

Newly established apple scab infection may be eradicated effectively within 30-36 hours from the beginning of an infection period—using either $\frac{1}{4}$ pound of dichlone (Phygon) with a protective fungicide at half-strength, or within 72 hours from the beginning of an infection period using full-strength mercury. When mercury is used at half-strength in combination with a protective fungicide, the effective period for eradication is usually reduced to 40-45 hours. However, the period of effective eradication may be somewhat longer for all concentrations of eradivative fungicides, if the temperature during the time of infection is under 50° F. It should be remembered also that liquid lime-sulfur has effective eradivative properties, if used at 2 gallons per 100 gallons of spray within 72 hours from the beginning of the infection period.

In Michigan, mercurial compounds may be most valuable as an emergency measure following rains, when protection against possible apple scab infection is questionable. A protective fungicide should be used with the mercury.

Phygon should not be used later than Petal Fall, because of possible fruit russetting. Fruit russetting has occurred on Golden Delicious in Michigan from the use of ferbam and glyodin. Captan has been the most favorable fungicide for Golden Delicious. Ferbam has also caused fine network-like russetting on Jonathan when used before Third Cover.

Use all materials according to the directions on the container.

APPLE SPRAYING SCHEDULE—1956

Time	Materials per 100 gallons	To control
DORMANT	Elgetol-318 or DN-289 at manufacturers' directions.	Rosy aphids

This application is necessary only when rosy aphids are a serious problem. Red mites may be better controlled later by foliar applications.

FROM first sign of GREEN TISSUE to PRE-PINK	Lime-sulfur—2 gallons <i>or</i> Either keep covered with protective fungicides just before rains according to expanding growth, or use eradivative fungicides immediately after rains. (See page 6.)	Sepal and leaf scab
PRE-PINK to BLOOM	Protective fungicides applied before rains wetttable sulfur—6 pounds, <i>or</i> ferbam—1½ pounds, <i>or</i> captan—2 pounds, <i>or</i> glyodin—1 quart <i>or</i> Eradicative fungicides applied after rain. (See page 6.) Half strength protective fungicide <i>with</i> either Phygon at ¼ pound, <i>or</i> mercury at half or full strength. (See page 6.)	Fruit and leaf scab

Rosy apple aphids and green apple aphids may be controlled in Delayed Dormant, Early Pre-Pink or Pre-Pink with any *one* of the following: parathion (15 percent wetttable) at 1 pound, malathion (25 percent wetttable) at 2 pounds; lindane (25 percent wetttable) at 1 pound; BHC (10 percent wetttable) 2 pounds per 100 gallons; or demeton at manufacturer's directions. Of the materials listed, BHC and lindane are not compatible with lime-sulfur; therefore, do not use them with lime-sulfur in a tank mixture. Parathion is the only insecticide of this group that is economically effective against red-banded leafroller.

PERIOD OF BLOOM	Bordeaux 2-6-100, <i>or</i> Streptomycin—50 to 100 parts per million (trial basis).	Fire blight
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For varieties susceptible to fire blight—First application of fire blight spray should be made as soon as 25 percent of the blossoms are open. Two or three sprays at 4-day intervals may be necessary, depending on weather conditions. Damp, rainy weather or high humidity is favorable for development of fire blight. To avoid fruit russetting when bordeaux is used on bearing trees, spray during quick-drying conditions. Fog the spray into the trees and do not drench. Bordeaux is effective against scab infection. Streptomycin has no value for the control of scab and is suggested against fire blight only on a trial basis.

Scab sprays with protective fungicides may be needed if wet weather occurs during bloom. Mercury should not be used during bloom because it is highly toxic to bees.

Time	Materials per 100 gallons	To control
PETAL FALL (When $\frac{3}{4}$ of the petals have fallen)	Protective fungicides applied before rains wetttable sulfur—5 pounds, <i>or</i> ferbam— $1\frac{1}{2}$ pounds, <i>or</i> glyodin—1 quart, <i>or</i> captan—2 pounds <i>or</i>	Fruit and leaf scab
	Eradicative fungicides applied after rain Half strength protective fungicide <i>with</i> either Phygon at $\frac{1}{4}$ pound, <i>or</i> mercury at half or full strength. (See page 6) <i>plus either</i>	
	Effective only 7 days parathion— $\frac{1}{2}$ to 1 pound, <i>or</i> EPN 300— $\frac{1}{2}$ pound <i>or</i>	Curculio, red-banded leafroller
	Methoxychlor (50% wetttable)—2 pounds	Curculio

Do not use mercury later than *Petal Fall* because of possible mercury residue on the fruit at harvest.

Methoxychlor has little value against red-banded leafroller. When this pest is present, include with methoxychlor, DDD or TDE (50 percent wetttable) at 2 pounds per 100 gallons.

FIRST COVER (7 days after Petal Fall)	Same fungicides suggested as for Petal Fall <i>except for mercury.</i> <i>plus</i>	Scab
	Parathion <i>or</i> EPN 300 <i>or</i> methoxychlor for curculio as in Petal Fall.	Curculio

Continue checking orchard for signs of *red-banded leafroller*. If this pest is present, include DDD or TDE (50 percent wetttable) at 2 pounds per 100 gallons to spray mixture.

SECOND COVER (7 days after first Cover)	Protective fungicides only ferbam—1 to $1\frac{1}{2}$ pounds, <i>or</i> glyodin— $\frac{3}{4}$ to 1 quart, <i>or</i> captan— $1\frac{1}{2}$ to 2 pounds <i>plus either</i>	Scab
	Effective for approximately 7 days parathion (15% wetttable)— $\frac{1}{2}$ to 1 lb. + DDT (50% wetttable)—1 pound, <i>or</i> EPN 300— $\frac{1}{2}$ pound + DDT (50% wetttable)—1 pound, <i>or</i> methoxychlor (50% wetttable)—2 pounds <i>or</i>	Curculio, codling moth
	Effective for approximately 14 days dieldrin (50% wetttable)— $\frac{1}{2}$ pound + DDT (50% wetttable)— $1\frac{1}{2}$ pounds	

Do not use dieldrin later than *Second Cover* on apples. If *green apple aphids* become excessive, add an aphicide to the spray mixture to keep them in check. Remember, *green apple aphids* may continue to migrate into the planting and a single application may fail to control them.

Watch for announcement of *codling moth* emergence which will be made by your county agricultural agent.

Time	Materials per 100 gallons	To control
THIRD COVER (10-14 days after Second Cover)	The same fungicides are suggested as for Second Cover	Apple scab
and FOURTH COVER (10-14 days after Third Cover)	<i>plus</i> DDT (50% wettable)—1 pound + parathion $\frac{1}{2}$ pound, or Methoxychlor (50% wettable)—2 pounds, or DDT (50% wettable)—2 pounds	Codling moth

Mites may be controlled when necessary using such materials as parathion, EPN 300, ovex, Aramite, or demeton as suggested by the manufacturer.

When used alone, DDT controls only codling moth. Methoxychlor controls both codling moth and late-emerging curculio. The combination of DDT and parathion is effective against codling moth and late curculio, and delays the buildup of mites and red-banded leafroller. If red-banded leafroller is present, include DDD or TDE (50 percent wettable) at 2 pounds per 100 gallons in the spray mixture.

MID-SUMMER (July and August)	Glyodin—1 pint, or Ferbam— $\frac{3}{4}$ pound + liquid spreader, or Captan—1 pound <i>plus</i> Lead arsenate—2 pounds, or Methoxychlor (50% wettable)—2 pounds, or DDT (50% wettable)—2 pounds, or Parathion (15% wettable)—1 pound + DDT (50% wettable)—1 pound	Apple scab Apple maggot, codling moth
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When *glyodin* is used in July and August with *lead arsenate* for the control of *apple maggot*, include a safening agent to correct against possible arsenical injury. No arsenical corrective is usually needed until *Third Cover*. Either one-half pound of ferbam or three-quarters of a pound of ferric sulfate per 100 gallons will safen 2 pounds of lead arsenate. Ferric sulfate should not be used on apples before *Third Cover*, because of the possibility of fruit russetting. If the combination of ferric sulfate, lead arsenate and glyodin results in foaming in the spray tank, the addition of 1 or 2 pounds of hydrated lime usually corrects the condition. The period to protect against *apple maggot* injury usually extends from 5 to 6 weeks. DDT, methoxychlor, and the combination DDT + parathion give protection for approximately 7 days. By contrast, lead arsenate gives protection for approximately 14 days. Thus, the number of repeat applications will be based on the effective period of the insecticide.

Timing for *apple maggot* and *second brood codling moth* spray will be announced by your county agricultural agent. To avoid excessive chemical residues on the fruit at harvest, DO NOT use any chemicals closer to harvest than suggested on the label.

Continue checking during July and August for the buildup of red-banded leafroller. When control is necessary, include DDD or TDE (50 percent wettable) at 2 pounds per 100 gallons in the spray mixture you are using for the control of apple maggot. Do not apply DDD or TDE later than 5 weeks before harvest because of the possibility of excessive residue on the harvested fruit.

PEAR SPRAYING SCHEDULE—1956

Time	Materials per 100 gallons	To control
PRE-BLOOM (When buds of blossom clusters begin to separate)	Ferbam—1½ pounds, <i>or</i> Bordeaux 3-8-100	Pear scab, leaf spot

Additional fungicide sprays may be necessary before bloom if wet weather prevails.

PERIOD OF BLOOM (Beginning when 25 percent of the blossoms are open)	Bordeaux 2-6-100, <i>or</i> Streptomycin—50 to 100 parts per million (trial basis)	Fireblight
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Streptomycin may be used at 50-100 ppm. However, this material is still *in the trial stage* because exact dosage and timing for continually good results are not clearly known. The first spray should be applied when approximately 25 percent of the blossoms are open; a second application should be made at the time of full bloom. In some years, three sprays at 3- to 4-day intervals may be necessary during the period of bloom if wet weather prevails. To avoid fruit russetting when using bordeaux on bearing trees, make the spray applications during quick-drying conditions and fog the spray into the trees rather than drench them. Streptomycin has no value for the control of pear scab.

PETAL FALL (When ¾ of the petals have fallen)	Ferbam—1½ pounds, <i>or</i> Bordeaux 3-8-100 <i>plus</i> Parathion (15% wettable)—1 pound, <i>or</i> EPN 300—½ pound	Pear scab, leaf spot Pear psylla, tarnished plant bug, curculio
FIRST COVER (14 days after Petal Fall)	The same materials are suggested as for First Cover	Pear scab, leaf spot Pear psylla, curculio
SECOND COVER (14 days after First Cover)	Ferbam—1½ pounds, <i>or</i> Bordeaux 2-6-100 <i>plus</i> Parathion (15% wettable)—1 pound <i>plus</i> DDT (50% wettable)—1 pound	Pear scab, leaf blight Pear psylla, codling moth
THIRD COVER (14 days after Second Cover)	The same materials are suggested as for Second Cover	Pear scab, leaf blight Pear psylla, codling moth
FOURTH COVER (Time to be announced)	Ferbam—1½ pounds, <i>or</i> Bordeaux 2-6-100 <i>plus</i> DDT (50% wettable)—1½ pounds using ferbam, <i>or</i> DDT (50% wettable)—2 pounds using bordeaux	Leaf blight, pear scab Codling moth

PEACH SPRAYING SCHEDULE—1956

Time	Materials per 100 gallons	To control
DORMANT (In the fall after leaf drop, or in the spring before buds swell)	Use either in fall or spring Bordeaux 6-6-100, or Ferbam—2 pounds or In spring only Lime-sulfur—5 gallons	Peachleaf curl

Peach twig borer may be controlled at this time with lime-sulfur by increasing the concentration to 6 gallons per 100 gallons of spray.

BLOOM (Beginning with balloon pink and continuing through Bloom)	At time of balloon pink Lime sulfur—2 gallons, or Phygon (dichlone)— $\frac{1}{2}$ pound, or sulfur paste—6 pounds, or wetttable sulfur—5 pounds	Brown rot (blossom blight)
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Continue applications through Bloom at 2- to 4-day intervals when wet, rainy weather prevails
Use either:

Phygon (dichlone)— $\frac{1}{2}$ pound, or sulfur paste—6 pounds, or wetttable sulfur—5 pounds	Brown rot (blossom blight)
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Lime-sulfur at 2 gallons per 100 gallons of spray may be used through bloom when heavy fruit set is expected. Its use throughout bloom may injure some blossoms, but it has not reduced the final crop in Michigan tests. Dusting or spraying with elemental sulfur fungicides in the early stages (first 10 hours) of each rain during the period of bloom has given good results.

PETAL FALL (When $\frac{3}{4}$ of the petals have fallen)	Parathion (15% wetttable)— $1\frac{1}{2}$ pounds, or EPN 300—1 pound, or DDT (50% wetttable)— $1\frac{1}{2}$ pounds	Curculio, oriental fruit moth, tarnished plant bug
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DDT controls only tarnished plant bug and oriental fruit moth.

If brown rot blossom blight has not been controlled, include:

Sulfur paste—6 pounds, or
Wetttable sulfur—5 pounds

SHUCK SPLIT (Usually 10-14 days after Petal Fall)	Dieldrin (50% wetttable)— $\frac{1}{2}$ pound <i>plus</i> DDT (50% wetttable)— $1\frac{1}{2}$ pounds, or Parathion (15% wetttable)— $1\frac{1}{2}$ pounds, or EPN 300—1 pound	Curculio Oriental fruit moth
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If brown rot blossom blight has not been controlled, include:

	Sulfur paste—6 pounds, or Wetttable sulfur—5 pounds	Brown rot
FIRST COVER (Approx. 3 weeks after Petal Fall)	Sulfur paste—6 pounds, or Wetttable sulfur—5 pounds <i>plus</i> Dieldrin (50% wetttable)— $\frac{1}{2}$ pound <i>plus</i> DDT (50% wetttable)— $1\frac{1}{2}$ pounds, or Parathion (15% wetttable)— $1\frac{1}{2}$ pounds, or EPN 300—1 pound	Peach scab, brown rot Curculio Oriental fruit moth

Time	Materials per 100 gallons	To control
SECOND COVER (4-6 weeks after First Cover)	DDT (50% wettable)—1½ pounds, or Parathion (15% wettable)—1½ pounds, or EPN 300—1 pound	Oriental fruit moth

If mites appear during the growing season, use either the parathion or EPN 300 rather than DDT for the control of oriental fruit moth. The timing of the sprays to control *peach tree borer*, *lesser peach tree borer*, and *lecanium scale* is determined by the department of entomology, Michigan State University, and the announcements will be made by the county agricultural agents.

To control *peach tree borer*, spray trunks of trees from just below crotches to ground line with a gun and reduced pressure, using either DDT (50 percent wettable) at 3 pounds or parathion (15 percent wettable) at 2 pounds per 100 gallons. Follow with a second application in 12-14 days.

To control *lesser peach tree borer*, spray crotches and areas of cankers with parathion (15 percent wettable) at 2 pounds per 100 gallons.

To control *lecanium scale*, spray infested areas with parathion (15 percent wettable) at 1½ pounds per 100 gallons when the scales are in the crawler stage. Proper timing of this application is very important for control. A second application may be necessary in some instances.

THIRD COVER (Approx. 1 month before harvest)	Wettable sulfur—5 pounds, or Sulfur paste—6 pounds, or Captan—2 pounds	Peach scab, brown rot
	<i>plus</i> DDT (50% wettable)—1½ pounds, or Parathion (15% wettable)—1½ pounds	Oriental fruit moth

Do not apply DDT on peaches to be sold on the fresh market within 30 days of harvest because of the possibility of excessive DDT residue.

FOURTH COVER (7-10 days after Third Cover)	Wettable sulfur—5 pounds, or Sulfur paste—6 pounds, or Captan—2 pounds, or Lime-sulfur—2 quarts + wettable sulfur—3 pounds	Brown rot
	<i>plus</i> Parathion (15% wettable)—1½ pounds	Oriental fruit moth

Do not use parathion on peaches to be sold on the fresh market within 21 days of harvest because of the possibility of excessive parathion residue. The use of DDT and parathion may be continued on Amber Gem and other varieties of peaches being grown for processing.

PRE-HARVEST COVERS (7-10 days after Fourth Cover and repeating 7-10 days until harvest)	Captan—2 pounds, or Lime-sulfur—2 quarts + wettable sulfur—3 pounds, or Wettable sulfur—5 pounds, or Sulfur paste—6 pounds <i>plus</i> A wetting agent used at manufacturers' di- rection to insure good wetting of the surface of the peach fruits.	Brown rot
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Malathion (50 percent wettable) at 2 pounds per 100 gallons may be used to within 7 days of harvest to control oriental fruit moth on peaches being raised for fresh market.

Parathion (15 percent wettable) at 1½ pounds or DDT (50 percent wettable) at 1½ pounds per 100 gallons may be used to control oriental fruit moth on Amber Gem and other varieties of peaches being grown for processing.

PLUM SPRAYING SCHEDULE—1956

Time	Materials per 100 gallons	To control
GREEN-TIP	Lime-sulfur—10 gallons	Black-knot

This spray is suggested only for plantings in which black-knot is a problem. To be of value, it must be accompanied by the pruning out and burning all of the “knots”.

BLOOM (Beginning with balloon stage and continuing through bloom)	At time of balloon stage Lime-sulfur—2 gallons, <i>or</i> Phygon (dichlone)—½ pound, <i>or</i> sulfur paste—6 pounds, <i>or</i> wetttable sulfur—5 pounds	Brown rot (Blossom blight), black-knot
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Continue applications through Bloom at 2- to 4-day intervals when wet weather prevails. Use either:

Phygon (dichlone)—½ pound, <i>or</i> Sulfur paste—6 pounds, <i>or</i> Wetttable sulfur—5 pounds	Brown rot (Blossom blight)
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Dusting or spraying with elemental sulfur fungicides in the early stages (first 10 hours) of each rain during the period of bloom has given good results.

PETAL FALL (When ¾ of the petals have fallen)	Ferbam—1½ pounds, <i>or</i> Sulfur paste—6 pounds, <i>or</i> Wetttable sulfur—5 pounds <i>plus</i> Parathion (15% wetttable)—1½ pounds, <i>or</i> EPN 300—1 pound, <i>or</i> Methoxychlor (50% wetttable)—2 pounds	Leaf spot, black knot Curculio
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Dieldrin is not suggested for the control of curculio as no residue tolerance has been established for this material on plums.

SHUCK SPLIT (Usually 10-14 days after Petal Fall)	Ferbam—1½ pounds, <i>or</i> Sulfur paste—6 pounds, <i>or</i> Wetttable sulfur—5 pounds <i>plus</i> Methoxychlor (50% wetttable)—2 pounds, <i>or</i> Parathion (15% wetttable)—1½ pounds, <i>or</i> EPN 300—1 pound	Leaf spot, black-knot Curculio
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If a tolerance is established for dieldrin on plums prior to the 1956 spraying season, this material may be substituted for any of the above insecticides to control curculio.

FIRST COVER (10 days after Shuck Split)	The same materials are suggested as for Shuck Split.	Leaf spot, curculio
SECOND COVER (14 days after First Cover)	DDT (50% wetttable)—1½ pounds, <i>or</i> Methoxychlor (50% wetttable)—2 pounds	Leafhopper

To control lecanium scale, spray infested areas with parathion (15 percent wetttable) at 1½ pounds per 100 gallons when the scales are in the crawler stage. Proper timing is very important for good control. Emergence is determined by the department of entomology, Michigan State University, and the announcement will be made by the county agricultural agents. This parathion application also controls leafhoppers and mites and may be substituted for DDT or methoxychlor.

If mites become numerous, use parathion (15 percent wetttable) at 1 pound per 100 gallons, or Aramite or EPN 300 as suggested by the manufacturer.

Time	Materials per 100 gallons	To control
THIRD COVER (Approx. 1 month before harvest)	Captan—2 pounds, <i>or</i> Sulfur paste—6 pounds, <i>or</i> Wettable sulfur—5 pounds, <i>or</i> Lime-sulfur—2 quarts + wettable sulfur—3 pounds	Brown rot
<p>If mites become numerous, add parathion (15 percent wettable) at 1 pound per 100 gallons to the fungicide, or include some other miticide such as Aramite or EPN 300 as suggested by the manufacturer. Do not use parathion within 3 weeks of harvest because of the possibility of excessive residue on the harvested fruit. Miticides should be used as suggested on the label.</p>		
FOURTH COVER (7-10 days before harvest)	Captan—2 pounds, <i>or</i> Sulfur paste—6 pounds, <i>or</i> Wettable sulfur—5 pounds, <i>or</i> Lime-sulfur—2 quarts + wettable sulfur—3 pounds	Brown rot

RED TART CHERRY SPRAYING SCHEDULE—1956

Time	Materials per 100 gallons	To control
DORMANT	In orchards north of Ottawa County along Lake Michigan where European brown rot has been a problem, apply a single spray of monocalcium arsenite at 3 pounds per 100 gallons during the period of approximately 2 weeks before buds break dormancy until the buds show a glossy green.	European brown rot
<p>For areas north of Oceana County, dormant DN applications may be desirable in some orchards to control <i>case-bearers</i>, <i>peach twig borer</i>, <i>mineola moth</i> and <i>bud moth</i> as follows:</p>		
	DN 289—2 quarts, <i>or</i> Elgetol 318—2 quarts, <i>or</i> Elgetol or Krenite—4 quarts	

If any of these insects *and* European brown rot occur in the same orchard during the dormant period, apply DN compounds and monocalcium arsenite together as a single mixture *when the trees are completely dormant*. The spray should be timed to control European brown rot. If no DN application has been made in orchards infested with the above insects, spray with parathion (15 percent wettable) at 1½ pounds per 100 gallons as soon as observed. The mineola larvae become active with the first warm days in the spring when the buds are a glossy green.

PRE-BLOSSOM THROUGH BLOOM (Begin when first blossoms open)	<p>In orchards with a history of European brown rot blossom blight, use bordeaux 4-6-100 when the first blossoms open.</p> <p>In orchards with a history of the common form of brown rot blossom blight, use <i>one</i> of following: Bordeaux 4-6-100, Phygon (dichlone) at ½ pound, wettable sulfur at 5 pounds, <i>or</i> sulfur paste at 6 pounds per 100 gallons when the first blossoms open. During bloom, one or more applications of Phygon, wettable sulfur, or sulfur paste at the rates given above may be necessary when wet weather prevails. Both Phygon and elemental sulfur may be applied either as a dust or spray.</p>	European brown rot (blossom blight), common brown rot (blossom blight)
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Time	Materials per 100 gallons	To control
PETAL FALL (When $\frac{3}{4}$ of the petals have fallen)	Fixed copper to give 0.75 of a pound <i>actual copper</i> +hydrated lime—3 pounds, or Ferbam—1½ pounds, or Dithane D-14—1 quart+ monohydrated zinc sulfate (36% zinc)—½ pound, or Glyodin—1½ pints, or Captan—2 pounds	Leaf spot
	<i>plus</i> Parathion (15% wettable)—1½ pounds, or EPN 300—1 pound, or Methoxychlor (50% wettable)—2 pounds, or Lead arsenate—3 pounds, or Dieldrin (50% wettable)—½ pound	Curculio

If mineola moth, case-bearers, bud moth or peach twig borer were pests in 1955, use parathion (15 percent wettable) at 1½ pounds per 100 gallons at the time of Petal Fall and First Cover. Parathion, EPN 300 and methoxychlor will give protection against curculio for approximately 7 days, compared to approximately 14 days for dieldrin and lead arsenate. Thus, more frequent applications of these insecticides are usually necessary for effective control.

When lead arsenate is used with glyodin in the spraying schedule, include either equal amounts of hydrated lime and lead arsenate or $\frac{3}{4}$ pound of ferric sulfate per 100 gallons, to protect against arsenical injury. When the combination of ferric sulfate, lead arsenate and glyodin results in foaming in the spray tank, the addition of 1 or 2 pounds of lime usually corrects the condition.

FIRST COVER (10 days after Petal Fall)	The same materials are suggested as for Petal Fall.	Leaf spot, curculio
SECOND COVER (10 days after First Cover)	Fixed copper to give 0.75 of a pound <i>actual copper</i> +hydrated lime—3 pounds, or Ferbam—1½ pounds, or Dithane D-14—1 quart+monohydrated zinc sulfate (36% zinc)—½ pound, or Glyodin—1½ pints, or Captan—2 pounds <i>plus</i> Lead arsenate—2 pounds, or Methoxychlor (50% wettable)—3 pounds	Leaf spot Cherry fruit fly, curculio

The emergence of cherry fruit flies will be announced by your county agricultural agent. Methoxychlor gives effective protection against cherry fruit fly for approximately 7 days; lead arsenate is effective for approximately 14 days. Thus, two applications of methoxychlor are needed to give protection equal to one application of lead arsenate.

THIRD COVER (7-10 days after Second Cover)	The same materials are suggested as for Second Cover.	Leaf spot, Cherry fruit fly
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If leaf spot threatens, actidione may be used at 1½-2 ppm to within 4 days of harvest, except in those schedules where ferbam has been used as late as Third Cover.

AFTER-HARVEST COVER (Immediately after harvest)	Bordeaux 4-6-100, or Fixed copper to give 0.75 of a pound <i>actual copper</i> with hydrated lime at 3 pounds, or Actidione—2 parts per million	Leaf spot
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Caution: Do not use actidione within a month of a ferbam application because the possible leaf injury could result in heavy leaf drop.

If *slugs* are present, add lead arsenate at 2 pounds per 100 gallons to the spray mixture.

SWEET CHERRY SPRAYING SCHEDULE—1956

Time	Materials per 100 gallons	To control
DORMANT	DN compounds at manufacturers' directions	Black cherry aphid
<i>Black cherry aphids</i> may be controlled during the growing season with parathion (15 percent wettable) at 1 pound, or malathion (50 percent wettable) at 2 pounds, or nicotine sulfate (40 percent nicotine) at 1 pint per 100 gallons.		
PRE-BLOSSOM THROUGH BLOOM	Use any <i>one</i> of the following: 4-6-100 Bordeaux, or Phygon at $\frac{1}{2}$ pound, or wettable sulfur at 5 pounds, or sulfur paste at 6 pounds per 100 gallons when first blossoms open. Follow by one or more applications of Phygon (dichlone) at $\frac{1}{2}$ pound, or sulfur paste at 6 pounds, or wettable sulfur at 5 pounds per 100 gallons <i>during bloom</i> when wet weather prevails. Both Phygon (dichlone) and elemental sulfur materials may be applied either as a dust or a spray.	Brown rot (Common form blossom blight)
PETAL FALL (When $\frac{3}{4}$ of the petals have fallen)	Ferbam— $1\frac{1}{2}$ pounds, or Captan—2 pounds <i>plus</i> Dieldrin (50% wettable)— $\frac{1}{2}$ pound, or Parathion (15% wettable)— $1\frac{1}{2}$ pound, or EPN 300—1 pound, or Methoxychlor (50% wettable)—2 pounds	Leaf spot, brown rot Curculio

Dieldrin has an effective period against curculio of approximately 14 days, compared to approximately 7 days for parathion, EPN 300, and methoxychlor. Thus, these latter insecticides must be applied more often to give control equal to dieldrin. If black aphids or insects other than curculio are present when using dieldrin, include parathion at 1 pound per 100 gallons in the spray mixture.

FIRST COVER (14 days after Petal Fall)	The same materials are suggested as for Petal Fall.	Brown rot, leaf spot Curculio
SECOND COVER (14 days after First Cover)	The same materials are suggested as for Petal Fall, except do not use dieldrin later than First Cover.	Brown rot, leaf spot, Curculio

Do not use parathion within 21 days of harvest because of the possibility of excessive residue on the harvested fruit.

THIRD COVER (Timing based on cherry fruit fly emergence)	Captan—2 pounds, or Ferbam— $1\frac{1}{2}$ pounds, or Wettable sulfur—5 pounds, or Sulfur paste—6 pounds <i>plus</i> Lead arsenate—2 pounds <i>with corrective</i> , or Methoxychlor (50% wettable)—3 pounds	Brown rot, leaf spot Cherry fruit fly
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When lead arsenate is used with wettable sulfur and sulfur paste, include equal parts of hydrated lime and lead arsenate. *No arsenical corrective is needed when using captan or ferbam.*

The emergence of cherry fruit flies will be announced by the department of entomology, Michigan State University, and the timing of the spray applications will be made through your county agricultural agent.

Methoxychlor gives effective protection against *cherry fruit fly* for approximately 7 days. Lead arsenate is effective for 14 days. Thus, two applications of methoxychlor are necessary to give protection equal to one application of lead arsenate.

Time	Materials per 100 gallons	To control
FOURTH COVER (7-10 days after Third Cover)	The same fungicides are suggested for Third Cover Methoxychlor (50% wettable)—3 pounds, <i>or</i> Rotenone (4% wettable)—4 pounds, <i>or</i> Malathion (50% wettable)—2 pounds	Brown rot, leaf spot Cherry fruit fly

Lead arsenate this near to harvest could result in excessive residue on fruit grown for fresh market. However, lead arsenate at 2 pounds per 100 gallons may be used at this time on cherries to be processed as "brined" or canned cherries without leaving excessive lead arsenate residue on the processed product. If it is necessary to control cherry fruit fly within 10 days of harvest on fruit for fresh market, use either rotenone (4 percent wettable) at 4 pounds, or malathion (50 percent wettable) at 2 pounds per 100 gallons. Malathion should not be used within 3 days of harvest.

AFTER HARVEST APPLICATION	Fixed copper—0.37 pounds <i>actual</i> copper + fresh hydrated lime—3 pounds + wettable sulfur—3 pounds, <i>or</i> Ferbam—1½ pounds, <i>or</i> Captan—2 pounds, <i>or</i> Actidione at 1½-2 parts per million in or- chards <i>not sprayed</i> with ferbam. Actidione following ferbam has resulted in leaf injury and heavy leaf drop.	Leaf spot
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GRAPE SPRAYING SCHEDULE—1956

Time	Materials per 100 gallons	To control
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Economic control of grape pests depends on good coverage. A minimum of 100 gallons of spray per acre should be used through First Cover, and a minimum of 150 gallons of spray per acre should be used beginning with Second Cover.

Just before and as buds start to swell	DDT (50% wettable)—2 pounds	Grape flea beetle, climbing cutworm
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Grape flea-beetles and climbing cutworms begin to work before and at the time buds start to swell. Check the vineyard daily to determine the presence of these insects and the need for spraying.

FIRST COVER (When shoots are 2-6 inches long)	Coro-SDD—1½ pints with ferric sulfate— ½ pound, <i>or</i> Ferbam—1½ pounds, <i>or</i> Zineb—1½ pounds DDT (50% wettable)—1½ pounds	Black rot Berry moth
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Coro-SDD with ferric sulfate is a tank-mix ferbam. In vineyards where *black rot* has been a serious problem, apply the first protective spray when the shoots are 2 to 3 inches long, rather than delaying until the shoots have grown 4 to 6 inches in length. Follow with an additional spray 10 days later. The use of ferbam or zineb will not only give excellent control of *black rot*, but will increase yields over the use of copper fungicides.

Time	Materials per 100 gallons	To control
SECOND COVER (Just as blossoms are opening)	Coro-SDD—1½ pints with ferric sulfate— ½ pound, <i>or</i> Ferbam—1½ pounds, <i>or</i> Zineb—1½ pounds, <i>or</i> Fixed copper (1½ pounds actual copper) with 4 pounds hydrated lime, <i>or</i> 6-6-100 bordeaux <i>plus</i> DDT (50% wettable) at 1½ pounds when ferbam or zineb is used; increase DDT to 2 pounds when fixed copper or bordeaux is used.	Black rot Berry moth, rose chafer

Ferbam or zineb are not effective for the control of downy mildew on grapes. For this reason, fixed copper or bordeaux is suggested for varieties susceptible to downy mildew—such as Fredonia, Niagara, and Delaware.

THIRD COVER (Immediately after fruit set)	The same chemicals are suggested as for First Cover.	Black rot, berry moth, leafhopper, rose chafer
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Growers using ferbam or zineb on the Concord variety for the control of black rot should substitute fixed copper or bordeaux sprays in place of ferbam or zineb as soon as they observe powdery mildew. Powdery mildew has been appearing on the Concord variety in certain Michigan vineyards.

FOURTH COVER (10-14 days after Third Cover)	The same chemicals are suggested as for First Cover.	Black rot, berry moth, leafhopper, rose chafer
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For the control of mildews, see note under Third Cover.

FIFTH COVER (Just before the berries begin to touch in clusters)	The same chemicals are suggested as for First Cover.	Black rot, berry moth, leafhopper
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For the control of mildews, see note under Third Cover.

If grape berry moth larvae continue to cause damage after Fifth Cover, DDT (50 percent wettable) at 1½ pounds per 100 gallons may be used up to 60 days before harvest. For later applications, malathion (50 percent wettable) may be used at 2 pounds per 100 gallons as late as 3 days before harvest without danger of excessive residue on the harvested fruit. When applying malathion on grapes, avoid driving through the spray drift to prevent inhaling this material.

RASPBERRY SPRAYING SCHEDULE—1956

Time	Materials per 100 gallons	To control
DELAYED DORMANT (When leaves are exposed $\frac{1}{2}$ to $\frac{3}{4}$ inch)	Lime-sulfur— $12\frac{1}{2}$ gallons	Anthracnose

To attain commercial control of anthracnose, it is important to reduce the primary infection which occurs early in the season. Tests have shown that *one thorough* application of lime-sulfur at this critical stage often controls anthracnose for the season.

PRE-BLOSSOM (When blossom buds are visible on fruiting cane or when new canes are 6-8 inches in height)	Ferbam— $1\frac{1}{2}$ pounds <i>plus</i> Lead arsenate—3 pounds	Anthracnose Sawfly, fruit worm
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Fungicide sprays at this time aid greatly in reducing anthracnose infection on the tender flower parts and young canes. Time protective sprays on raspberries with plant development and apply *before* predicted rains.

To control *spur blight* (a disease common in northern areas) on red raspberries, apply 3-3-100 bordeaux at this time instead of ferbam. Follow with a second bordeaux spray 10 to 14 days later.

FIRST COVER (Right after Petal Fall)	Ferbam— $1\frac{1}{2}$ pounds	Anthracnose
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A fungicide at this time helps protect the developing fruit and spurs, as well as the new cane growth, against anthracnose infection. If sawfly or aphids appear before harvest, use rotenone (4 percent wettable) at 4 pounds per 100 gallons.

If mites are present after harvest, use parathion (15 percent wettable) at 1 pound per 100 gallons of spray, or Aramite at manufacturers' directions.

After-harvest sprays to control anthracnose are useless because late infection occurs on the young terminal portions of the plants which are generally removed by pruning during the dormant season.

STRAWBERRY SPRAYING SCHEDULE—1956

Time	Materials per 100 gallons	To control
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To reduce white grub and root weevil injury in strawberry plantings—Just before planting, treat the upper 3 inches of soil with aldrin or chlordane at the rate of 5 pounds *actual* aldrin 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 the application is made. Approximately 40 percent of the effectiveness of these two chemicals may be lost in 5 hours if allowed to remain exposed on the surface of the soil. This treatment is effective against white grub and root weevil for approximately 3 years.

To avoid root aphid injury—When the soil is not treated with chlordane, dip roots and crowns of plants in a solution of nicotine sulfate (40 percent nicotine) at $\frac{1}{2}$ pint of nicotine sulfate to 25 gallons of water, just before setting the plants in the field.

DORMANT (When new growth is just visible in crown)	Eradicative chemicals Lime-sulfur— $2\frac{1}{2}$ gallons, or Organic mercuries at strength given on label for controlling apple scab	Leaf blight, stem-end Fruit rot
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Leaf blight and stem-end fruit rot are usually problems in Michigan on Dunlap, Redcrop, and Robinson varieties. A thorough eradivative spray at this critical time often gives commercial control of these two diseases for the season. This application is not effective when applied through mulch.

FIRST COVER (When new leaves are fully expanded and blossom buds are visible)	Fixed copper—($1\frac{1}{2}$ pounds <i>actual</i> copper) with 4 pounds hydrated lime, or Ferbam— $1\frac{1}{2}$ pounds, or Zineb— $1\frac{1}{2}$ pounds, or Captan—2 pounds, or Ziram—2 pounds	Leaf blight, stem-end fruit rot
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A protective spray during this early, succulent stage of growth further *reduces primary infection* of blight on leaves as well as stem-end rot on the sepals of the blossom buds. Copper fungicides applied after this period may result in stunting and reddening of the leaves, and reddening of the caps of the berries.

SECOND COVER (4 to 5 days after first spittle bug hatch)	Captan—2 pounds, or Zineb— $1\frac{1}{2}$ pounds, or Ferbam— $1\frac{1}{2}$ pounds, or Ziram—2 pounds <i>plus</i> Parathion (15% wettable) 1 pound	Gray mold, leaf blight, stem-end fruit rot Spittle bug, tarnished plant bug, leafroller
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MINIMUM COVERAGE NECESSARY: 200 gallons per acre

A fungicide included with parathion at this time will prevent leaf blight and reduce gray mold buildup. Gray mold is generally confined to the fruit. However, in wet seasons, it may attack the blossoms, flower stalks and leaves, turning them brown. The infected parts soon become covered with gray mold spores which may cause extensive fruit infection prior to and during harvest.

When no fungicide is being used, methoxychlor emulsion (25 percent methoxychlor) at 1 quart per 100 gallons is suggested in the place of parathion to control spittle bug in the Second Cover.

THIRD COVER (When berries are $\frac{1}{2}$ grown)	Captan—2 pounds, or Zineb— $1\frac{1}{2}$ pounds, or Ferbam— $1\frac{1}{2}$ pounds, or Ziram—2 pounds MINIMUM COVERAGE NECESSARY: 200 gallons per acre	Gray mold, leaf blight
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Time	Materials per 100 gallons	To control
To reduce gray mold, apply captan at 2 pounds per 100 gallons at least 3 days before harvest.		
AFTER-HARVEST (Immediately after harvest)	Parathion—(15% wettable) 2 pounds	Root weevil, leafrolle.

If leafroller is the only pest present, DDD or TDE (50 percent wettable) may be used at the rate of 2 pounds per 100 gallons. The need for this application is determined by observation.

CURRENT AND GOOSEBERRY SPRAYING SCHEDULE—1956

Time	Materials per 100 gallons	To control
DORMANT (For both currants and gooseberries)	DN-289—1 quart, or Elgetol 318—1 quart	Aphids
GREEN TIP (For gooseberries only)	Eradicative application Lime-sulfur—12½ gallons THOROUGH COVERAGE IS ESSENTIAL FOR GOOD CONTROL OF POWDERY MILDEW.	Powdery mildew
FIRST COVER (As soon as the fruit has set) (For gooseberries only)	Eradicative and protective Lime-sulfur—2½ gallons <i>plus</i> Parathion (15% wettable)—1 pound	Powdery mildew Currantworm
SECOND COVER (2-3 weeks after bloom) (For both currants and gooseberries)	Bordeaux mixture—3-4-100, or Fixed copper—¾ pound actual copper with 3 pounds hydrated lime <i>plus</i> Parathion (15% wettable)—1 pound	Leaf spot Currantworm

If leaf spot is present at harvest time, spray immediately after harvest with any of the fungicides suggested for Second Cover.

BLUEBERRY SPRAYING SCHEDULE—1956

Time	Materials per 100 gallons	To control
DORMANT (When buds are swelling)	Eradicative measures: Premerge—1½ quarts; or rake and cultivate planting floor to cover the mumified berries.	Mummy berry

The premerge spray should be applied to the entire ground area of the planting and especially to the crowns of the plant.

FIRST COVER (Immediately after bloom or as soon as curculio is active)	Methoxychlor (50% wettable) 3 pounds	Curculio
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When using dust, apply 30 pounds of 5% methoxychlor dust per acre.

SECOND COVER (10 days after First Cover)	The same chemicals are suggested as for First Cover.	Curculio, fruit worm
THIRD COVER (10 days after Second Cover)	The same chemicals are suggested as for First Cover.	Fruit worm
FOURTH COVER (When fruit fly appears)	Rotenone dust (2½%) used at the rate of 25 pounds per acre.	Fruit fly

The time to make this application will be announced by your county agricultural agent.

When the lecanium scale is abundant, make 2 applications of malathion (50 percent wettable) at 2 pounds per 100 gallons, or a malathion dust (5 percent active malathion) at the rate of 30 pounds per acre. Make the first application when 75 percent of the eggs have hatched; follow by a second application 7 days later. The need for a third application will depend on the presence of crawlers 14 days after the first treatment. *Do not harvest berries within 3 days after a malathion treatment.*

Cooperative extension work in agriculture and home economics. Michigan University and the U. S. Department of Agriculture cooperating. Paul A. Miller, Director, Cooperative Extension Service, Michigan State University, East Lansing. Printed and distributed under Acts of Congress, May 8 and June 30, 1914.

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