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1969

For Commercial Fruit Growers

FRUIT SPRAYING CALENDAR

COOPERATIVE EXTENSION SERVICE
MICHIGAN STATE UNIVERSITY

Extension Bulletin 154 Farm Science Series



PROTECT THE BEES

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

"Do not spray plants in bloom" is the basic rule in protecting bees. This applies not only to the fruit bloom but also to dandelions and clovers that may be reached by the spray. Mowing dandelions, yellow rocket and clovers in the fruit area helps. Also, do not let puddles of spray accumulate on the ground where bees might drink it. If beekeepers supply fresh water near the bee hives, this hazard is reduced. Where there is a choice, use insecticides least harmful to bees. The picture on the front cover shows how a bee carries pollen from one flower to another on the hairs of his body, thus bringing about the vital pollination process.

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1969 FRUIT SPRAYING CALENDAR

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

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

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

1. *How to Recognize and Control Cherry Leaf Spot* by E. J. Klos, Extension Bulletin 596.
2. *How to Recognize and Control Apple Scab* by E. J. Klos, Extension Bulletin 595.
3. *How to Recognize and Control Black Knot of Plum and Cherry* by E. J. Klos, Extension Bulletin 469.
4. *Chemical Weed Control for Horticultural Crops* by A. R. Putnam, S. K. Ries and J. Hull, Extension Bulletin 433.

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

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

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

USE CHEMICALS SAFELY

Phosphate Insecticides

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

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

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

All Agricultural Chemicals

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

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

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

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

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

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

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

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

In Case of Poisoning

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

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

POISON CONTROL CENTERS

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

City

ADRIAN

Poison Control Center
Emma L. Bixby Hospital
818 Riverside Avenue 49221
275-6161
Robert Greiner, M.D.

ANN ARBOR

Poison Control Center*
University Hospital
1405 E. Ann St. 48104
764-5102
George H. Lowrey, M.D.

BAD AXE

Poison Control Center
Hubbard Memorial Hospital
423 E. Irwin St. 48413
CO 9-6444
Alice J. Shoemaker, R.Ph., Director
Roy Gettel, M.D.

BATTLE CREEK

Poison Control Center
Community Hospital
200 Tomkins St. 49016
WOODWARD 3-5521
Sterling L. Butterfield, R.Ph.

BAY CITY

Poison Control Center
Mercy Hospital
100 15th St. 48706
TWINBROOK 5-8511
Theodore Meyer, Pharmacist

Poison Treatment Center
Bay City Osteopathic Hospital
300 Mulholland Street 48706
TWINBROOK 3-9554
Emergency Room under charge
of Floor Supervisors
Mrs. Virginia Davis, LPN
7:00 a.m. to 3:00 p.m.

COLDWATER

Poison Control Center
Community Health Center of
Branch County
274 E. Chicago St. 49036
279-9501
John C. Heffelfinger, M.D.
Office 278-2359

DETROIT

Poison Control Center
Children's Hospital
5224 St. Antoine St. 48202
833-1000
Paul V. Wooley, Jr., M.D.
Regine Arorow, M.D.

Poison Information Center
Registrar's Office
Herman Kiefer Hospital
1151 Taylor Avenue 48202
872-3334
Paul T. Chapman, M.D.
William G. Frederick, Sc.D.

Poison Treatment Center
Saratoga General Hospital
15000 Gratiot Ave. 48205
LAKEVIEW 6-5100
Wm. B. Hennessey, Chief
Pharmacist

FLINT

Poison Control Center
Hurley Hospital
6th Ave. & Begole 48502
CEDAR 2-1161
Douglas L. Vivian, R.Ph.

GRAND RAPIDS

Poison Control Center
Blodgett Memorial Hospital
100 Wealthy, S.E. 49506
456-9548
John P. Foxworthy, M.D.

Poison Control Center
Butterworth Hospital
100 Michigan, N.E. 49503
451-3591
John R. Wilson, M.D.

Poison Control Center
St. Mary's Hospital
201 Lafayette, S.E. 49503
459-3131
John Rupke, M.D.

Poison Control Center
Grand Rapids Osteopathic Hospital
1919 Boston St., S.E. 49506
452-5151
Eugene M. Johnson, D.O.
Wallace Stolcenberg, R.Ph.

JACKSON

Poison Treatment Center*
Foote Memorial Hospital
205 N. East St. 49201
STATE 3-2711
Ethan Stone, M.D.

KALAMAZOO

Poison Control Center
Bronson Methodist Hospital
252 E. Lovell St. 49006
342-9821
H. Sidney Heersma, M.D.
Kenneth Huckendubler, Dir. of
Pharmacy and Central Services
(Asst. Director)

LANSING

Poison Treatment Center
Edw. W. Sparrow Hospital
1215 E. Michigan Ave. 48912
487-6111
Sprigg S. Jacob, M.D.
Office 332-6848

*Facilities available for determining cholinesterase levels in blood samples.

Poison Control Center
 St. Lawrence Hospital
 1210 W. Saginaw St. 48914
 372-3610
 Howard Comstock, M.D., Dir.
 William Mueller, Pharm., Asst.
 William Adrian Phrm.

Poison Treatment Center
 Lansing General Hospital
 2800 Devonshire Ave. 48910
 485-4311, Ext. 225
 John E. Morgan, R.Ph.

Poison Treatment Center
 Ingham Medical Hospital
 401 W. Greenlawn 48910
 484-2511
 Robert C. Combs, M.D.

LINCOLN PARK

Poison Control Center
 Outer Drive Hospital
 26400 Outer Drive 48146
 386-0606
 W. S. Wheeler, Admin.
 Carl A. Gagliardi, M.D.

MARQUETTE

Poison Information Center
 St. Luke's Hospital
 West College Ave. 49855
 CAnal 6-3511
 Charles King, Pharmacist
 Norman Matthews, M.D.

MIDLAND

Poison Control Center
 Midland Hospital
 4005 Orchard Drive 48640
 TE 5-6771

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

MONROE

Poison Treatment Center
 Memorial Hospital of Monroe
 700 Stewart Road 48161
 241-6500
 Donald Wojack, Pharmacist

PETOSKEY

Poison Control Center
 Little Traverse Hospital
 416 Connable 49770
 Dlamond 7-2551
 Thomas R. Kirk, M.D.

PONTIAC

Poison Control Center
 St. Joseph Mercy Hospital
 900 Woodward Ave. 48053
 338-9111
 Robert J. Mason, M.D.

PORT HURON

Poison Control Center
 Mercy Hospital
 2601 Electric Ave. 48060
 YUkon 5-9531
 Robert Lugg, M.D.

SAGINAW

Poison Control Center
 Saginaw General Hospital
 1447 N. Harrison Rd. 48602
 753-3411
 William G. Mason, M.D., Chair.

Poison Treatment Center
 Saginaw Osteopathic Hospital
 515 N. Michigan 48602
 PL 3-7751
 T. D. Webber, D.O., Chair.
 C. S. Chicky, D.O.
 W. C. Adams, D.O.

TRAVERSE CITY

Poison Control Center
 Munson Medical Center
 Traverse City 49684
 947-6140
 Philip K. Wiley, M.D., Dir.
 A. McCrackin, Pharm.,
 Deputy Dir.

WAYNE

Poison Treatment Center
 Annapolis Hospital
 33155 Annapolis 48184
 PA 2-4400
 House Physician on duty

YPSILANTI

Poison Treatment Center
 Beyer Memorial Hospital
 28 So. Prospect 48197
 HU 2-6500
 Gust Petropoulos, 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
Vorlex (DD plus 20% methyl isothiocyanate)	10 gallons/acre

WHEN SETTING CHERRY AND PEACH TREES

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

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

SUPERIOR OIL

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

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

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

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

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

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

^a The following ASTM methods are to be used:

¹ D445-61 and D446-53; ² D287-55; ³ D483-61T;

⁴ D97-57 and ⁵ D1160-61.

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

EFFECTIVE DILUTE AND CONCENTRATE PESTICIDE APPLICATIONS

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

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

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

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

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

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

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

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

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

COMMON (GENERIC) NAMES OF INSECTICIDES AND FUNGICIDES

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

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

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

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

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

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

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

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

ACCESSORY MATERIALS

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

WETTING OR SPREADING AGENTS AND STICKERS

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

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

LIQUID PESTICIDES AND SURFACTANTS OR WETTING AGENTS

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

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

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

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

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

CORRECTIVES FOR SPRAY INJURY

Copper Injury

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

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

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

Arsenical Injury

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

arsenical injury, has been replaced by organic fungicides.

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

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

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

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

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

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

RUSSETING OF APPLES BY COLD AND CHEMICALS

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

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

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

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

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

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

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

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

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

If back action beyond 25 hours is required to control scab, use Dodine (Cyprex) at ¼ pound plus Glyodin at 1 pint per 100 gallons. If no freezing air temperatures occur at *Pink* or thereafter, any of the fungicides as suggested for apples in Michigan may be used with safety.

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

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

Delicious:—Many Michigan growers have experienced unfavorable russeting of Delicious. In every case, these growers had used either wettable Sulfur, Sulfur paste, Lime-Sulfur or Dichlone (Phygon) as a

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

CHEMICAL THINNING

APPLES

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

Thinning With NAA

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

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

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

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

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

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

Thinning With Amid-thin

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

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

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

Evaluating Results

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

Cautions

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

- Weak trees are thinned more easily than vigorous ones.

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

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

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

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

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

Sevin as a Thinning Agent

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

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

Thinning With Concentrated Mixtures

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

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

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

PEARS

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

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

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

PEACHES

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

N-1-naphthylphthalamic acid sold and Nip-A-Thin has been tried experimentally and by growers in Michigan and in other states. This chemical has performed very erratically under Michigan conditions and thus cannot be suggested for thinning peaches except on a trial basis. A new material, Fruitone 3 CPA is available for peach thinning and is worthy for trial in Michigan. These chemicals 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, or Captan at	Lime-Sulfur
Wettable Sulfur	Dichlone (Phygon)	half-strength combined with half-	Dichlone (Phygon)
Sulfur paste	Dodine (Cyprex)	strength Dichlone (Phygon).	Dodine (Cyprex)
Ferbam	Captan		Captan
Glyodin			
Captan			
Dichlone (Phygon)			
Dodine (Cyprex)			

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, Dichlone (Phygon) 40 to 48 hours, Dodine (Cyprex) 30 to 36 hours and Captan 18 to 24 hours after infection at suggested full strengths in the pre-cover sprays.

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

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

Growers should keep track of the start of a rain and average temperature and calculate from the following table the length of time it takes for infection to occur. For example, at an average temperature of 58° F. it takes 9 hours for primary infection to take place after the start of a rain. If a protective spray is not

applied before or within this 9-hour period, you must rely on a chemical with eradicative properties. Whether a ½-strength or full-strength eradicant is used will depend on the number of hours after infection you apply the spray.

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

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

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

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

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

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

Dust programs of fungicides are not, in general, as effective as spray programs. Dusts are more effective for protection than for eradication. Dry dusts applied to dry foliage give no eradication unless the dusted tree becomes wet within the eradication time limitation for the fungicide used.

Some Properties of Apple Scab Fungicides

Fungicide	Rate Per 100 Gallons of Spray	Retention	Redistribution	*Eradication from Beginning of Infection Period
Captan 50% WP	2 lb.	Fair	Fair-Good	18-24 hrs.
Dichlone (Phygon) 50% WP	½ lb.	Fair	Fair	36-48 hrs.
Dodine (Cyprex) 65% WP	½ lb.	Good	Good	30-36 hrs.**
Ferbam 75%	2 lb.	Good	Good	0
Glyodin	1 qt.	Good	Poor-Fair	0
Sulfur 95%	5 lb.	Fair	Good	0
Lime Sulfur	2 gal.	Good	Good	60-72 hrs.

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

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

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

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

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

Guidelines to Aerial Application for Control of Apple Scab

In Michigan, appreciable acreages of orchard are sprayed annually with pesticides applied from aircraft. Aerial application programs with protectant fungicides have provided good control of primary apple scab when applied in concentrations 70 times the recommended dilute rate and using 5 gallons of spray per acre. At these high concentrations, after-in-

fection control of scab has been poor. Under quick-drying, somewhat windy conditions, only light deposits of chemicals are obtained. Control of special problems, such as powdery mildew, mites and aphids, require supplemental applications with ground equipment.

Compatibility Chart

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

Q = Questionable; compatibility not clear.
 N = Not compatible.
 + = Decomposes on standing; residual action reduced.
 += Materials compatible.

*Compatible materials are those which can be mixed together in a spray tank without: (1) loss of effectiveness of the materials, or (2) unfavorable chemical reactions between the materials which might harm the plants. (See statement, page 6)
 Except when using ferbam, streptomycin is most favorable applied as a separate application, although it is compatible with ferbam or captan when necessary for scab control. 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 when dilute applications of 400 gallons per acre are employed.

Silver Tip to Pre-Pink Non-Oil Schedule

DISEASES	INSECTS
Speal and Leaf Scab only* (Powdery Mildew and other diseases—see page 18)	Climbing Cutworms
LIME SULFUR 2 gallons	PARATHION (15% WP) 2 pounds
<i>or</i>	<i>or</i>
DODINE (CYPREX)** (65% WP) ¾ to ½ pound	PARATHION LIQUID 0.30 pounds active ingredient
<i>or</i>	<i>or</i>
DICHLONE (PHYGON) (50% WP) ¼ pound, <i>plus</i> PROTECTANT ½ strength	DDT (50% WP) 1 pound, <i>plus</i>
<i>or</i>	PARATHION (15% WP) 1 pound, <i>or</i>
GLYODIN (30% Sol.) 1 quart	PARATHION LIQUID 0.15 pounds active ingredient
<i>or</i>	<i>or</i>
CAPTAN (50% WP) 2 pounds	
<i>or</i>	
FERBAM (76% WP) 2 pounds	
<i>or</i>	
WETTABLE SULFUR 6 pounds	

Green Tip to Pre-Pink Oil Schedule

Sepal and Leaf Scab*	European Red Mite (preventive program) San Jose Scale, Aphids, Tarnished Plant Bug, Leafroller
DODINE (CYPREX)** (65% WP) ¾ to ½ pound	Superior Oil, 70 sec. vis. 2 gallons
<i>or</i>	NOTE: Superior oil, 70 sec. vis. <i>plus</i> ETHION ¼ actual, or FLOWABLE PARATHION 0.15 pounds actual, has given better control of San José scale than oil applied alone. Use 8 gallons of oil in 400 gallons of water per acre. Better mite control has been achieved by spraying 4 sides of the tree. In this case an additional application using 4 gallons of oil in 400 gallons of water is applied immediately after the first application or later before bloom. Do not add parathion to oil when spraying McIntosh and related varieties.
GLYODIN (30% Sol.) 1 quart	Rosy apple aphid, other aphids
<i>or</i>	BHC (12% gamma WP) 2 pounds
FERBAM (76% WP) 2 pounds	<i>or</i>
	PHOSPHAMIDON (8 pounds/gallon) ¼ pint
	Tarnished Plant Bug, Green Fruit Worms, Leafrollers, Climbing Cutworms
	DDT (50% WP) 2 pounds
	<i>or</i>
	PARATHION (15% WP) 1 pound
	<i>or</i>
	PARATHION LIQUID 0.15 pounds active ingredient
	<i>or</i>
	GUTHION (50% WP) ½ pound

NOTE: Do not use SULFUR compounds, DICHLONE (Phygon), CAPTAN or DINOCA (KARATHANE) with oil.

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

**Cyprex ¼ pound has given satisfactory scab control, recommended for use on a trial basis, as a protectant with proper timing and coverage. Use ½ pound for longer back action.

APPLES

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

Scab

DODINE (CYPREX) (65% WP)	.....	¾ to ½ pound
	<i>or</i>	
DICHLONE (PHYGON) (50% WP)	.....	¼ pound, plus
PROTECTANT	.....	½ strength
	<i>or</i>	
GLYODIN (30 % Sol.)	.....	1 quart
	<i>or</i>	
CAPTAN (50% WP)	.....	2 pounds
	<i>or</i>	
FERBAM (76% WP)	.....	2 pounds
	<i>or</i>	
WETTABLE SULFUR	.....	6 pounds

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

European Red Mite		
MORESTAN (25% WP)	.....	½ pound
	<i>or</i>	
TEDION (EC 1)	.....	1 quart
	<i>or</i>	
CHLOROPROPYLATE (ACARALATE) (2 EC)	.....	1½ pint
Rosy Aphid, Other Aphids		
PHOSPHAMIDON (8 pounds per gallon)	.....	¼ pint
	<i>or</i>	
BHC (12% gamma)	.....	2 pounds
	<i>or</i>	
DEMETON (SYSTOX) (26% EC)	.....	¾ pint
	<i>or</i>	
DIMETHOATE (CYGON) (2.67 EC)	.....	1 pint
	<i>or</i>	
DIMETHOATE (CYGON) (25% WP)	.....	1 pound
Tarnished Plant Bug, Green Fruitworm, Fruit Tree Leafroller		
DDT (50% WP)	.....	2 pounds
	<i>or</i>	
PARATHION (15% WP)	.....	1 pound
	<i>or</i>	
PARATHION LIQUID	.....	0.15 pounds active ingredient
	<i>or</i>	
GUTHION (50% WP)	.....	½ pound

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

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

Period of Bloom

Fire Blight

On susceptible varieties*	
BORDEAUX	..... 2-6-100
	<i>or</i>
STREPTOMYCIN	..... 50 to 100 ppm

Limitations: STREPTOMYCIN should not be applied within 120 days of harvest at 100 ppm, 50 days of harvest at 50 ppm. The average number of days between full bloom and harvest for selected apple varieties are provided as a guide for staying within these limitations: McIntosh – 130, Rhode Island Greening – 135, Jonathan – 137, Delicious – 144, Idared – 145, Golden Delicious – 155, Rome Beauty and Stayman – 160. Generally, 75 ppm or more should be used; use 50 ppm only in mild cases or between 120 and 50 days of harvest.

Timing of bloom sprays: Use STREPTOMYCIN when maximum temperatures above 65°F exist or are anticipated to occur and are accompanied by precipitation or follow rainy days. Use 100 ppm in orchards prone to blight. Dormant pruning of overwintering cankers ½ inch or larger is a must. Remove all cankers on young trees and lightly infected mature trees. (See bloom schedule under PEARS, page 19.)

Post-bloom sprays: In orchards with a history of severe fire blight, but where overwintering cankers have been removed and a well-timed blossom blight program has been followed, STREPTOMYCIN at 50 ppm starting 120 days before harvest can reduce shoot infections. Apply on a 7-day protective schedule for 4 or 5 applications. Spray during the evening or early morning hours to increase effectiveness.

Compatibility: Use protective compatible fungicides in STREPTOMYCIN schedule if scab infection periods occur (see page 12). If BORDEAUX is used, fog-spray and apply only under fast drying conditions. Do not use STREPTOMYCIN after a BORDEAUX spray.

*Susceptible varieties include: Wagener, Tompkins King, Twenty Ounce, Rhode Island Greening, Yellow Transparent, Jonathan, Idared, Fenton (Beacon), and many Crab apple varieties. In some years, Golden Delicious and Stayman will develop twig infections.

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

Petal Fall

(When the last of the blossom petals are falling)

Fruit Scab and Leaf Scab

CAPTAN (50% WP)	2 pounds
<i>or</i>	
DODINE (CYPREX) (65% WP)	$\frac{3}{8}$ to $\frac{1}{2}$ pound
<i>or</i>	
DICHLONE (PHYGON) (50% WP)	$\frac{1}{4}$ pound, <i>plus</i> PROTECTANT, $\frac{1}{2}$ strength
<i>or</i>	
GLYODIN (30% Sol.)	1 quart
<i>or</i>	
FERBAM (76% WP)	2 pounds
<i>or</i>	
WETTABLE SULFUR	6 pounds

Red-Banded Leaf Roller, Plum Curculio

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

NOTE: To control White Apple Leafhopper, use PHOSPHAMIDON (8 pounds/gallon) at $\frac{1}{4}$ pint, or CYGON (30.5% EC) at $1\frac{1}{2}$ pints, or CYGON (25% WP) at 2 pounds, or DEMETON (SYSTOX) (26% EC) at 1 pint on or about First Cover. An additional application of DEMETON or PHOSPHAMIDON or CYGON may be needed in late August or September to control the second generation of Leafhoppers.

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

First Cover

(7 to 10 days after Petal Fall)

Scab

Same fungicides as in Petal Fall

Red-Banded Leaf Roller, Plum Curculio

Same insecticide as in Petal Fall

Second Cover

(10 to 14 days after First Cover)

Scab

CAPTAN (50% WP)	$1\frac{1}{2}$ to 2 pounds
<i>or</i>	
DODINE (CYPREX) (65% WP)	$\frac{1}{4}$ pound
<i>or</i>	
GLYODIN (30% Sol.)	$\frac{3}{4}$ to 1 quart
<i>or</i>	
FERBAM (76% WP)	$1\frac{1}{2}$ pounds

Plum Curculio, Codling Moth, Aphids

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

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

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

NOTE: Refer to page 6 on liquid pesticides.

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

***NOTE:** To prevent fruit injury, do not tank-mix with other materials.

APPLES

Third Cover

(10 to 14 days after Second Cover)

Scab

CAPTAN (50% WP)	1 to 1½ pounds
<i>or</i>	
DODINE (CYPREX) (65% WP)	¼ pound
<i>or</i>	
GLYODIN (30% Sol.)	¾ to 1 quart
<i>or</i>	
FERBAM (76% WP)	1 to 1½ pounds

Codling Moth, Aphids

GUTHION (50% WP)	½ pound
<i>or</i>	
*SEVIN (50% WP)	1 pound
<i>or</i>	
*SEVIN LIQUID	0.5 pounds active ingredient
<i>or</i>	
DDT (50% WP)	1 pound, <i>plus</i>
PARATHION (15% WP)	1 pound, <i>or</i>
PARATHION LIQUID	0.15 pounds active ingredient
<i>or</i>	
DIAZINON (50% WP)	1 pound

*NOTE: If plum curculio is still a problem increase Sevin to 2 pounds or 1 pound active ingredient (liquid formulations).

Fourth Cover

(Time to be announced by District Horticultural agents between June 25 to July 15)

Scab

DODINE (CYPREX) (65% WP)	¼ pound
<i>or</i>	
CAPTAN (50% WP)	1 pound
<i>or</i>	
GLYODIN (30% Sol.)	1 pint

Apple Maggot, Codling Moth, Aphids

GUTHION (50% WP)	½ pound
<i>or</i>	
*SEVIN (50% WP)	2 pounds
<i>or</i>	
*SEVIN LIQUID	1 pound active ingredient
<i>or</i>	
GUTHION (50% WP)	¼ pound, <i>plus</i>
SEVIN (50% WP)	½ pound, <i>or</i>
SEVIN LIQUID	0.25 pounds active ingredient
<i>or</i>	
DIAZINON (50% WP)	1 pound
<i>or</i>	
LEAD ARSENATE	2 pounds, <i>plus</i>
PARATHION (15% WP)	1 pound, <i>or</i>
PARATHION LIQUID	0.15 pounds active ingredient
<i>or</i>	
LEAD ARSENATE	2 pounds, <i>plus</i>
SEVIN (50% WP)	1 pound, <i>or</i>
SEVIN LIQUID	0.5 pounds active ingredient
<i>or</i>	
LEAD ARSENATE	2 pounds, <i>plus</i>
PHOSPHAMIDON (8 pounds/gallon)	¼ pint
<i>or</i>	
LEAD ARSENATE	2 pounds, <i>plus</i>
DIAZINON (50% WP)	½ pound

CAUTION: Use ½ pound FERBAM as an arsenical corrective if GLYODIN or DODINE is used with LEAD ARSENATE. (See Arsenical Injury, page 6.)

Do not Use LEAD ARSENATE on varieties ripening before Wealthy.

*NOTE: SEVIN may be used alone on a 10-day schedule only where Apple Maggot is not a severe problem.

Fifth Cover

(10 to 14 days after Fourth Cover)

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

(10 to 14 days after Fifth Cover)

Scab	Codling Moth, Apple Maggot, Red-Banded Leaf Roller, Aphids
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Same fungicides as for Fourth Cover	Same insecticides as for Fourth Cover
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NOTE: To avoid possible excess residues do not apply lead arsenate after July 25 on varieties to be harvested before September 15, and do not use lead arsenate after August 10 on varieties to be harvested after September 15.

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

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

Seventh and Eighth Cover

(10-14 day intervals after Sixth Cover)

Scab	Codling Moth, Apple Maggot, Red-Banded Leaf Roller, Aphids, White Apple Leafhopper*
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Same fungicides as for Fourth Cover	GUTHION (50% WP) ½ pound <i>or</i> **SEVIN (50% WP) 2 pounds <i>or</i> **SEVIN LIQUID 1 pound active ingredient <i>or</i> GUTHION (50% WP) ¼ pound, <i>plus</i> SEVIN (50% WP) ¼ pound, <i>plus</i> SEVIN LIQUID 0.25 pounds active ingredient
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*NOTE: If second generation of Leafhoppers are a problem, use SYSTOX or CYGON or PHOSPHAMIDON.

**NOTE: Refer to use of SEVIN for Apple Maggot under Fourth Cover.

SPECIAL APPLE DISEASE CONTROLS

(Controls are suggested where these diseases are economic problems)

<i>Silver Tip to Petal Fall</i>	<i>Cover Sprays Starting at Third Cover</i>
<p>Powdery Mildew (on susceptible varieties)*</p> <hr/> <p>Scab fungicide <i>plus</i> WETTABLE SULPHUR 2 pounds</p> <p style="text-align: center;"><i>or</i></p> <p>Scab fungicide <i>plus</i> DINOCAPI (KARATHANE) (25% WP) ½ pound</p> <p>NOTE: When LIME SULFUR is used, do not use SULFUR or DINOCAPI (KARATHANE). Add wetting agent if necessary to wet fungal growth.</p>	<p>Sooty Blotch, Fly Speck and Scab</p> <hr/> <p>CAPTAN (50% WP) 1 pound, <i>plus</i> ZINEB (75% WP) 1 pound</p>
<p><i>First Cover to Third Cover (or cessation of terminal growth)</i></p> <p>Powdery Mildew</p> <hr/> <p>SCAB FUNGICIDE <i>plus</i> WETTABLE SULFUR (325 mesh) 2 pounds</p> <p style="text-align: center;"><i>or</i></p> <p>SCAB FUNGICIDE <i>plus</i> DINOCAPI (KARATHANE) (25% WP) ½ pound</p>	<p><i>Pink to Third Cover</i></p> <p>Cedar-Apple Rust</p> <hr/> <p>FERBAM (76% WP) 2 pounds</p> <p style="text-align: center;"><i>or</i></p> <p>FERBAM (76% WP) ¾ pound, <i>plus</i> SCAB FUNGICIDE ½ strength</p> <p style="text-align: center;"><i>or</i></p> <p>THIRAM (THYLATE) (65% WP) 2 pounds</p>

*Susceptible varieties to mildew include: Jonathan, Rome Beauty, Cortland, Baldwin, Monroe and Idared.

Northwestern Anthracnose (Bull's Eye Rot) on Golden Delicious: Where this disease is a problem, use ZIRAM

1½ pounds or CAPTAN (50% WP) 2 pounds in the late cover sprays, starting in early August until 1 or 2 weeks before harvest at 2-week intervals.

Days Between Final Spray and Harvest

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

Fungicides: CAPTAN-0; DICHLONE (PHYGON)-1; DODINE (CYPREX)-7; GLYODIN-0; DINOCAPI (KARATHANE)-21; SULFUR-0; THIRAM (THYLATE)-0; ZINEB-7; STREPTOMYCIN-50.

PEAR SPRAYING SCHEDULE

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

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

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

Delayed Dormant

Oil Schedule

DISEASES

Pear Scab, Leaf Spot

FERBAM (76% WP) 1½ pounds

*NOTE: Refer to San José scale in oil schedule on apples.

**NOTE: For Pear Psylla control where GUTHION,

INSECTS

European Red Mite (preventive program), San Jose Scale* Pear Psylla**

SUPERIOR OIL, 70 sec. vis. 2 gallons

SEVIN or PARATHION are not effective, add one quart of PERTHANE 4 EC per 100 gallons to the 2 gallons of SUPERIOR OIL.

Pre-Bloom (green tip to bloom)

Non-Oil Schedule

Pear Scab, Leaf Spot

FERBAM (76% WP) 1½ pounds

or

BORDEAUX 3-8-100

or

CAPTAN (50% WP) 2 pounds

European Red Mite (preventive program), Pear Psylla*

TEDION (EC 1) 1 quart

or

MORESTAN (25% WP) ½ pound

Tarnished Plant Bug, Green Fruit Worms, Leafrollers

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

PARATHION LIQUID 0.15 pounds active ingredient

or

GUTHION (50% WP) ½ pound

*NOTE: To control overwintering psylla adults before they lay eggs, apply PERTHANE 4 EC at 1 quart per 100 gallons during Delayed Dormant period.

Period of Bloom

(When first blooms start to open)

Fireblight

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

or

BORDEAUX 2-6-100

Insecticides should not be used during Bloom.

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

PEARS

***Streptomycin sprays:** Use STREPTOMYCIN when maximum temperatures above 65° exist or are likely, and are accompanied by precipitation or follow rainy days. Use 100 parts per million (ppm), when moderate to severe conditions occur. When temperatures slightly above 65°F are anticipated with moisture, use 50 to 75 ppm.

Apply the first spray before or within 24 hours after favorable conditions develop. Apply a second spray if favorable conditions reappear, or, if blossoms are opening rapidly and favorable conditions persist, 1 to 2 days after previous spray. Repeat applications if warm, wet conditions prevail.

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

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

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

Petal Fall

(Three-fourths of the petals fallen)

1. Pear Scab, Leaf Spot

2. Fireblight, Scab, Leaf Spot

1. FERBAM (76% WP) 1½ pounds

or

CAPTAN (50% WP) 2 pounds

2. BORDEAUX 2-6-100

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

GUTHION (50% WP) ½ pound

or

SEVIN (50% WP) 2 pounds

or

SEVIN LIQUID 1 pound active ingredient

or

PARATHION (15% WP) 1 pound

or

PARATHION LIQUID 0.15 pounds active ingredient

NOTE: Where GUTHION, SEVIN or PARATHION will not control psylla, make summer applications of PERTHANE 4 EC at 1 quart per 100 gallons applied 7 days apart.

First Cover

(12 to 14 days after Petal Fall)

1. Pear Scab, Leaf Spot

2. Fireblight, Scab, Leaf Spot

Same fungicides as for Petal Fall

Pear Psylla, Plum Curculio

Same insecticides as for Petal Fall

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

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

Second Cover

(12 to 14 days after First Cover)

1. Pear Scab, Leaf Blight (Fabraea)

2. Fireblight, Scab, Leaf Blight

1. FERBAM (76% WP) 1½ pounds

or

CAPTAN (50% WP) 2 pounds

2. BORDEAUX 2-6-100

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

SEVIN (50% WP) 2 pounds

or

SEVIN LIQUID 1 pound active ingredient

NOTE: If blister mite and pear rust mites are not a problem, GUTHION (50% WP), ½ pound or PARATHION (15% WP), 1 pound, or PARATHION LIQUID, 0.15 pounds active ingredient, may be substituted for SEVIN. KELTHANE, 1¼ pounds or 1½ pints will control pear rust mites and other mites if they are the only problem. **For aphids,** use either Demeton (Systox) (26% EC) at ¾ pint or Dimethoate (Cygon) (25% WP) at 1 pound or Dimethoate (Cygon) (2.67 EC) at ¾ pint.

Third Cover

(10 to 14 days after Second Cover)

1. Pear Scab, Leaf Blight

2. Fireblight, Scab, Leaf Blight

Codling Moth

1. FERBAM (76% WP)	1½ pounds	GUTHION (50% WP)	½ pound
	<i>or</i>		<i>or</i>
CAPTAN (50% WP)	1½ pounds	SEVIN (50% WP)	1 pound
2. BORDEAUX	2-6-100		<i>or</i>

NOTE: Continue Bordeaux in subsequent sprays if fireblight is not controlled.

SEVIN LIQUID

½ pound active ingredient

Fourth Cover

(10 to 14 days after Third Cover)

Pear Scab, Leaf Blight

Codling Moth

BORDEAUX	2-6-100	SEVIN (50% WP)	1 pound
	<i>or</i>		<i>or</i>
FERBAM (76% WP)	1½ pounds	SEVIN	0.5 pounds active ingredient
	<i>or</i>		<i>or</i>
CAPTAN (50% WP)	1½ pounds	GUTHION (50% WP)	½ 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 by District Horticultural agents – 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: CHLOROPROPYLATE (ACARALATE)–14; GUTHION–15; KELTHANE–7; MORESTAN–35; 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; CAPTAN–0; COPPER–0; STREPTOMYCIN – Do not apply after 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. Some fungicidal protection is obtained against Valsa infection in newly exposed cuts from the leaf curl and bloom sprays. For best results time the spray or sprays before rain occurs after pruning.

NOTE: Control of borers is essential.

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.

PRE-PLANT TREATMENT TO CONTROL PEACH TREE BORER

Check plants for Crown Gall. If plants are not infected with Crown Gall, dip trees in bundles or individually in THIODAN (EC-2) used at the rate of 5 pounds actual

per 100 gallons. Dip trees several inches above the bud scar and allow to dry before planting or returning to storage.

Dormant

DISEASES	INSECTS
Peach Leaf Curl	Climbing Cutworms
In fall after leaf drop or spring before bud swell	PARATHION (15% WP) 2 pounds
FERBAM (76% WP) 1½ to 2 pounds	<i>or</i>
<i>or</i>	PARATHION LIQUID 0.30 pounds active ingredient
BORDEAUX 6-6-100	<i>or</i>
(Use on bacterial spot susceptible varieties.)	DDT (50% WP) 1 pound, <i>plus</i>
In the spring only	PARATHION (15% WP) 1 pound, <i>or</i>
LIME SULFUR 5 gallons	PARATHION LIQUID 0.15 pounds active ingredient
	NOTE: When growth starts, spray ground 3 feet from tree trunk plus trunk and main branches thoroughly. Guthion will not control climbing cutworms.

Pink

Plant Bugs

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

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

LIME SULFUR (balloon pink only)	2 gallons
<i>or</i>	
DICHLONE (PHYGON) (50% WP)	½ pound
<i>or</i>	
SULFUR PASTE	6 pounds
<i>or</i>	
WETTABLE SULFUR	5 pounds

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

Insecticides should not be used during Bloom.

Petal Fall

1. **Brown Rot, Powdery Mildew**
2. **Bacterial Spot, Brown Rot**

Oriental Fruit Moth, Plant Bugs

1. 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.

2. On trial basis for susceptible varieties*
DODINE (CYPREX) (65% WP) ½ pound, *plus*
CAPTAN (50% WP) 1 pound

NOTE: Repeat at 7- to 10-day intervals for 5 applications to reduce leaf and fruit infection. Spray injury may result if combined with, or applied near, solvent formulations of insecticides or sulfur.

*Susceptible varieties include: Suncling, Babygold-5, Kalhaven, Suncrest, Blake, Sunhigh, and certain nectarine varieties.

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

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

* Only if necessary

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

**Powdery Mildew has been found on fruit in a number of orchards that had not been sprayed with sulfur in the early fruit development period. Symptoms are smooth, leathery, light-brown spots.

NOTE: Continue Bacterial Spot program in problem orchards.

Plum curculio, Oriental Fruit Moth

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

Control Programs for Peach Tree Borers

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

if applied as a dilute spray.

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

PEACHES

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

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

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

First Cover

(10 to 12 days after Shuck Split)

Peach Scab and Powdery Mildew

Plum Curculio, Oriental Fruit Moth

WETTABLE SULFUR 5 pounds
or
SULFUR PASTE 6 pounds

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

Second Cover

(14 days after First Cover)

Powdery Mildew

Oriental Fruit Moth

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

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

Third Cover

(14 days after Second Cover)

Peach Scab

Oriental Fruit Moth, Mites

WETTABLE SULFUR 5 pounds
or
SULFUR PASTE 6 pounds
or
CAPTAN (50% WP) 2 pounds

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

Mites
KELTHANE (35% WP) ¼ pounds
or
KELTHANE (18.5 EC) 1 quart
or
TEDION (EC 1) 1 quart

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

Fourth Cover

(10 to 14 days after Third Cover)

Brown Rot	Oriental Fruit Moth
CAPTAN (50% WP) 2 pounds	GUTHION (50% WP) ½ pound
WETTABLE SULFUR, <i>or</i> 5 pounds	GUTHION (2 #/gal. SC) 1 pint
SULFUR PASTE, <i>or</i> 6 pounds	SEVIN (50% WP) 2 pounds
	SEVIN LIQUID 1 pound active ingredient
	PARATHION (15% WP) 1½ pounds
	PARATHION LIQUID 0.23 pounds active ingredient

Pre-Harvest Covers

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

1. Brown Rot

2. Brown Rot and Rhizopus Rot

1. Same fungicides as for Fourth Cover.
2. CAPTAN (50% WP) 1 pound, *plus*
*BOTRAN (75% WP) ½ pound

Oriental Fruit Moth

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

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

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

NOTE: BOTRAN is effective on Rhizopus Rot.

Fall Soil Fumigation

See Nematode Control, page 3

Days Between Final Spray and Harvest

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

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

APRICOT SPRAYING SCHEDULE

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

Period of Bloom

(Balloon Pink Through Bloom)

DISEASES

INSECTS

Brown Rot (blossom blight)

CAPTAN (50% WP) 2 pounds

Insecticides should not be used during Bloom.

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

Petal Fall Spray

DISEASES

INSECTS

Brown Rot, Scab

CAPTAN (50% WP) 2 pounds

Shuck Split Spray

DISEASES

INSECTS

Brown Rot, Scab

Plum Curculio, Oriental Fruit Moth

CAPTAN (50% WP) 2 pounds

GUTHION (50% WP) ½ pound

or

SEVIN (50% WP) 2 pounds

or

PARATHION (15% WP) 2 pounds

First Cover Spray

(8-10 Days After Shuck Split)

DISEASES

INSECTS

Apricot Scab

Plum Curculio, Oriental Fruit Moth

Same as Shuck Split Spray

Same as Shuck Split Spray

Second Cover Spray

(8-10 Days After First Cover)

DISEASES

Apricot Scab

Same as Shuck Split Spray

INSECTS

Plum Curculio, Oriental Fruit Moth

Same as Shuck Split Spray

Summer Sprays

(Starting End of June)

DISEASES

Apricot Scab, Brown Rot

CAPTAN (50% WP) 2 pounds

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

INSECTS

Oriental Fruit Moth

SEVIN (50% WP) 2 pounds

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

or

GUTHION (50% WP) ½ pound

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

After-Harvest Spray

DISEASES

INSECTS

Peach Tree Borer

THIODAN (endosulfan) (50% WP) 1½ pound

NOTE: Thoroughly soak trunk to ground level.

Special Problems

DISEASES

INSECTS

European Red Mite

KELTHANE (35% WP) 1¼ pounds

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

or

TEDION (EC 1) 1 quart

NOTE: One Application after shuck split is permissible.

Days Between Final Spray and Harvest

Insecticides: GUTHION-21; PARATHION-14; TEDION -Not more than 2 applications after shuck split. KELTHANE -14; SEVIN-3; THIODAN-21.

Fungicides: CAPTAN-0.

PLUM AND PRUNE SPRAYING SCHEDULE

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

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

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

Delayed Dormant

Oil Schedule

DISEASES

Black Knot

ZINEB (75% WP) 2 pounds

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

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

INSECTS

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

Superior Oil, 70 second viscosity 2 gallons

NOTE: For scale control, add one pound of PARATHION (15% WP) to the oil.

*See apple schedule, Page 13. See Page 5.

Delayed Dormant

Non-Oil Schedule

Black Knot

LIME SULFUR 10 gallons

or

ZINEB (75% WP) 2 pounds

Pink

Oil Schedule

Black Knot (problem orchards)

ZINEB (75% WP) 2 pounds

Pink

Non-Oil Schedule

Black Knot (problem orchards)

European Red Mite (preventive mite program)

ZINEB (75% WP) 2 pounds

TEDION (EC 1) 1 quart

or

MORESTAN (25% WP) $\frac{1}{2}$ pound

Bloom

1. Black Knot, Brown Rot
2. Black Knot

- | | | |
|------------------------------------|-----------|---|
| 1. LIME SULFUR (early bloom) | 2 gallons | Insecticides should not be used during Bloom. |
| | <i>or</i> | |
| DICHLONE (PHYGON) (50% WP) | ½ pound | |
| | <i>or</i> | |
| WETTABLE SULFUR | 5 pounds | |
| 2. ZINEB (75% WP) | | |
| | 2 pounds | |

Petal Fall

Brown Rot, Leaf Spot

Plum Curculio, Leaf Rollers

- FERBAM (76% WP) 1 pound, *plus*
 WETTABLE SULFUR 3 pounds

- GUTHION (50% WP) ½ pound
or
 GUTHION (2#/gallon SC) 1 pint
or
 DIELDRIN (50% WP) ½ pound, *plus*
 PARATHION (15% WP) 1 pound, *or*
 PARATHION LIQUID 0.15 pounds
 active ingredient

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

Shuck Split

(Usually 10 to 14 days after Petal Fall)

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

Plum Curculio

1. FERBAM (76% WP) 1½ to 2 pounds
or
 FERBAM (76% WP) 1 pound, *plus*
 WETTABLE SULFUR 3 pounds
or
 LIME SULFUR 2 gallons
2. ZINEB (75% WP) 2 pounds

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

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

NOTE: Check compatibility of insecticides with lime sulfur.

PLUMS AND PRUNES

First Cover
(10 days after Shuck Split)

Leaf Spot	Plum Curculio
Same fungicides as Shuck Split, except LIME SULFUR	Same insecticides as for Shuck Split
LECANIUM SCALE: The young crawlers can be controlled with PARATHION (15% WP) 1½ pounds, or PARATHION LIQUID, 0.23 pounds active ingredient, or GUTHION (50% WP), ½ pound, or GUTHION (2#/gal. SC),	1 pint, applied when the crawlers are first observed (usually June 25 to July 15). Make a second application 10 to 12 days later.
PEACH TREE BORERS: For peach tree borer control, see section under Peach Spraying Schedule, page 22. Thiodan may be used up to 7 days of harvest.	MITES: If European red mites build up, spray with KELTHANE (18.5% EC), 1 quart, or TEDION (EC 1), 1 quart. Do not repeat KELTHANE application within 30 days of last application.

Second Cover
(10 to 14 days later)

Leaf Spot	Leafhoppers
FERBAM (76% WP) 1½ pounds	DDT (50% WP) 1½ pounds
	<i>or</i>
	PARATHION (15% WP) 1½ pounds
	<i>or</i>
	PARATHION LIQUID 0.23 pounds active ingredient
SPECIAL APPLE MAGGOT SPRAYS: LEAD ARSENATE—2 pounds, or GUTHION (50% WP)—½ 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 2. Brown Rot only	Apple Maggot
1. CAPTAN (50% WP) 2 pounds	See Special Apple Maggot Sprays under Second Cover.
<i>or</i>	
2. WETTABLE SULFUR 5 pounds	NOTE: See interval to harvest for lead arsenate and DDT.

Fourth Cover
(15 days before harvest)

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

Days Between Final Spray and Harvest

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

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

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

Red Tart (Sour) Cherry Spraying Schedule

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

Dormant

(1 to 2 weeks before bud break)

DISEASES

INSECTS

European Brown Rot

NOTE: In orchards north of Ottawa County along Lake Michigan, where European Brown Rot is a problem, cutting out the twigs and branches killed by the fungus will aid in blossom blight control. Pruning trees to allow for good air drainage will also help.

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

Bloom

1. European Brown Rot (Problem Orchards)
2. Common Brown Rot (Blossom Blight)

- | | |
|-------------------------------------|----------|
| 1. BORDEAUX | 4-6-100 |
| 2. DICHLONE (PHYGON) (50% WP) | ½ pound |
| <i>or</i> | |
| WETTABLE SULFUR | 5 pounds |

Insecticides should not be used during Bloom.

Petal Fall

(or when first leaves unfold)

Leaf Spot

- | | |
|----------------------------------|-----------------------|
| DODINE (CYPREX) * (65% WP) | ¼ to ⅓ pound |
| <i>or</i> | |
| GLYODIN (30% Sol.) | 1½ pints, <i>plus</i> |
| FERBAM (76% WP) | ½ pound |

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

Plum Curculio, Cherry Fruitworm, Leafrollers, Peach Twig Borer

- | | |
|------------------------------|----------------------|
| PARATHION (15% WP) | 1½ pounds, <i>or</i> |
| PARATHION LIQUID | 0.23 pounds |
| | active ingredients |
| <i>or</i> | |
| GUTHION (50% WP) | ½ pound |
| <i>or</i> | |
| GUTHION (2#/gallon SC) | 1 pint |

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

RED TART CHERRIES

First Cover

(10 to 14 days after Petal Fall)

Leaf Spot

Same fungicides as Petal Fall.

Plum Curculio, Cherry Fruitworm, Mineola Moth*, Lesser Peach Tree Borer**

Same insecticides as Petal Fall.

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

**NOTE: Lesser Peach Tree Borer has become a serious problem on tart cherry trees due to mechanical harvesting. Shaking the trees bruises and breaks the bark on the trunk and scaffold limbs, thus attracting and providing egg-laying sites for the moth. Air blast applications are not effective. Make applications with a high pressure gun using methods detailed for borer control for peaches.

Second Cover

(10 days after First Cover)

Leaf Spot

DODINE (CYPREX) (65% WP) ¼ to ⅜ pound
or
 GLYODIN (30% Sol.) 1½ pints, *plus*
 FERBAM (76% WP) ½ pound
or
 FIXED COPPER 0.75 pound actual copper, *plus*
 HYDRATED LIME 3 pounds

Plum Curculio, Mineola Moth**

GUTHION (2#/gallon SC) 1 pint
or
 GUTHION (50% WP) ½ pound
or
 SEVIN (50% WP) 2 pounds
or
 SEVIN LIQUID 1 pound
 active ingredient
or
 PARATHION (15% WP) 1½ pounds
or
 PARATHION LIQUID 0.23 pounds
 active ingredient

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

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

NOTE: Third Cover usually coincides with cherry fruit fly emergence. The emergence of cherry fruit flies will be announced by your county agricultural agent. **Timing for Mineola Moth will be announced by your county agricultural agent.

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

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

Third and Fourth Cover

(10-14 day intervals)

Leaf Spot*

Cherry Fruit Flies, Mineola Moth

Same fungicides as suggested for Second Cover

*NOTE: Where Brown Rot has been a problem, or if wet, rainy weather prevails, add CAPTAN at 1 pound or SULFUR at 3 pounds to DODINE (CYPREX) as used for Leaf Spot control. If wet weather continues, additional sprays or dusts of SULFUR or CAPTAN will be necessary.

**LEAD ARSENATE	2 pounds
	<i>or</i>
DIAZINON (50% WP)	1 pound
	<i>or</i>
GUTHION (50% WP)	½ pound
	<i>or</i>
GUTHION (2#/gallon SC)	1 pint
	<i>or</i>
SEVIN (50% WP)	2 pounds
	<i>or</i>
SEVIN LIQUID	0.5 pounds active ingredient
	<i>or</i>
PARATHION (15% WP)	1½ pounds
	<i>or</i>
PARATHION LIQUID	0.23 pounds active ingredient

**NOTE: LEAD ARSENATE is not effective against Mineola Moth adults or larvae. Use PARATHION or GUTHION (wetttable powder or liquid equivalents).

After Harvest Cover

Leaf Spot

DODINE (CYPREX) (65% WP) ¼ to ½ pound

Days Between Final Spray and Harvest

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

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

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

SWEET CHERRY SPRAYING SCHEDULE

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

DISEASES	Bloom	INSECTS
Common Brown Rot (Blossom Blight)		
BORDEAUX (early bloom)	4-6-100	
<i>or</i>		
WETTABLE SULFUR	5 pounds	
<i>or</i>		
DICHLONE (PHYGON) (50% WP)	½ pound	Insecticides should not be used during Bloom.
<i>or</i>		
SULFUR PASTE	6 pounds	
If wet weather prevails, additional sprays or dusts of PHYGON or SULFUR will be necessary.		

Petal Fall

<ol style="list-style-type: none"> 1. Leaf Spot, Brown Rot 2. Leaf Spot 	Plum Curculio, Black Cherry Aphid
<ol style="list-style-type: none"> 1. CAPTAN (50% WP) <li style="padding-left: 2em;"><i>or</i> <li style="padding-left: 2em;">FERBAM (76% WP) <li style="padding-left: 2em;">WETTABLE SULFUR 2. DODINE (CYPREX) (65% WP) 	<ol style="list-style-type: none"> 1. DIELDRLIN (50% WP) <li style="padding-left: 2em;">PARATHION (15% WP) <li style="padding-left: 2em;">PARATHION LIQUID <li style="padding-left: 2em;"><i>or</i> 2. GUTHION (50% WP) <li style="padding-left: 2em;"><i>or</i> GUTHION (2#/gallon SC)
<p>2 pounds</p> <p>1 pound, <i>plus</i></p> <p>3 pounds</p> <p>¾ pound</p> <p>NOTE: Dodine may not be compatible with Guthion emulsion if water is hard.</p>	<p>½ pound, <i>plus</i></p> <p>1 pound</p> <p>0.15 pounds</p> <p>active ingredient</p> <p>½ pound</p> <p>1 pint</p>

First Cover

(10 to 14 days later)

<ol style="list-style-type: none"> 1. Leaf Spot, Brown Rot 2. Leaf Spot 	Plum Curculio, Red-Banded Leaf Roller, Black Cherry Aphid, Mineola Moth
<ol style="list-style-type: none"> 1. Same fungicides as for Petal Fall 2. Same fungicides as for Petal Fall 	<p style="text-align: center;">Same insecticides as for Petal Fall</p> <p>NOTE: Refer to tart cherry schedule for Mineola Moth Control Programs.</p>

CONTROL PROGRAM FOR PEACH TREE BORERS

Thiodan may be used in two applications during the fruiting season but not within 21 days of harvest. On some

varieties of sweet cherries, only one application can be made and still stay within the 21-day interval to harvest.

REGULAR PEACH TREE BORER

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

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

LESSER PEACH TREE BORERS

THIODAN (50% WP), 1½ pounds per 100 gallons. Apply June 3-10 depending on harvest date of that particular variety. Apply a post-harvest spray if needed. Guthion and parathion, when used in the regular spray program, do not provide control of this insect.

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

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

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

Second Cover

(10 to 14 days later)

SWEET CHERRIES

1. **Leaf Spot, Brown Rot**

2. **Leaf Spot**

1. CAPTAN (50 % WP) 2 pounds
or
 FERBAM (76% WP) 1 pound, *plus*
 WETTABLE SULFUR 3 pounds
2. DODINE (CYPREX) (65% WP) ¼ pound

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

- GUTHION (50% WP) ½ pound
or
 GUTHION (2#/gallon SC) 1 pint
or
 PARATHION (15% WP) 1½ pounds
or
 PARATHION LIQUID 0.23 pounds
 active ingredient

Third Cover

(Based on cherry fruit fly emergence)

1. **Leaf Spot, Brown Rot**

2. **Brown Rot, Rhizopus Rot***

3. **Leaf Spot**

1. CAPTAN (50% WP) 2 pounds
or
 FERBAM (76% WP) 1 pound, *plus*
 WETTABLE SULFUR 3 pounds
2. CAPTAN (50% WP) 1 pound, *plus*
 BOTRAN (75% WP) ⅔ pound

*NOTE: BOTRAN is effective on Rhizopus Rot and is compatible with wetttable powder insecticides listed under Third Cover.

3. DODINE (CYPREX) (65% WP) ¼ pound

Cherry Fruit Flies**

- LEAD ARSENATE 2 pounds
or
 GUTHION (50% WP) ½ pound
or
 GUTHION (2#/gallon SC) 1 pint
or
 DIAZINON (50% WP) 1 pound
or
 SEVIN (50% WP) 2 pounds
or
 SEVIN LIQUID 1 pound
 active ingredient

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

Fourth Cover

(12 to 14 days after Third Cover)

1. **Leaf Spot, Brown Rot**

2. **Brown Rot and Rhizopus Rot**

3. **Leaf Spot**

Same fungicides as for Third Cover.

NOTE: Use CAPTAN (2 pounds) during harvest, if necessary. CAPTAN *plus* BOTRAN should be applied in pre-harvest and, if necessary, in harvest sprays. BOTRAN may leave a yellow residue on fruit.

Cherry Fruit Flies

Same insecticides as for Third Cover.

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

Post Harvest

Leaf Spot

- DODINE (CYPREX) (65% WP) ¼ to ⅓ pound

Peach Tree Borer, Lesser Peach Tree Borer

See section on borer control, pages 23 and 24.

Days Between Final Spray and Harvest

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

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

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

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

GRAPE SPRAYING SCHEDULE

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

Bud Swell

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

First Cover (Shoots 4 to 8 inches long)

Black Rot		
FERBAM (76% WP)	1½ pounds	No insecticides recommended in this spray.
<i>or</i>		
ZINEB (75% WP)	1½ pounds	
NOTE: Not needed if second Dead Arm spray is applied.		

Second Cover (Blossom Opening)

1. Black Rot		Grape Berry Moth	
2. Black Rot, Powdery and Downy Mildew			
1. FERBAM (76% WP)	1½ pounds	GUTHION (50% WP)	½ pound
<i>or</i>		<i>or</i>	
ZINEB (75% WP)	1½ pounds	GUTHION (2#/gallon SC)	1 pint
<i>or</i>		<i>or</i>	
2. FIXED COPPER (actual)	1½ pounds, <i>plus</i>	SEVIN (50% WP)	2 pounds
HYDRATED LIME	6 pounds	<i>or</i>	
<i>or</i>		SEVIN LIQUID	1 pound active ingredient
BORDEAUX	4-4-100	<i>or</i>	
<i>or</i>		<i>or</i>	
3. *FOLPET (PHALTAN) (50% WP)	2 pounds	DDT (50% WP)	2 pounds
*For Black Rot and Powdery and Downy Mildew control, use FOLPET (PHALTAN) on trial basis. Read the label for compatibility and cautions.		<i>or</i>	
		DDT (50% WP)	1 pound, <i>plus</i>
		PARATHION (15% WP)	1 pound, <i>or</i>
		PARATHION LIQUID	0.15 pounds active ingredient
If FIXED COPPER or BORDEAUX are used with PARATHION, GUTHION or SEVIN, spray immediately		as these materials may lose some insecticidal effectiveness when combined with LIME or in alkaline solutions.	

Third Cover (Immediately after bloom)

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		

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

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

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

Fourth Cover

(10 to 14 days after Third Cover)

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

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

Fifth Cover

(Time to be announced)

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

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

Sixth Cover

(10 to 14 days after Fifth Cover)

Grape Berry Moth

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

Seventh Cover*

(about Aug. 7)

Grape Berry Moth

Same insecticides as for Sixth Cover.

Eighth Cover*

(about Aug. 20)

Grape Berry Moth

Same insecticides as for Sixth Cover.

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

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

Days Between Last Spray and Harvest

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

Fungicides: FERBAM-7; COPPERS-0; ZINEB-7; FOL-PET (PHALTAN)-0.

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

STRAWBERRY SPRAYING SCHEDULE

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

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

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

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

Fall

DISEASES

INSECTS

Stem-end Fruit Rot, Leaf Blight

Nematode Control — See page 3.

NOTE: The registration status of MERCURY FUNGICIDES was not clear at the time this publication was prepared. Before using, consult your District or County Extension Agricultural Agent for specific material and application rate.

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

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

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

1. Spittlebug, Tarnished Plant Bug
2. Strawberry Leafroller, Spittlebug, Tarnished Plant Bug

CAPTAN (50% WP)	2 pounds
<i>or</i>	
FIXED COPPER (actual copper)	1½ pounds, plus
HYDRATED LIME	6 pounds

1. THIODAN (2 EC)	1 quart
2. DDD (50% WP)	2 pounds, plus
DIELDRIN (50% WP)	½ pound
<i>or</i>	
GUTHION (50% WP)	½ pound
<i>or</i>	
GUTHION (2#/gallon SC)	1 pint
<i>or</i>	
SEVIN (50% WP)	2 pounds
<i>or</i>	
SEVIN LIQUID	1 pound
	active ingredient

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

If two-spotted mites are a problem, include KELTHANE (35% WP), 1¼ pounds or KELTHANE (18.5% EC), 2 pints per 100 gallons.

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

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

Second Cover

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

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

- | | |
|---|---------------------------------|
| 1. CAPTAN (50% WP) 2 pounds | See schedule under First Cover. |
| <i>or</i> | |
| 2. THIRAM (THYLATE) (65% WP) 2 pounds | |

Third Cover

(Berries one-half grown)

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

Same fungicides as for Second Cover.

If insects are present in troublesome numbers, include DIAZINON (50% WP) at 1 pound GUTHION (50% WP) at ½ pound or GUTHION (2#/gallon SC) at 1 pint per 100 gallons in this application.

Pre-Harvest

(At least 10 days before harvest)

(Up to beginning of harvest)

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

Strawberry Sap Beetle

- | | |
|--|--|
| 1. CAPTAN (50% WP) 2 pounds | |
| <i>or</i> | |
| CAPTAN DUST (7.5% CAPTAN) 40 pounds/A | |
| 2. THIRAM (THYLATE) (65% WP) 2 pounds | |
| <i>or</i> | |
| THIRAM (THYLATE) DUST (7.5% THYLATE)
..... 40 pounds per acre | |

BREWERS GRAIN or CORN COB WITH MOLASSES—GUTHION (1.25%)
BAIT 40 pounds/acre

Apply bait when beetles are first noticed migrating into the planting or when first injury is noticed. Repeat treatment as necessary. Baits should be fresh and moist when applied. If ground applicators are used, concentrate the baits between the rows. **Do not apply closer than 5 days of harvest.**

During Harvest Period

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

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

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

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

Control of Cyclamen Mites

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

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

Days Between Final Spray and Harvest

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

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

BRAMBLE SPRAYING SCHEDULE

(Red Raspberries, Black Raspberries, Dewberries and Blackberries)

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

Delayed Dormant

DISEASES

1. Anthracnose (when first leaves are exposed ¼ to ¾ inch)
2. Anthracnose (when a few leaves have unfolded)

- | | |
|----------------------|------------|
| 1. LIME SULFUR | 10 gallons |
| 2. LIME SULFUR | 5 gallons |

INSECTS

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
2. Spur Blight (Red Raspberry)

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

- | | |
|--------------------------|----------|
| 1. CAPTAN (50% WP) | 2 pounds |
| 2. BORDEAUX | 3-3-100 |

- | | |
|------------------------------|---------|
| GUTHION (50% WP) | ½ pound |
| <i>or</i> | |
| GUTHION (2#/gallon SC) | 1 pint |

(Repeat BORDEAUX 10 to 14 days later.)

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

First Cover

(At Petal Fall)

Anthracnose

Aphids, Leafrollers, Cane Borers

CAPTAN (50% WP) 2 pounds

GUTHION (50% WP) ½ pound

or

GUTHION (2#/gallon SC) 1 pint

or

MALATHION (50% WP) 2 pounds

Pre-Harvest

(15 days before harvest)

Aphids, Mites (See Mite section below)

PARATHION (15% WP) 2 pounds

or

PARATHION LIQUID 0.3 pounds

active ingredient

MITES

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

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

RASPBERRY ROOT BORER

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

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

Days Between Final Spray and Harvest

Insecticides: DIAZINON–7; GUTHION–14; KELTHANE–2; MALATHION–1; PARATHION–15; TEPP–3.

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

ELGETOL 318 1 quart

Green Tip

Powdery Mildew (Gooseberries only)

LIME SULFUR 5 gallons

Thorough coverage is essential.

First Cover

(As soon as the fruit has set)

Powdery Mildew (Gooseberries only)

Currantworm, Currant Aphid

LIME SULFUR 2½ gallons

PARATHION (15% WP) 1½ pounds

or

PARATHION LIQUID 0.23 pounds
active ingredient

or

MALATHION (25% WP) 2 pounds

Second Cover

(2 to 3 weeks after bloom)

Leaf Spot (Currants and Gooseberries)*

Currantworm, Aphids

FERBAM (76% WP) 2 pounds

MALATHION (25% WP) 2 pounds

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

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

Days Between Final Spray and Harvest

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

Fungicides: FERBAM-14.

BLUEBERRY SPRAYING SCHEDULE

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

Dormant

(When buds begin to swell)

DISEASES

INSECTS

Mummy Berry

PREMERGE 1½ quarts

or

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

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

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

First Cover

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

Plum Curculio, Blueberry Tip Borer*

GUTHION (50% WP) ½ pound

or

GUTHION (2#/gallon SC) 1 pint

or

PARATHION (15% WP) 1½ pounds

or

SEVIN (50% WP) 2 pounds

or

SEVIN 4 FLOWABLE 1 quart

or

MALATHION DUST (4%) 40 pounds/acre

or

SEVIN DUST (5%) 40 pounds/acre

or

METHOXYCHLOR DUST (5%) 40 pounds/acre

*NOTE: Use PARATHION in First and Second Cover sprays for Tip Borer control.

Second Cover

(10 days after First Cover)

Plum Curculio, Cranberry Fruitworm, Blueberry Tip Borer, White Tussock Moth*

Same insecticides as for First Cover.

*NOTE: For the White Tussock Moth—Use SEVIN at 2 pounds per 100 gallons when the larvae are observed.

Third Cover

(10 days after Second Cover)

Cranberry Fruitworm

Same insecticides as for First Cover.

NOTE: If Lecanium Scale is a problem, use SEVIN at

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

Fourth and Subsequent Covers

(During Blueberry Maggot Fly emergence)

Blueberry Maggot

Same insecticides as for First Cover

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

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

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

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

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

Days Between Final Spray or Dust and Harvest

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

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

RESIDUE TOLERANCE OF PESTICIDES ON FRUITS

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

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

Rule No. 1

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

Rule No. 2

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

Rule No. 3

Do not use pesticides closer to harvest than

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

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

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

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

Table 1.—DAYS BETWEEN FINAL SPRAY AND HARVEST

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

Fungicides	Apples	Pears	Peaches	Plums and Prunes	Cherries	Grapes	Strawberries	Raspberries	Currants and Gooseberries	Blueberries	Apricot
Botran			1j		0(Sweet)j						
Captan	0	0	0	0	0	0	0	0			0
Copper (copper-lime mixtures)	h	h			h	h	h	h			
Dodine (Cyprex)	7		15		0		14				
Dichlone (Phygon)	1		7	3	3						
Ferbam	7	7		7	0	7			14		
Folpet (Phaltan)					0	0					
Glyodin	0e				7(Sour)						
Dinocap (Karathane)	21						21	7			
Mercuries							af				
Streptomycin	50k	l									
Sulfurs	h		h	h	h						
Thiram (Thylate)	0		7				3e				
Zineb	0			30		7					
Ziram	0										
Insecticides											
BHC	60a	60a	60	60a	a	a	a		a	a	
Chloropropylate	14	14									
Cygon	28	28									
DDD	30	30	30	30	30	40f	5	14	a	14	30
DDT	30	30	30	30	30	40f	c	a	a	c	42
Demeton (Systox)	21f	21f	30f	30f	f	21	21	d	d	d	30
Diazinon	14	14	20	10	10	10	5	7		7	10
Dieldrin	45	35	45	30	30	14	a,c	f	f	a	45
Endrin	f	f	f	f	f	30,46f	f				
Ethion	60f	60f	30f	21f	f	30f	2				f
Guthion	15	15	21	15	15	0	5	14		14i	21
Kelthane	7	7	14	7b	7b	7	2	2			14
Lead Arsenate	30g	30g		30g	14g,30g	a	a	a	a	a	30
Lindane	60	60	60	60	a,f	f	a		a	a	60
Malathion	3	1	7	3	3	3	3	1	1,3f	0-1f	7
Methoxychlor	7	7	21	7	7	14	3	3	14g	14	21
Morestan	35f	35f	a,e	a,e	a,e						a
Ovex	30	30	30	30	c	a	c				
Parathion	14	14	14	14	14	14	14	15	30,15f	14	14
Perthane	7	7			2						
Phosdrin	1	1	1	1	2	2	1	3			
Phosphamidon	60				f						
Sevin	1	1	1	1	1	0	1	7		0	3
Superior oil	e	e	e	e	e	e	e	e	e	e	e
Tedion	f	f	f	f	f	f	3f	f		f	f
TEPP	3	3	3	3	3	3	3	3	3	3	3
Thiodan	30f	30f	21f	21f	21f	7	4f				21f

Legend: a=Not after fruit begins to form.
 b=Do not repeat application within 30 days.
 c=Pre-bloom or Post-harvest application only.
 d=Post-harvest application only.
 e=No residue if used according to recommendations.
 f=See label restrictions on use.
 g=Remove excess residues at harvest.
 h=Sulfurs and copper plus lime mixtures are exempt if used as recommended.
 i=4 hours of harvest using 2% dust at 30 pounds per acre.
 j=May be used as Post-harvest treatment—See label directions.
 k=Do not use within 120 days of harvest at 100 ppm; 50 days of harvest at 50 ppm.
 l=Do not use after petal fall.

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

MOUSE CONTROL IN ORCHARDS

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

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

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

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

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

Warning

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

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

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

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

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

SPRAY RECORD SHEET

GROWER	YEAR 19
CROP	HARVEST DATE

DATE APPLIED	MATERIAL	RATE/APPLIED	VARIETY	COMMENTS (Weather Conditions, Etc.)

Tear out along this line

SPRAY RECORD SHEET

GROWER	YEAR
	19
CROP	HARVEST DATE

DATE APPLIED	MATERIAL	RATE/ APPLIED	VARIETY	COMMENTS (Weather Conditions, Etc.)

Tear out along this line

SPECIAL WARNING

PESTICIDE DRIFT AND CONTAMINATION OF FOOD AND FEED CROPS

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

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