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Fruit Spraying Calendar
Michigan State University Extension Service
Horticulture; Entomology; Botany and Plant Pathology
Revised April 1963
61 pages

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EXTENSION BULLETIN 154

1963
FRUIT

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SPRAYING CALENDAR



*This is a publication of the Cooperative Extension Service
with the Departments of Horticulture, Botany and
Plant Pathology, and Entomology cooperating*

**COOPERATIVE EXTENSION
SERVICE**
MICHIGAN STATE UNIVERSITY
EAST LANSING

COMPATIBILITY CHART*

| | Lead Arsenate | DDT, DDD, TDE | Methoxychlor | BHC, Lindane | Dieldrin | Kelthane | Ovex, Genite EM 923 | Chlorobenzilate | Parathion, Ethion | Systox (demeton) | Malathion, Trithion | Diazinon, Guthion | Captan | Glyodin | Phygon XL (dichlone) | Mercuries | Bordeaux | Fixed Copper | Lime sulfur | Elemental sulfur | Ferbam, Thiram | Ziram, Zineb | Niacide M | Lime | Karathane | Rotenone | Actidione | Sevin | Tedion, Mitox | Cyprex |
|----------------------|---------------|---------------|--------------|--------------|----------|----------|---------------------|-----------------|-------------------|------------------|---------------------|-------------------|--------|---------|----------------------|-----------|----------|--------------|-------------|------------------|----------------|--------------|-----------|------|-----------|----------|-----------|-------|---------------|--------|
| Lead Arsenate | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| DDT, DDD, TDE | + | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Methoxychlor | + | + | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| BHC, Lindane | + | + | + | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Dieldrin | + | + | + | + | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Kelthane | + | + | + | + | + | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Ovex, Genite EM 923 | + | + | + | + | + | + | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Chlorobenzilate | + | + | + | + | + | + | + | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Parathion, Ethion | + | + | + | + | + | + | + | + | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Systox (demeton) | + | + | + | + | + | + | + | + | + | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Malathion, Trithion | + | + | + | + | + | + | + | + | + | + | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Diazinon, Guthion | + | + | + | + | + | + | + | + | + | + | + | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Captan | + | + | + | + | + | + | + | + | + | + | + | + | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Glyodin | + | + | + | + | + | + | + | + | + | + | + | + | + | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Phygon XL (dichlone) | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Mercuries | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Bordeaux | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | + | + | + | + | + | + | + | + | + | + | + | + | |
| Fixed Copper | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | + | + | + | + | + | + | + | + | + | + | + | |
| Lime sulfur | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | + | + | + | + | + | + | + | + | + | + | |
| Elemental sulfur | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | + | + | + | + | + | + | + | + | + | |
| Ferbam, Thiram | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | + | + | + | + | + | + | + | + | |
| Ziram, Zineb | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | + | + | + | + | + | + | + | |
| Niacide M | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | + | + | + | + | + | + | |
| Lime | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | + | + | + | + | + | |
| Karathane | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | + | + | + | + | |
| Rotenone | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | + | + | + | |
| Actidione | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | + | + | |
| Sevin | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | + | |
| Tedion, Mitox | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Cyprex | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |

Q = Questionable; compatibility not clear.

N = Not compatible.

± = Decomposes on standing; residual action reduced.

+ = Materials compatible.

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

Streptomycin is most favorably applied as a separate application.

Urea formulated for foliar applications is compatible with the commonly used pesticides. However, it doesn't seem to be compatible with fixed copper or Bordeaux.

1963 FRUIT SPRAYING CALENDAR¹

*This is a publication of the Cooperative Extension Service
with the Departments of Horticulture, Botany and
Plant Pathology, and Entomology cooperating*

Much goes into the planning of an economical and effective spraying program. In fruit growing, a successful pest control schedule must be based on a knowledge of (1) the life history of the important insects and diseases likely to be encountered; (2) the various kinds of spray chemicals available, and their proper use; and (3) susceptibility of the different kinds and varieties of fruit to insect, disease and spray injury.

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

1. Tree Fruit Diseases in Michigan by E. J. Klos, Extension Bulletin E-361.
2. Small Fruit Diseases in Michigan by R. H. Fulton, Extension Bulletin E-370.
3. Fruit Insects in Michigan by A. C. Dowdy, Extension Bulletin E-372.
4. Chemical Weed Control for Horticultural Crops by S. K. Ries, H. K. Bell, H. D. Davidson, R. P. Larsen, Extension Bulletin F-241.

The pest control schedules in this publication (pages 32-52) 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 the 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 54.

¹The help and suggestions received from the district horticultural agents, the county agricultural agents, and the Extension and Research personnel in the Departments of Horticulture, Entomology, and Botany and Plant Pathology in preparing this publication have been very valuable and are gratefully acknowledged.

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 if and when poisoning symptoms occur. Early symptoms include weakness, headache, nausea, vomiting, and tightness in the chest. Never take atropine before symptoms occur; and it is not safe to give tablets by mouth to an unconscious person.

ALL AGRICULTURAL CHEMICALS

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

1. Always read the label before using sprays or dusts. Note warnings and cautions each time before opening the container.
2. Keep sprays and dusts out of the reach of children, pets and irresponsible people. Pesticides should be stored outside the home and away from food and feed.
3. Always store sprays and dusts in original containers and keep them tightly closed. Never keep them in anything but the original container.
4. Never smoke while spraying or dusting.
5. Avoid inhaling sprays or dusts. When directed on the label, wear protective clothing and masks.
6. Do not spill sprays or dusts on the skin or clothing. If they are spilled, remove contaminated clothing immediately and wash thoroughly.
7. Wash hands and face and change to clean clothing after spray-in or dusting. Also wash clothing each day before reuse.
8. Cover food and water containers when treating around livestock or pet areas. Do not contaminate fishponds.
9. Use separate equipment for applying hormone-type herbicides in order to avoid accidental injury to susceptible plants.
10. Always dispose of empty containers so that they cannot harm humans, animals or valuable plants.
11. Observe label directions and cautions to keep residues on edible portions of plants within the limits permitted by law.
12. If symptoms of illness occur during or shortly after spraying or dusting, call a physician or get the patient to a hospital immediately.

IN CASE OF POISONING.

1. *Call your physician.* NOTE TO PHYSICIAN: The table below lists Poison Control Centers in Michigan which can furnish specific information including antidotes, for various trade named poisons. Services of the Centers are intended mainly for Medical Doctors. However, offices remain open 24 hours a day and can give emergency poison treatment advice over the phone.

POISON CONTROL CENTERS

| City | Name of center and street address | Telephone | Name of director |
|--------------|---|-------------------------------|---|
| Adrian | Poison Control Center Emma L. Bixby Hospital 818 Riverside Ave. | Colfax 5-6161 | Robert Greiner, M.D. |
| Ann Arbor | Poison Control Center University Hospital 1313 E. Ann Street | Normandy 31531 Ext. 589 | George H. Lowrey, M.D. |
| Eattle Creek | Poison Control Center Community Hospital 200 Tomkins Street | Woodward 3-5521 | Sterling L. Butterfield, R. Ph., Director |
| Bad Axe | Poison Control Center Hubbard Memorial Hosp. | CO 9-6444 | Alice J. Shoemaker, R. Ph., Director |
| Bay City | Poison Control Center Mercy Hospital 100—15th Street | TWintrook 5-8511 | Theodore Norman Meyer, Pharmacist |
| Bay City | Poison Treatment Center Bay City Osteopathic Hosp. 300 Mulholland Street | TWintrook 3-9554 | Emergency Room under charge of Floor Superv'r |
| Coldwater | Poison Control Center Community Health Center of Branch County 274 E. Chicago Street | Broadway 279-9501 | John C. Heffelfinger, M.D. Office 278-2359 |
| Detroit | Poison Control Center Children's Hospital 5224 St. Antoine Street | Temple 3-1000 | Paul V. Wooley, Jr., M.D. Emily Meginnity, M.D. |
| Detroit | Poison Information Center Registrar's Office Herman Kiefer Hospital 1151 Taylor Avenue | Trinity 2-3334 | Paul T. Salchow, M.D. William G. Frederick, Sc.D. |
| Detroit | Poison Treatment Center Saratoga General Hospital 15000 Gratiot Avenue | Lakeview 6-5100 | Mr. Wm. B. Hennessey, Chief Pharmacist |

| City | Name of center and street address | Telephone | Name of director |
|--------------|--|--------------------|---|
| Flint | Poison Control Center Hurley Hospital 6th Ave. & Begole | Cedar 2-1161 | Mr. Douglas L. Vivian, R. Ph. |
| Grand Rapids | Poison Control Center Butterworth Hospital 300 Bostwick, N.E. | Glendale 1-3591 | Donald F. Waterman, M.D. |
| Grand Rapids | Poison Control Center Blodgett Memorial Hospital 1800 Wealthy, S.E. | Glendale 6-5301 | John Montgomery, M.D. |
| Grand Rapids | Poison Control Center St. Mary's Hospital 250 Cherry, S.E. | Glendale 9-3131 | Craig E. Booher, M.D. |
| Jackson | Poison Treatment Center Foote Memorial Hospital 205 N. East Street | State 3-2711 | Ethan Stone, M.D. |
| Kalamazoo | Poison Control Center Bronson Methodist Hosp. 252 E. Lovell Street | Fireside 2-9821 | H. Sidney Heersma, M.D. Mr. Wm. E. Johnson, Chief Pharmacist (Asst. Dir.) |
| Lansing | Poison Treatment Center St. Lawrence Hospital 1210 W. Saginaw Street | Ivanhoe 7-5451 | Robert F. Thimmig, M.D. |
| Lansing | Poison Treatment Center Edw. W. Sparrow Hospital 1215 E. Michigan Avenue | Ivanhoe 4-7721 | Harry C. George, M.D. |
| Lansing | Poison Treatment Center Lansing General Hospital 2800 Devonshire Avenue | Ivanhoe 5-4311 | Agnes Taft, Chief Phar- macist |
| Lansing | Poison Treatment Center Ingham Medical Hospital 401 W. Greenlawn | Ivanhoe 5-2511 | Robert C. Combs, M.D. 1023 E. Michigan Ave. |
| Lincoln Park | Poison Control Center Outer Drive Hospital 26400 Outer Drive | Dunkirk 6-0606 | W. S. Wheeler |
| Marquette | Poison Information Center St. Luke's Hospital West College Avenue | Canal 6-3511 | R. Mick, Pharmacist Thomas Bell |
| Midland | Poison Control Center Midland Hospital 4005 Orchard Drive | TE 5-6771 | B. E. Lorimer D. N. Fields, M.D. |

| City | Name of center and street address | Telephone | Name of director |
|------------|---|----------------------|--|
| Petoskey | Poison Control Center Little Traverse Hospital 416 Connable | Diamond 7-2551 | Norbert R. Wegemer Chief Pharmacist |
| Pontiac | Poison Control Center St. Joseph Mercy Hospital 900 Woodward Avenue | Federal 4-3511 | Robert J. Mason, M.D. |
| Port Huron | Poison Control Center Mercy Hospital 2601 Electric Avenue | Yukon 5-9531 | Robert Lugg, M.D. |
| Saginaw | Poison Control Center Saginaw General Hospital 1447 N. Harrison Rd. | Pleasant 853-3411 | Wm. G. Mason, M.D. |
| Saginaw | Poison Treatment Center Saginaw Osteopathic Hosp. 515 N. Michigan | PL 3-7751 | Dr. I. W. Graw, Chairman Dr. M. M. Mayne Dr. L. W. Pettygrew |
| Wayne | Poison Treatment Center Annapolis Hospital 33155 Annapolis | PA 2-4400 | House Physician on duty |
| Ypsilanti | Poison Treatment Center Beyer Memorial Hospital 28 So. Prospect | HU 2-6500 | Emergency Room Residents |

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

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

4. *For poisons that have been swallowed,* induce vomiting as soon as possible. To do this, 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. When the physician arrives, he 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.

EFFECTIVE APPLICATION OF PESTICIDES

Effective pest control is dependent upon proper application, which includes the correct amount of chemical per tree or per acre and equal

distribution of the chemical throughout the tree. Studies have shown that equal distribution is accomplished on commercially bearing trees for both dilute and concentrate spraying by setting up the sprayer so that two-thirds of the chemical mixture discharged is dispersed into the upper one-third of the tree. This is particularly important for poorly pruned trees and those 16 feet or higher.

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

When using concentrated mixtures, there is no change in the amount of actual pesticide required for pest control. Rather, it is the principle of using less water to distribute the chemical equally throughout the tree. Thus, concentrate spraying simply refers to the use of a greater amount of a given chemical per 100 gallons than is used in dilute (conventional) spraying and to the application of a correspondingly less quantity of spray mixture per tree. Remember—the same amount of pesticide is required per acre whether dilute or concentrated mixtures are employed.

The dilutions used in concentrate spraying are referred to as 2x, 3x, 4x, etc. This means that 2, 3 or 4 times the amount of chemicals is used per 100 gallons than is suggested for dilute spraying, and that only one-half, one-third, or one-fourth the amount of spray mixture is applied per tree as is suggested for conventional spraying.

To change from Dilute to Concentrate Spraying

Before setting up a sprayer for concentrate spraying, you must know the following: (1) the gallons of spray you applied per tree by conventional methods, (2) the average spread of the trees in feet, (3) the rate of travel to be used while spraying, and (4) the new concentration to be used. By applying a simple formula to these figures, you can figure the gallons per minute to be delivered by one side of the sprayer which will deposit the same amount of chemicals on the tree as when you used conventional spraying. This formula, along with an example of its use, is given below:

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

A = The new spray delivery rate for one side of the sprayer in gallons per minute, to be determined.

B = The amount of spray per tree used in dilute spraying. We will assume this to be 12 gallons per tree.

C = The rate of travel you wish to use while spraying. Assume this to be 3 miles per hour or 264 feet per minute. (88 feet per minute = 1 mile per hour. $88 \times 3 = 264$ feet per minute.)

D = Always is 2. Only one-half the tree is sprayed when passing.

E = The grower wishes to use "4x" concentration, thus $E = 4$.

F = Average spread of the trees to be sprayed; assume this to be 30 feet.

Thus, the formula will be as follows:

$$A = \frac{12 \times 264}{2 \times 4 \times 30} = \frac{3168}{240} = 13.2 \text{ gallons per minute}$$

The delivery rate for one side of the sprayer should be 13.2 gallons per minute. For two-way spraying, each side of the sprayer should deliver 13.2 gallons per minute. This would make a total 2-side delivery of 26.4 gallons a minute with the nozzles arranged on each manifold so that two-thirds of the spray volume would be delivered into the upper one-third of the tree.

If you plan to use concentrate spraying, be prepared to do some night spraying, since best results from spraying are obtained when air movement is less than 7 miles per hour.

CHEMICAL THINNING OF APPLES AND PEACHES

The continued demand for apples of certain varieties with a minimum size of not less than $2\frac{1}{2}$ inches has made blossom and fruit thinning a "must" in Michigan. High labor costs and the need for thinning during the period *Petal Fall* to 14 days after *Petal Fall* to induce annual bearing have stimulated the practice of thinning with chemicals.

The two chemicals currently suggested for use in Michigan are the naphthaleneacetic acid compounds, referred to as NAA, and naphthaleneacetamide, sold as Amid-Thin. NAA is available in acid form and as a sodium salt and is sold under such tradenames as Fruitone, and Stafast.

Thinning with NAA

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

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

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

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

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

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

Thinning with Amid-Thin

Under Michigan conditions, Amid-Thin is suggested for use at 60 parts per million at *Petal Fall*. Concentrations lower than this, as recommended by the manufacturer, have not given adequate thinning. Applying Amid-Thin *after Petal Fall* has resulted in *no* thinning; and it has caused the fruit to stick fast to the tree so that no "June drop" occurred. When this happens, there is nothing but a large crop of valueless, small apples.

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

Evaluation of Chemical Thinning

Fruits *affected* by the thinning spray (NAA or Amid-Thin) 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 difference in fruit size is very apparent 7 to 10 days after application. This makes it possible for you to determine the results of the thinning spray and 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 to 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.
 - 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 *Pre Pink* and before applying the thinning sprays, NAA may cause excessive thinning. Reduce the concentration 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 when too high concentrations are used. When conditions exist which might result in injury or loss of crop from overthinning with NAA, Amid-Thin is safer for widespread use. These decisions have to be made by the grower.

Suggestions for Thinning with Concentrated Mixtures

Fruit-thinning sprays can be applied in concentrate form with air-blast equipment. A 2x concentration is suggested in the beginning whereby you use one-half the amount of spray per tree as you would use in conventional spraying (See Concentrate Spraying, page 7).

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

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

Sevin as a Thinning Agent

Sevin has been used as an insecticide on apples in Michigan since 1957 and it was not until 1959 that a reduction in crop yield was noted when this chemical was used throughout the season, beginning at *Petal Fall*. Subsequent studies revealed that it was only the use of Sevin during the period of *Petal Fall* through *Second Cover* which caused the reduced yield, and that applications at other times in the growing season had no adverse effect.

Studies indicated that Sevin may be useful for fruit thinning. Growers evaluating Sevin for thinning purposes under local conditions 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. Applications should be made at *First Cover*. When Sevin is used at *First Cover*, do not use Sevin again at *Second Cover*; select some other insecticide. (See Apply Spraying Schedule, Page 32). After *Second Cover*, Sevin may be used without any danger of added thinning.

Work will continue in evaluating the use of Sevin for thinning purposes.

CHEMICAL THINNING OF PEACHES

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

N-1-naphthylphthalamic acid sold as Peach-Thin 322 and Nip-A-Thin has been tried experimentally and by growers in Michigan and in other states. This chemical has performed very erratically under Michigan conditions and thus cannot be suggested for thinning peaches except on a trial basis. The material should be used according to the directions on the label.

MOUSE CONTROL IN ORCHARDS

There are many different methods for controlling meadow mice in orchards. The most widely used include: wire guards around the base of the trees, baiting trails with zinc phosphide-treated cracked corn or apple slices, broadcasting zinc phosphide-treated cracked corn either from the ground or by aircraft, or spraying the orchard floor with endrin in the fall after harvest. The use of wire guards is generally restricted for use on young trees while the other procedures apply for plantings of all ages. No type of fruit tree is immune to injury by mice. Protection is an annual procedure. Each procedure will be discussed separately.

Protective Wire Guards

The placement of 1/2-inch or smaller mesh galvanized wire guards around the base of newly planted fruit trees is usually effective in protecting against mouse injury for 5 to 7 years after planting. However, it is possible for the mice to burrow under the guards or go over the guards when there is deep snow. The use of protective guards plus ground baiting is the safest procedure. The wire mesh should be cut 18 inches high and 18 to 24 inches wide so that there will be space between the guard and the tree. In this way even with the expansion of the tree the guard will be effective for 5 to 7 years. The wire should be embedded in the ground one to two inches so that the mice will have difficulty burrowing under it.

The use of aluminum foil for tree guards is questionable and may result in injury to the tree.

Baiting Stations or Trail Baiting

Baiting stations may be created by placing either bales of hay or straw, a forkful of hay, an 18 x 18-inch piece of tar paper, or a wooden slab close to the drip line of each tree late in the summer. The mice make runways under these different covers into which bait may be dropped in early fall or winter by carefully lifting the ground cover exposing the runways. Cracked corn, $\frac{3}{8}$ -inch squares of apple or carrot treated with zinc phosphide, or strychnine-treated oats, may be placed in the runways of the baiting stations. The absence of runways under the bait stations is an indication of no mouse activity in that area.

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.

Ground Sprays with Endrin

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. Even as little as 5 parts per billion will kill fish. Dropped fruit on the ground sprayed with endrin could be very poisonous to man or animal if eaten. *Thus, ground sprays of endrin should never be applied until after harvest and after all dropped fruit has been removed from the orchard.*

Endrin is used for mouse control at the rate of 350 gallons of spray mixture per acre using 0.5 to 0.6 pound of actual endrin per 100 gallons of spray. 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.

Cautions

- (a) Endrin is highly toxic — comparable to parathion. The person making the application should be extremely careful *not to come in contact* with the endrin spray mixture.
- (b) Treated areas should be posted stating that the orchard has been treated with a poison spray.
- (c) Unless properly applied, endrin is very ineffective in controlling mice.
- (d) Because of the hazard to fish, do not wash containers or pails which have contained endrin or flush out a spray tank contaminated with endrin in an area that may drain into a stream or lake.

PESTICIDE CHEMICALS AND THEIR USE

Pesticide chemicals may be classified into three groups: (1) *Fungicides* — materials used to control fungous diseases; (2) *Insecticides* — materials used to control insects; and (3) *Accessory Materials (Adjuvants)* — materials used as correctives, stickers, spreaders, activators, flocculators, and emulsifiers.

Fungicides

COPPER FUNGICIDES

Copper fungicides are usually divided into two groups: (1) Bordeaux; (2) proprietary or low-soluble copper compounds.

Bordeaux is a tank-mix of copper sulfate (bluestone or blue vitriol), hydrated lime, and water. It is identified by a characteristic formula, an example of which is 4-6-100. The "4" means 4 pounds of copper sulfate; the "6" means 6 pounds of hydrated lime; and the "100" means that the total volume of spray mixture is 100 gallons.

There are various formulae for bordeaux mixtures, such as 1-6-100, 4-2-100, 4-4-100, etc. When bordeaux is suggested in the *spraying schedules* in this publication, the first figure always refers to the amount of copper sulfate in pounds, the second figure to the amount of hydrated lime in pounds, and the third figure to the quantity of spray mixture in gallons, with the liquid always water.

Preparation of Bordeaux. There are several methods for preparing bordeaux; but the one most common is the "instant bordeaux" method. *One precaution should always be remembered in making bordeaux: Never mix concentrated solutions of copper sulfate and hydrated lime.* In such a mixture the suspended particles are coarse and do not adhere well to the fruit or foliage.

The "instant method" requires the use of copper sulfate in the "powdered" or "snow" forms. The hydrated lime should be fresh (see page 25. Make "instant bordeaux" as follows:

1. Fill the spray tank almost full of water (12 to 14 inches from the top of the tank).
2. Dissolve the amount of copper sulfate to be used in the tank of spray in a pail of water, using a porcelain pail.
3. With the agitator running, pour the dissolved copper sulfate into the tank.
4. Remove the screen of the spray tank and, with the agitator running, slowly pour the required amount of hydrated lime into the tank.
5. Add any other chemicals to be included with the bordeaux.
6. Replace the screen in the spray tank and finish filling the tank with water.

Proprietary Copper Compounds are fungicides or bactericides containing copper in a low-soluble, slowly available form. They are sold under various trade names, such as Basicop, COCS, Spray-Cop, Tennessee 26 and Tennessee 53.

Because they vary in copper content, these compounds should be used at manufacturers' directions. To guard against possible injury from soluble copper, include 1 pound of fresh hydrated lime with each 0.24 to 0.26 of a pound of actual metallic copper used in the spray mixture.

SULFUR FUNGICIDES

Elemental Sulfur means sulfur in pure form. For disease control, the sulfur is reduced to extremely small particles by mechanical grinding or by other processes. Dry, powdered sulfur which is used for dusting contains an inert material to improve the flowing properties of the sulfur. Wettable powdered sulfur is elemental sulfur varying in particle size from 4 to 40 microns with a wetting agent added. Sulfur pastes are finely divided sulfur particles, less than 5 microns, combined with enough water and wetting agent to make a paste.

In general, 4 to 6 pounds of 95 to 98% wettable sulfur are used per 100 gallons of spray. A sulfur common in Michigan is Magnetic 70 Paste. This product contains 70 percent elemental sulfur and is used at the rates of 5 to 6 pounds per 100 gallons of spray.

The adhesiveness and fungicidal value of wettable and paste sulfurs depend, within limits, upon the size of the sulfur particles and the content of sulfur in the product. Sulfur referred to as 325-mesh sulfur is coarse with a maximum allowable particle size of 40 microns (a micron is equal to 1/25,000 of an inch). Paste sulfur and some of the wettable

sulfurs have particles which range in size from 1 to 4 microns and are called microfine sulfurs.

Wettable and paste sulfurs are principally protective in their action against disease organisms. All parts of the fruit and foliage must be kept covered during infection periods.

Wettable and paste sulfurs are virtually noninjurious to apple fruit and foliage before *bloom*; but, beginning with *bloom*, they should be used with caution (see Russetting of Apples, Page 26).

However, wettable sulfurs and paste sulfurs are safe to use in all applications on peaches, plums, and cherries even under conditions injurious to apples.

Lime-sulfur is available in both the liquid and dry forms. In this bulletin the term lime-sulfur refers to commercial concentrated solutions testing 32° to 33° Baume'. Liquid lime-sulfur is a true solution consisting of caustic calcium polysulfides and thiosulfates as the toxic ingredients. The caustic action of the polysulfides kills apple scab spores which are germinating or partly established, giving the material some eradivative as well as protective properties. Soon after being exposed on the leaf surface, the polysulfides and thiosulfates break down into finely divided sulfur, which has a protective action similar to elemental sulfurs.

Lime-sulfur is suggested for the control of primary apple scab and, if present, mildew during the development period of *green-tip* to *pre-pink*. It is not suggested later in the growing season because of possible caustic injury to the foliage. While caustic to apple foliage and fruit, lime-sulfur is a mild, non-caustic fungicide when used on cherries.

The polysulfides of lime-sulfur are broken down into inert compounds by freezing, changing the color of the lime-sulfur from a reddish-orange to a brownish-black. This change in color is also associated with an unfavorable accumulation of sludge in the bottom of the lime-sulfur barrel. The fungicidal value of lime-sulfur after freezing is questionable and the material should be thrown away.

ORGANIC FUNGICIDES

Dithiocarbamates

Ferbam (ferric dimethyldithiocarbamate) is a black, bulky powder sold under such trade names as Fermate, Karbam, and Coromate. This material is suggested to control scab and leaf spot on pears, black rot on grapes and leaf spot on currants. It is as effective as elemental sulfur in controlling scab on apples. It may be used also with glyodin, Glyoxide, Cyprex and actidione as a safening agent when these chem-

icals are used with lead arsenate. One-fourth pound of ferbam is required to safen one pound of lead arsenate.

Thiram (tetramethylthiuram disulfide) is formulated as a 65% wettable powder and sold under the name of Thylate. This material is effective for the control of scab on apples and may be used on Golden Delicious without the danger of russetting the fruit. This lends itself for the control of cedar rust, replacing ferbam, without the danger of fruit injury. Thiram is also suggested for use on strawberries for the control of gray mold. This chemical does *not safen* lead arsenate.

Zineb (zinc ethylenebisdithiocarbamate) is formulated as a 65% wettable powder and is sold under the names of Dithane Z-78 and Parzate. It is particularly useful in controlling late summer diseases on apples, such as sooty blotch and fly speck. It is also suggested in the control of black rot on grapes.

Other Organic Fungicides

Actidione (B-[2-(3, 5-dimethyl-2-oxocyclohexyl)-2-2 hydroxyethyl] glutarimide) is an efficient antibiotic fungicide in killing established infections of cherry leaf spot fungus. This material is marketed in pill form, with one pill containing 0.38 of a gram or 380 milligrams of actidione. This material is suggested at the rate of 1 to 2 parts per million to control established leaf spot. One pill in 100 gallons of spray mixture equals one part per million.

Captan (N-tricholomethylmercapto-4-4 cyclohexene-1, 2-dicarboximide) is a 50% wettable powder sold as Orthocide 50 wettable and Stauffer's Captan Fungicide. This material has given good control of apple scab, cherry leaf spot on sweet cherries, brown rot on stone fruits and fruit rots on strawberries.

Captan is suggested for use on Golden Delicious and Jonathan during the period *Pink* through *Second Cover* to aid in the development of good fruit finish. Captan has caused leaf injury on Delicious in some orchards when applications have been too heavy or when used with incompatible materials. One-half pound of captan is required to safen one pound of lead arsenate.

Cyprex or dodine (n-dodecylguanidine acetate) is a good fungicide to control scab on apples and leaf spot on sour cherries.

For apples, Cyprex is suggested at the rate¹ of $\frac{3}{8}$ to $\frac{1}{2}$ pound per 100 gallons in a protective and/or eradivative schedule up to *First Cover*, changing to $\frac{1}{4}$ pound rate beginning with *Second Cover*.

Cyprex should not be used on Golden Delicious during the period of *Pink* through *Second Cover* or on Jonathan during the period of *Bloom*.

¹The $\frac{1}{4}$ -pound rate is suggested for a trial basis.

through *Second Cover* as it causes unfavorable fruit russeting. It may be used, however, after *Second Cover* with no danger of injury.

Cyprex is included in the Red Tart (sour) Cherry Spraying Schedule (Page 41) for the control of leaf spot at the rate of $\frac{1}{4}$ to $\frac{1}{2}$ pound per 100 gallons.

Dichlone (2, 3-dichloro-1, 4-naphthoquinone) is formulated as a 50% wettable powder and is sold under the name of Phygon XL. Against apple scab, it has both eradivative and protective properties. However, there is the danger of injury to the fruit of Delicious (to include the red strains) and Jonathan if used during the period of *Bloom* through *Second Cover*. On apples, it is suggested in combination with a protective fungicide. Dichlone is also favorable on cherries, peaches, prunes and plums for the control of brown rot blossom blight. It will give up to 12 hours back action against brown rot.

Glyodin (2-heptadecylglyoxalidine acetate) is a liquid fungicide sold as Crag Fruit Fungicide for use as a protective fungicide on apples to control scab and on cherries to control leaf spot. In fact, the combination of glyodin plus ferbam has performed creditably on sour cherries for the control of leaf spot. It has resulted in good finish of apples of all varieties, except Golden Delicious and Jonathan and it is not suggested for use on these two varieties during the period *Bloom* through *Second Cover* (see page 33). When lead arsenate is used with glyodin, include one-fourth pound of ferbam for each pound of lead arsenate in the spray mixture to guard against arsenical injury.

The use of glyodin in a spray program does have a suppressing effect on mites and it also is an excellent wetting or spreading agent. In fact, one-half pint of glyodin per 100 gallons gives wetting capacity equivalent to that of commercial wetting agents.

Glyoxide (heptadecylimadazoline) is a wettable powder closely related to the liquid fungicide *glyodin*. These two fungicides may be used interchangeably. When lead arsenate is included with glyoxide, add ferbam to the spray mixture at the rate of $\frac{1}{4}$ pound of ferbam to 1 pound of lead arsenate. Ten ounces of glyoxide is equivalent in fungicidal strength to 1 quart of glyodin. For all practical purposes, one might state that glyoxide is the powdered form of glyodin.

Mercury Compounds—The phenyl mercurial compounds such as Tag 331, Puratized Apply Spray, Coromerc, and Phix are useful in eradicating newly established infections of apple scab. Sprays containing mercury at the rate of one-fourth to one-half pound, or one-fourth to one-half pint of 10 percent mercury are suggested for use on apples within 36 to 72 hours after an infection-producing rain, when protection from previously applied fungicides is questionable. Actually, these

mercuries may have a longer period of action if temperatures remain low (below 50° F.) after the rain.

Mercurial compounds should not be used after an application of ferbam unless ferbam is included with the mercury. Do not use mercury in hot weather.

Mercury sprays are suggested as a dormant application on strawberries for eradicating the leaf blight (*Dendrophoma*) fungus. Mercury sprays may injure or kill old leaves, but these leaves are replaced by new leaves and will not be missed. See Strawberry Spraying Schedule, page 47.

Niacide M (formerly Vanicide M) is a mixture containing the following: 53.9 percent manganous dimethyldithiocarbamate, 10.9 percent thiram, 2.9 percent benzothiazyl disulfate, and 2.3 percent manganous benzothiazylmercaptide. It is suggested for use on apples any time throughout the growing season. Niacide M is white or light gray in color, and leaves no undesirable visible residue on the harvested fruit. Niacide M has performed well throughout the season on Golden Delicious and all other apple varieties with no unfavorable russetting.

Phybam S is a mixture of Phygon, ferbam, and sulfur containing 3 percent dichlone, 9.5 percent ferbam and 71 percent elemental sulfur. It is suggested for use on apples at 4 pounds per 100 gallons. At this strength, the spray will contain about one-eighth pound of actual dichlone (equivalent to one-fourth pound of Phygon XL), one-third pound of ferbam, and 3 pounds of sulfur. Phybam S is effective in controlling powdery mildew and as a protective fungicide against apple scab. This mixture does have back action properties against apple scab* of 24 to 30 hours.

INSECTICIDES

UNRELATED MATERIALS

Lead Arsenate is a long standing standard stomach poison suggested for the control of apple maggot and cherry fruit fly. The use of parathion with lead arsenate in the first two applications suggested for the control of apple maggot gives favorable control of second brood red-banded leafroller. Lead arsenate used in Michigan is standard acid lead arsenate and should not be used on fruits without including a corrective. (See page 25 for correctives.)

DN COMPOUNDS

DN-289 and **Elgetol 318** (dinitro-*o*-sec-butylphenyl) are DN compounds which are effective against aphids, bud moth and mineola moth as dormant applications *only*.

Genite EM-923 (2,4-dichlorophenyl ester benzene sulfonic acid) is a specific miticide which may be used during *Pink* on apples to prevent a build-up of European red mites.

CHLORINATED HYDROCARBONS

BHC (benzene hexachloride) is a contact and stomach poison suggested in the Apple Schedule at the time of *Pre-Pink* or *Pink* to control rosy aphids. This material should not be used after *Pink* since it may create an off-flavor in the harvested fruit.

The active portion of BHC is the gamma isomer. Amounts of BHC suggested in this publication are based on 11.8 percent gamma isomer content.

DDT (dichlorodiphenyl trichloroethane) is used on fruits as a wettable powder and may be combined with other spray materials, except oils and strongly alkaline mixtures. DDT controls codling moth, oriental fruit moth, leafhoppers, grape berry moth, and cutworms.

Dieldrin (hexachloroepoxyoctahydrodimethanonaphthalene) has proved very effective against the plum curculio on tree fruits and spittlebug on strawberries. It has a persistent residue and should not be applied later than 3 weeks after *Petal Fall*, on peaches, plums, or cherries nor after *Third Cover* on apples. Do not use Dieldrin after *Bloom* on strawberries.

Endrin (hexachloroepoxyoctahydro-endo, endodimethanonaphthalene), has been cleared for use on apples and pears with no allowable residue on harvested fruit. To avoid possible residue, endrin must *not* be used later than *First Cover*. Endrin is considerably more toxic to humans and warm-blooded animals than other commonly used chlorinated hydrocarbons. Extreme care should be exercised in the use of this material. All safety precautions given on the label *must* be followed precisely. Fish are especially sensitive to minute amounts of this chemical. Thus, endrin should *not* be used when sprayers are filled from streams and ponds inhabited by fish or in orchards where run-off will contaminate waters inhabited by fish. Pests against which endrin sprays are usually used include red-banded leaf roller, curculio and aphids. However, in Michigan, endrin has not been too effective against these insects.

Kelthane (1, 1-bis (chlorophenyl) trichloroethanol) is a specific miticide that has performed well in Michigan during the past six years. It is the most widely used miticide from July to harvest in Michigan. For best results, apply Kelthane when the average temperature is predicted to be above 70° F. for 5 to 7 days. Note the added information on Kelthane AP and the emulsion concentrate form on page 28.

Methoxychlor (1, 1, 1-trichloro-2, 2-bis (paramethoxyphenyl) ethane), a close relative of DDT, is also sold under the trade-name *Marlate*. It exercises control against such pests as the plum curculio, codling moth, apple maggot, and cherry fruit fly. Methoxychlor is a relatively safe chemical and can be used as close as 7 days before harvest on tree fruits.

Mitox (p-chlorbenzyl, p-chlorphenyl sulfide), a specific miticide, has proved effective for the control of European red mites in the *Pre-Bloom* period. Its action is primarily against eggs and newly hatched mites.

Ovex (para-chlorophenyl para-chlorobenzenesulfonate) is a specific miticide sold under the trade name *Ovotran*. It is effective largely against eggs and young mites. *Ovex* is virtually non-toxic to warm blooded animals and may be used as late as 30 days before harvest on apples, pears, peaches, and plums.

Tedion (2,4,5,4-tetrachlorodiphenyl sulphone) is a specific miticide formulated as a 25% wettable powder which has performed very favorably in Michigan. *Tedion* offers long residual effectiveness and a high degree of safety to man and plants. It is most effective against eggs and young mites. At present *Tedion* is usually suggested for use when mite control is necessary before July 1, with *Kelthane* suggested after July 1.

Thiodan (hexachloro-hexahydro-methano-2,4,3-benzodioxathiepin-oxide) is a new chlorinated hydrocarbon which shows considerable promise against peach tree borers. Both the lesser borer and the peach tree borer are controlled by this material. *Thiodan* is suggested for growers who have severe borer problems on peaches, plums or cherries. A period of 30 days between last application and harvest must elapse if the fruit is to be safely within tolerance limits of 2 ppm.

CHOLINESTERASE-INHIBITING COMPOUNDS

Demeton (O-(2-ethylmercapto) ethyl)-O, O-diethyl thiophosphate) commonly called *Systox*, is a systemic aphicide and miticide formulated as an emulsion concentrate. Do not use it more than three times during the growing season. At present, demeton has been cleared for use on apples, pears, peaches, cherries, grapes and strawberries. Like parathion and certain other phosphates, this chemical is highly toxic to man and precautions on the label should be followed.

Diazinon (O, O-diethyl-O-(2-isoproyl-4-methyl-pyrimidyl (6) thiophosphate) is intermediate between parathion and malathion in toxicity to humans. It is effective against a wide range of insect pests, and has

a residual action of 11 to 14 days. Diazinon is cleared for use on apples, pears, cherries, peaches, plums, strawberries and grapes.

Ethion (0,0,0¹,0¹-Tetraethyl S, S¹-Methylene bisphosphorodithioate) is a relatively new phosphate chemical showing effectiveness against mites, codling moth, leafhoppers, pear psylla and certain other fruit pests. It has been cleared for use on apples, pears, grapes, plums, peaches, and strawberries. Dosage rates vary between 1 and 2 pounds of the 25% wettable powder depending upon the crop and pest situation. Considerable variation exists among crops regarding the time interval required between last application and harvest. Read the label carefully. Ethion is suggested only on a trial basis pending more experience on its performance under Michigan conditions. It should not be used on apple varieties related to Duchess, Melba, or Wealthy because of the possibility of causing severe leaf injury and subsequent fruit drop.

Guthion (O, D-Dimethyl S-(4-oxo-1,2,3,-benzotriazinyl-3-methyl) phosphorodithioate) has been performing very favorably in Michigan orchards. Almost all common fruit insects were controlled with sprays applied at 10- to 14-day intervals.

Guthion has not performed well as a late clean-up material for mites, especially two-spotted mites.

Guthion has been cleared for use on apples, pears, peaches, cherries, plums, grapes, apricots and strawberries. To avoid prohibitive residues, do not use more than 8 applications of Guthion per season.

Experiences in Michigan to date have indicated a greater degree of fruit safety with the wettable powder than the emulsifiable formulation.

Guthion is similar to parathion in toxicity to humans.

Malathion (S-(1, 2-dicarbethoxyethyl) O, O-dimethyl dithiophosphate) is useful against many insect pests and is especially effective against many forms of aphids. Its period of effectiveness is only 2 to 3 days. Because of its short residual action, it can often be used to good advantage in late season sprays.

Parathion (O, diethyl O-p-nitrophenylthiophosphate) is highly toxic to man and animals. It has been widely used since 1949 for control of aphids, bud moth, pear psylla, curculio, codling moth, oriental fruit moth, and grasshoppers. Some effectiveness is exhibited against mites and red-banded leaf roller. No injury from this material has been observed on peaches, plums, or cherries. Apples have been injured when parathion was used in amounts greater than the dosages suggested in the Apple Spraying Schedule. Parathion can be used often to good advantage in combination with other insecticides.

Phosdrin (alpha isomer of 2-carbomethoxy-1-methylvinyl dimethyl phosphate) has given good results as a clean-up material against red-banded leaf roller. Although phosdrin controls a wide range of pests, its effectiveness lasts only about 24 hours. From this standpoint, it is more useful as a clean-up material than as a protective insecticide. Phosdrin is now labeled for most Michigan fruits. Since it is highly toxic to humans, all safety precautions and a special mask are necessary when phosdrin is used. Information on suitable respirators may be obtained from:

1. The Shell Chemical Corp., Agricultural Chemical Sales Division, 460 Park Avenue, New York 22, N. Y.
2. Acme Protection Equipment Co., 1201 Kalamazoo Street, South Haven, Mich.
3. American Optical Co., Safety Division, Southbridge, Mass.

TEPP (tetraethylpyrophosphate) has been used commercially against certain pests for several years. Its main value is that it gives quick initial kill of mites and insects and can be combined with residual miticides and other materials advantageously. TEPP may be applied as late as 72 hours before harvest. This material is highly toxic to man and should be used with extreme caution.

Trithion (O, o-diethyl S-p-chlorophenylthiomethyl phosphorodithiate) is a phosphate material showing long residual effectiveness against certain pests. In experimental plots, aphids, scales, and mites have been controlled for periods longer than three weeks with one application. Research studies indicate that Trithion is effective against other fruit pests, but the protection is for a shorter period of time—approximately 10 days. Trithion is cleared for use on most fruits. However, Trithion has injured the leaves of Delicious and has russeted the fruit of Jonathan and Golden Delicious apples in Michigan, when used after *Bloom*. Its present suggested usage is on cherries in the *Dormant* period in orchards where scale problems exist.

Sevin (1-naphthyl N-methylcarbamate), a relatively safe insecticide, controls a wide range of insects at dosage rates from 1 to 2 pounds of 50 percent wettable Sevin per 100 gallons. While not a phosphate, Sevin is classified as a cholinesterase-inhibiting compound. Its effectiveness ranges from 10 to 14 days depending on the insects to control. Sevin is not effective against mites. It is compatible with most other pesticides. Sevin offers a high degree of safety to animals and plants and gives good control of certain pests resistant to other frequently used insecticides. Sevin will be available for 1963 in the flowable and wettable powder forms.

ACCESSORY MATERIALS

“Accessory materials” are those materials added to fungicides and insecticides 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 AGENTS OR SPREADERS

Years ago, experience indicated that the action of many orchard sprays was improved by the addition of wetting agents or spreaders. Common materials—such as dried milk, casein, eggs, dried blood, fish-oil soap, laundry soap, soybean flour and lime—were used for that purpose. In recent years, synthetic chemicals have replaced these older wetting agents.

At present, it is seldom necessary for the orchardist to add such materials in the field. Occasionally—if the water is unusually hard, if hard-to-wet plants such as plum fruits are involved, or if hard-to-wet insects such as waxy aphids or mites are to be controlled—it may be helpful to add a small amount of wetting agent to the tank. Too much will cause excessive runoff.

Some materials act as spreaders (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 or spreaders, stickers are often included by the manufacturer in the formulation of the spray material. Occasionally the use of additional amounts of sticker is advised. Excessive use of stickers may cause *excessive* residues at harvest and should be used with caution.

LIQUID PESTICIDES AND SURFACTANTS OR WETTING AGENTS

In general wettable formulations of insecticides are suggested in the Spraying Schedules for the various fruits to avoid possible incompatibilities with other pesticides included in the same spray mixture. However, in certain cases the liquid formulations may be more favorable to use because of ease of handling and cost.

The use of wetting agents and adhesive agents on apples is a questionable practice because of the wide variation in chemical and physical properties of the pesticides presently available. 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 mixture, the amount of wetting agents is 2 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

added to concentrated mixtures could result in chemical injury to leaves or fruit. The liquid pesticides such as liquid parathion and liquid Guthion have higher wetting properties than the wettable powder forms. Also, the pesticides glyodin, glyoxide and Cyprex are excellent wetting agents and no commercial surfactant (wetting agent) should be included in the same spray mixture with them. When using these fungicides on apples, it is desirable to select an insecticide of wettable powder form rather than the liquid to avoid possible chemical injury.

When using a liquid insecticide, consideration should be given in selecting a fungicide of wettable powder formulation that does not have the high wetting properties of glyodin, glyoxide and Cyprex especially for use on apples. Remember too that chemicals with a narrow range of safety such Phygon XL and parathion will be more likely to cause injury when used with the liquid fungicide formulations, or when a commercial wetting agent is added to the spray mixture. Select pesticides carefully for each variety of apple 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.*

SPRAY LIME

There are several grades of hydrated lime—"mason's hydrate," "finishing hydrate," "agricultural lime," "chemical hydrate lime," and "spraying lime." The first three mentioned grades are nearly always undesirable for spraying purposes. Special spraying or chemical hydrate lime should be used.

Do not use old lime for spraying purposes. Lime that is freshly hydrated in the spring should be satisfactory for 10 to 12 weeks if stored in a dry place and not exposed to the air. Lime carried over from last season can more profitably be added to the soil than put in the spray tank. Brands of lime vary in fineness and physical properties.

Lime made from limestone composed almost entirely of calcium carbonate is called "high-calcium lime"; lime made from limestone containing a mixture of calcium and magnesium carbonates is called "dolomitic lime." Both the "high calcium" and the "dolomitic" forms are satisfactory for spraying purposes.

CORRECTIVES FOR SPRAY INJURY

COPPER INJURY

When using copper sulfate (blue vitriol) or "fixed" copper as a fungicide or bactericide, add hydrated lime to the spray mixture to prevent injury to leaves and fruit from any soluble copper that may be in solution. By adding hydrated lime to spray mixtures of copper sulfate, the resulting product is bordeaux (see bordeaux, page 14). When using

“fixed” copper, one pound of lime is added 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 also 3 pounds of hydrate lime per 100 gallons of spray.

ARSENICAL INJURY

Hydrated lime may be used with lead arsenate to safen against arsenical injury to leaves and fruit. (See lead arsenate, page 19.) However, organic fungicides which also safen against arsenical injury are replacing hydrated lime.

The following organic fungicides safen against arsenical injury when used in the same spray mixture with lead arsenate:

- 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 Cyprex will safen two pounds of lead arsenate.
- Add $\frac{1}{2}$ pound of ferbam when 2 pounds of lead arsenate are used with $\frac{1}{4}$ pound of Cyprex.

Glyodin and Thylate will *not* safen lead arsenate. When using these two fungicides with lead arsenate, reduce by one-third to one-half the amount suggested per 100 gallons and add either ferbam, captan or Niacide M in quantities required to safen the lead arsenate being used. For example, if using glyodin at $1\frac{1}{2}$ pints per 100 gallons with 2 pounds of lead arsenate, you could reduce the amount of glyodin to one pint and use with it one-half pound of ferbam as the arsenical safening agent.

RUSSETING OF APPLES BY COLD AND CHEMICALS

Golden Delicious, Jonathan and Delicious are the three commercially important apple varieties most easily russeted by certain pesticide chemicals in years when freezing air temperatures (32° F. or lower) occur close to bloom. The most critical time is the period, *Full Bloom* through *Second Cover*. The opportunity for russeting is even more acute when cool, humid, rainy weather accompanies or follows freezing temperatures.

Golden Delicious: — Ferbam, mercury, Cyprex, glyodin or glyoxide should *not* be used on this variety during the time *Pink* through *Second Cover*. Wettable sulfur or lime-sulfur may cause unfavorable russeting during the critical period if used when weather conditions are cool, humid and rainy. The most favorable hedge for good finish on Golden Delicious is to use captan beginning with *Pre-Pink* and continue its use through *Second Cover*. Experimental findings in Michigan have shown

also that Niacide M and Thylate may be used safely on this variety in a protective schedule against scab. If "back action" is necessary against possible apple scab infection, Phygon XL at $\frac{1}{4}$ pound plus captan at 1 pound per 100 gallons may be used. Remember, captan alone has "back action" of 18 to 24 hours against this organism. When using spray masts or hand guns, fog the spray into the trees. *Do not* use a coarse stream because the force of the droplets hitting the fruit will cause russeting. Dust applications on this variety during the critical period of *Pink* through *Second Cover* in place of sprays is a very favorable practice. Avoid insecticides until *First Cover* if possible and then use either wettable Guthion or methoxychlor. Do not use parathion at least until *Second Cover*, and from this time on, at no higher rate than $\frac{1}{2}$ to $\frac{3}{4}$ of a pound of 15% wettable or its equivalent per 100 gallons.

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*. Jonathan may be unfavorably russeted from the use of bordeaux or fixed copper plus hydrated lime during *Bloom* for the control of fire-blight when freezing temperatures have occurred anytime during the period *Pre-Pink* through *Bloom*. In years when the air temperature drops to 32° F. or lower at *Bloom* or shortly thereafter, use captan, Niacide M or Thylate through *Second Cover*. If back action beyond 25 hours is required to control scab, use mercury with half-strength protective fungicide providing tree development is no later than *Petal Fall*. After *Petal Fall* for "back action," use Phygon XL at $\frac{1}{4}$ pound plus captan at 1 pound per 100 gallons. If no freezing air temperatures occur at *Pink* or thereafter, any of the fungicides as suggested for apples in Michigan may be used with safety. The use of parathion at *Petal Fall* following freezing injury close to *Bloom* frequently causes undue stem cavity russeting. Delay the use of insecticides until *First Cover* except when necessary for the control of rosy aphids. At *First Cover* use wettable Guthion. Any of the pesticide chemicals suggested for apples in Michigan may be used before *Pink* and after *Second Cover* without danger of injury to the fruit.

Delicious: — Many growers in Michigan experienced unfavorable russeting of Delicious in 1960 and some in 1961. Every case these growers had used either wettable sulfur, sulfur paste, lime-sulfur or Phygon XL as a spray after *Bloom*. If freezing conditions (32° F. or lower) occur close to *Bloom* and/or if humid, rainy, cool conditions prevail after *Bloom*, the use of sulfur pesticides or over-spraying with Phygon XL will russet Delicious, including the red sports. By avoiding the use of these above mentioned chemicals applied as a spray *in* or *after Bloom*, there will be no problem of russeting of Delicious in Michigan.

NEW INSECTICIDES AND THEIR USE

Chlorobenzilate is a chlorinated hydrocarbon. In the 1962 trials it was one of the most effective miticides. There was no evidence of injury caused by this compound under the conditions used in Michigan in 1962. However, in Michigan it has caused leaf and fruit injury. In the Northwest it has caused an enlargement and blackening of the lenticels of Red and Golden Delicious apples. Pending further research, Chlorobenzilate is being recommended only on a trial basis.

Kelthane AP wettable powder is an improved formulation designed to provide more uniform distribution on foliage and fruit and more effective control of mites. This new formulation performed very well in the 1962 trials. It is registered for the same crops as the regular Kelthane wettable powder, except on strawberries and brambles. Since the Kelthane AP formulation is not cleared on strawberries and brambles, growers should use Kelthane emulsion concentrate or the regular Kelthane Wettable powder on these crops.

Phosphamidon is an organic phosphorous compound which has been proven to be highly effective as a systemic insecticide to control aphids, leafhoppers, certain beetles, plant bugs, larvae of moths and butterflies, and other insects. Aphid control has been particularly outstanding. It has been shown to be effective against both sucking and chewing insects. The full effect generally becomes evident 1 to 3 days after application. The LD-50 is 16.8 and 267 mg 1 kg. for the acute oral and acute dermal toxicity, respectively.

Sevin 4-Flowable is an extremely fine suspension of Sevin in water. When agitated or stirred, it has the consistency of a thin cream which can readily be poured or dipped from the container. On standing, Sevin 4-Flowable sets up as a light colloidal gel. Because of these jelly-like properties when at rest, this formulation does not separate or settle out on long standing. If measured out in the gel state, it should be premixed with a small amount of water in a bucket before being poured into the spray tank containing the bulk of the water for dilution. In the 1962 trials, this formulation gave comparable results and in some instances performed better than Sevin 50% wettable powder.

Tedion 18.5% emulsion concentrate is a new formulation of Tedion. In the 1962 trials in Michigan and in other fruit growing areas, this formulation was superior to the Tedion 18.5% wettable powder formulation. This formulation caused no injury under conditions in Michigan in 1962.

OILS

The oil recommended this year is a "70-second superior oil." Recent research work demonstrated that pesticidal efficiency in spray oils is related to their chemical composition. The prime consideration is paraffinicity. Other things being equal the more paraffinic the oil, the more effective it will be in pest control. This discovery led to the introduction of a so-called "superior type" spray oil. This type of oil is a highly refined, more narrow cut, oil fraction that is not only more efficient in pest control but less injurious to the trees.

The "70-second superior oil" is not a dormant oil. It is a lighter product than the original "superior" oil which was used as a dormant spray. The principal advantage of the 70-second superior oil is plant safety. It is safer because, being more volatile, it is less persistent. It will persist long enough to kill pests but not so long as to interfere seriously with plant respiration or to be present when oil-incompatible pesticides may be applied later. This means, then, that 70-second oil can be applied in the period between *green tip* and *pink*. Mite eggs are more susceptible when they are about to hatch. Under Michigan conditions, European red mite eggs begin hatching about the time the trees are in pink. Thus the closer the oil application to pink, the greater the kill of mites. With a "70-second superior oil", it will now be possible to approach applications of oil in the pink period. The addition of a phosphate *does not* increase the efficiency of the miticidal value of the oil.

The specifications for "70-second superior oil" are as follows:

| Property | 70-second Superior Oil |
|--|------------------------|
| Saybolt Universal Viscosity at 100° F..... | 66-74 seconds |
| Gravity..... | 33° API (minimum) |
| Unulfonated residue..... | 92% |
| Pour point..... | 20° F. (maximum) |
| Distillation ASTM D447 | |
| 50% point..... | 670 ± 10 F. |
| 10%—90% range (maximum)..... | 90 |

SPRAY CHEMICALS AND BASIC INFORMATION FOR THE CONTROL OF APPLE SCAB

The key to effective apple scab control is to prohibit the establishment of the fungus during the primary scab infection periods. If this disease is not controlled at this time, a grower is forced to spray longer into the summer. The table below classifies most of the scab fungicides used in Michigan.

CLASSIFICATION OF APPLE SCAB FUNGICIDES

| Protective | Eradicative | Mixtures with both eradicative and protective properties | Protectant- eradicants |
|--|--|---|---|
| Lime-sulfur Wettable sulfur Sulfur paste Ferbam Glyodin Glyoxide Captan Phygon XL (dichlone) Cyprex (dodine) | Lime-sulfur Mercurial compounds Phygon XL (dichlone) Cyprex (dodine) Captan | Sulfur, Ferbam, Glyodin, Glyoxide or Captan at half-strength combined with half-strength Phy- gon XL (dichlone). Sulfur, Glyodin, Glyoxide, Ferbam or Captan at half-strength combined with mercurial com- pounds. | Lime-sulfur Phygon XL (dichlone) Cyprex (dodine) Captan |

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

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

Half-strength organic mercuries eradicate 40-45 hours and half-strength Dichlone eradicates 30-36 hours after infection. Generally a 1/2-strength protectant is added to these chemicals.

In recent years, with the introduction of chemicals having both protectant and eradicant properties, many apple growers spray on a 5-to 7-day schedule during the primary infection period. The length of spray interval will depend on the amount of rainfall and expanded new growth during this time. The compounds used this way are lime-sulfur, Phygon XL, Captan, and Cyprex. Half-strength combinations of eradicants (mercuries or Phygon) plus 1/2-strength protectants are also used in this manner.

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

Growers should keep track of the start of a rain and average temperature and calculate from the following table the length of time it takes for infection to occur. For example, at an average temperature of 58° F. it takes 9 hours for primary infection to take place after the start of a rain. If a protective spray is not applied before or within this 9-hour period, you must rely on a chemical with 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.

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 schedules.

| Time and Pests | Materials per 100 gallons |
|--|--|
| Silver Tip to Pre-Pink | <i>Non-Oil Schedule</i> |
| <i>Sepal and leaf scab only</i> <i>Powdery mildew</i> (see page 35) | LIME SULFUR—2 gallons, or CAPTAN—2 pounds, or DODINE (CYPREX— $\frac{1}{2}$ to $\frac{1}{4}$ pound, or MERCURY— $\frac{1}{2}$ strength + $\frac{1}{2}$ strength protectant, or MERCURY—full strength (emergency) or DICHLONE (PHYGON XL)— $\frac{1}{4}$ pound + $\frac{1}{2}$ strength protectant, or GLYODIN—1 quart, or GLYOXIDE—10 ounces, or FERBAM—2 pounds, WET-TABLE SULFUR—6 pounds. (See page 14 for fungicide classification.) |
| | <i>Oil Schedule</i> |
| <i>Scab, scale, European red mite</i> | CYPREX— $\frac{1}{2}$ to $\frac{1}{4}$ pound, or GLYODIN—1 quart, or GLYOXIDE 10 ounces, or FERBAM—2 pounds plus SUPERIOR OIL 70 Sec. vis.—2 gallons. |
| <i>Rosy aphids</i> | Add BHC (11.8% gamma)—1 quart to oil and fungicide NOTE: Do not use SULFUR compounds, DICHLONE, CAPTAN or PHYBAM S with oil—*Caution—fill tanks $\frac{1}{2}$ full of water, with agitators running, adding the fungicide and BHC. Add oil after the fungicide and BHC have been mixed in the spray tank. Use emulsion concentrate of BHC in place of wettable powder. |
| Pre-Pink to Bloom | <i>Non-Oil Schedule</i> |
| <i>Fruit and leaf scab</i> | Same fungicides and rates as silver tip to pre-pink for scab, except LIME-SULFUR. |
| <i>European red mite</i> | GENITE (50% EC)—1 $\frac{1}{2}$ pints, or TEDION (25% WP)—1 pound, or TEDION (25% EC)—1 quart, or MITOX (40% WP)—1 pound. |
| <i>Rosy aphids</i> | PHOSPHAMIDON (49% EC)— $\frac{1}{2}$ pint, or SYSTOX (26% EC)— $\frac{1}{2}$ pint or BHC (12% gamma)—2 pounds. NOTE: CYPREX and SYSTOX are NOT COMPATIBLE. |
| If green fruitworms, fruit tree leafrollers or plant bugs are a problem, add DDT (50% WP)—2 pounds at the time of <i>Pre-Pink</i> or <i>Pink</i> . | |
| Period of Bloom | |
| <i>Fire blight</i> | On susceptible varieties, use BORDEAUX 2-6-100 or STREPTOMYCIN 50-100 parts per million (when maximum temperature is above 65° F.). Use 100 ppm in moderate to severe cases. <i>Dormant pruning out of larger overwintering cankers is a must.</i> For timing, see bloom schedule under pears. BORDEAUX controls scab. Use fog spray and apply only under fast drying conditions. |
| <i>Scab</i> | Use protective fungicides if scab infection periods occur. |

Apple Spraying Schedule (Continued from page 32)

| Time and Pests | Materials per 100 gallons |
|---|--|
| Petal Fall | |
| <i>Fruit and leaf scab</i> | CAPTAN—2 pounds, or CYPREX— $\frac{3}{8}$ to $\frac{1}{2}$ pound, or MERCURY + $\frac{1}{2}$ strength protectant, or MERCURY—full strength (emergency) + $\frac{1}{2}$ strength protectant, or PHYCONXL— $\frac{1}{4}$ pound + $\frac{1}{2}$ strength protectant, or GLYODIN—1 quart, or GLYOXIDE—10 ounces, or FERBAM—2 pounds, or WETTABLE SULFUR—6 pounds, |
| | <i>plus</i> |
| <i>Red-banded leaf-roller, curculio</i> | GUTHION (25% WP) 1 to 1 $\frac{1}{4}$ pounds, or DDD (50% WP)—2 pounds plus DIELDRLIN (50%)— $\frac{1}{2}$ pound. NOTE: <i>Extra scab spray may be needed between petal fall and first cover sprays. DO NOT use MERCURY compounds after petal fall.</i> *See section on Russetting of Jonathan and Golden Delicious. |
| <hr/> | |
| First Cover (10-14 days after petal fall) | |
| <i>Scab, red-banded leafroller, curculio</i> | Same fungicides and insecticides as in petal fall, <i>expect MERCURIES.</i> |
| <hr/> | |
| Second Cover (10-14 days after first cover) | |
| <i>Scab</i> | CAPTAN—1 $\frac{1}{2}$ to 2 pounds, or GLYODIN— $\frac{3}{4}$ to 1 quart, or GLYOXIDE—8 to 10 ounces or CYPREX— $\frac{1}{4}$ pound, or FERBAM—1 $\frac{1}{2}$ to 2 pounds |
| | <i>plus</i> |
| <i>Curculio, codling moth, aphids</i> | GUTHION (25% WP) 1 to 1 $\frac{1}{4}$ pounds or SEVIN (50% WP)—1 pound or SEVIN 4 FLOWABLE—1 pint, or DDT (50% WP)—1 pound + PARATHION (15% WP)—1 pound (Flowable PARATHION may be used at equivalent rates of active ingredient in place of PARATHION WP. |
| <hr/> | |
| <i>Mites</i> | Use two consecutive applications 7-10 days apart BEFORE mites build up. TEDION (25% WP)—1 pound or TEDION (25% EC)—1 quart, or KELTHANE (18.5% EC)—1 quart, or KELTHANE (18.5% WP)—2 pounds. NOTE: If adult mites are present in large numbers, add TEPP (40% EC)— $\frac{1}{4}$ pint, or TEPP (20% EC)— $\frac{1}{2}$ pint if using TEDION, or use KELTHANE (18.5% WP)—1 pound plus TEDION (25% WP)— $\frac{1}{2}$ pound, or KELTHANE (18.5% EC)—1 pint, plus TEDION (25% EC)—1 pint. <i>For use on trial basis—CHLOROBENZILATE (25% WP) 2 pounds for mites may be tried on a single tank basis, (See Page 28).</i> |

For summer control of both European red and two-spotted mites, thorough coverage in TWO CONSECUTIVE applications 7-10 days apart is necessary. After August 15, a single application should be sufficient for European red mite. However, if two-spotted mites occur in great numbers in August and September, con-

Apple Spraying Schedule (Continued from page 33)

Time and Pests

Materials per 100 gallons

secutive applications of miticides should be used. To avoid or delay resistance, growers should rotate the use of different CLASSES of miticides. For example, use oil in the early season, then in summer use either an ORGANO-PHOSPHATE, a CHLORINATED HYDROCARBON or a SULFUR-BASED compound.

Third Cover

(10 to 14 days after
second cover)

*Apple scab codling
moth, curculio,
aphids*

Same insecticides and fungicides as second cover.

Fourth Cover

(Time is announced
between June 25 to
July 15)

Scab

GLYODIN—1 pint, or FERBAM—1 pound + liquid spreader,
or CAPTAN—1 pound, or GLYOXIDE—5 ounces, or CY-
PREX— $\frac{1}{4}$ pound,

plus

*Apple maggot,
aphids*

GUTHION (25% WP) 1 to 1 $\frac{1}{4}$ pounds, or SEVIN (50%
WP)—2 pounds, or SEVIN 4 FLOWABLE—1 quart, or GU-
THION (25% WP)— $\frac{1}{2}$ pound plus SEVIN—($\frac{1}{2}$ pound of
50% WP or $\frac{1}{2}$ pint of SEVIN 4 FLOWABLE) or LEAD
ARSENATE—2 pounds + PARATHION (15% WP)—1
pound (or equivalent active ingredient of FLOWABLE
PARATHION).

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

Caution: Do Not use LEAD ARSENATE on varieties ripening before Wealthy. Use $\frac{1}{2}$ pound FERBAM if GLYODIN, GLYOXIDE or CYPREX is used with LEAD ARSENATE.

Fifth Cover

(12-14 days after
Fourth Cover)

Scab

The same fungicides and insecticides as fourth cover.

*Codling moth, red-
banded leafroller,
aphids*

Sixth Cover

(10-14 days after
Fifth Cover)

Scab,

*Codling moth, red-
banded leafroller,
aphids*

The same fungicides and insecticides as for fourth cover.

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

Two-spotted mite may attack in extreme numbers at this time. Adults may overwinter in the calyx end of the fruit. Adults of the European red mite may deposit

PEAR SPRAYING SCHEDULE

See end of schedule for intervals between final spray and harvest.

| Time and Pests | Materials per 100 gallons |
|---|---------------------------|
| <p>European red mites and two-spotted mites must be controlled to lessen leaf scorch. For European red mite control, use either program (1) dormant oil plus a miticide applied at pre-bloom; (2) a miticide applied at <i>pre-bloom</i> and at <i>petal fall</i>. (If LIME-SULFUR was used, follow program 2). For two spotted mite control, use TWO CONSECUTIVE applications of a summer miticide sprayed 7 to 10 days apart.</p> | |
| <hr/> | |
| <p>Dormant <i>Scale, European red mites, pear psylla*</i> Regular Dormant oil—3 gal. or SUPERIOR OIL—2 gallons.</p> | |
| <p>*Oil only effective against psylla when used as an egg-laying deterrent. For psylla then, oil must be applied before eggs are laid (generally about mid-April).</p> | |
| <hr/> | |
| <p>Pre-Bloom <i>Pear scab, leaf spot (green tip to bloom)</i> FERBAM — 1½ pounds, or BORDEAUX — 3-8-100 plus <i>European red mite</i> GENITE (50% EC) — 1½ pints or TEDION (25% WP) — 1 pound, or TEDION (25% EC) — 1 quart, or MITOX (40% WP) — 1 pound.</p> | |
| <p>If plant bugs, green fruitworms, or leafrollers are a problem, add DDT (50% WP) — 2 pounds per 100 gallons in the Pre-Bloom.</p> | |
| <hr/> | |
| <p>Period of Bloom (Beginning blossoms start to open) <i>Fire blight</i> BORDEAUX — 2-6-100, or STREPTOMYCIN 50 to 100 parts per million (when maximum temperature is above 65° F.) Use 100 ppm when moderate to severe conditions occur.</p> | |
| <p>Apply first spray when the first blossoms open; make second application at the time of full bloom. In some years, three sprays at 3- to 4-day intervals may be necessary during the period of bloom if wet weather prevails. To avoid fruit russeting, apply BORDEAUX during quick-drying conditions and fog the spray into the trees. STREPTOMYCIN does not control scab.</p> | |
| <hr/> | |
| <p>Petal Fall (¼ of the petals fallen) <i>Pear scab, leaf blight, pear psylla, tarnished plant bugs, curculio, green fruit worms</i> FERBAM — 1½ pounds, or BORDEAUX — 2-6-100 plus PARATHION — (15% WP) — 1 pound, or GUTHION (25% WP) 1 to 1½ pound. <i>European red mite</i> TEDION (25% WP) — 1 pound, or TEDION (25% EC) — 1 quart, or KELTHANE (18.5% WP) — 2 pounds.</p> | |
| <hr/> | |
| <p>First Cover (12-14 days after Petal Fall) <i>Pear scab, leaf spot, pear psylla, curculio</i> Same fungicides as suggested for petal fall plus PARATHION (15% WP) — 1 pound, or GUTHION (25% WP) 1 to 1½ pound.</p> | |

Pear Spraying Schedule (Continued from page 36)

| Time and Pests | Material per 100 gallons |
|---|--|
| Second Cover (12-14 days after first cover) | |
| <i>Pear scab, leaf blight</i> | FERBAM - 1½ pounds or BORDEAUX - 2-6-100 plus |
| <i>Pear psylla, codling moth, pear leaf blister mite, rust mite</i> | SEVIN - (50% WP) - 1 pound, or SEVIN 4 FLOWABLE - 1 quart. |

Note: If a dormant application of LIQUID LIME SULFUR was applied for blister mite, and rust mites are not a problem, GUTHION (25% WP) 1 to 1½ pounds, or PARATHION (15% WP) - 1 pound may be substituted for Sevin.

| | |
|---|--|
| Third Cover (10-14 days after Second Cover) | |
| <i>Pear scab, leaf blight,</i> | Same fungicides as suggested for <i>second cover</i> . |
| <i>Pear psylla, codling moth</i> | GUTHION (25% WP) 1 to 1½ pounds, or PARATHION (15% WP) - 1 pound + DDT (50% WP) - 1 pound. |

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

| | |
|---|--|
| Fourth Cover (10-14 days after third cover) | |
| <i>Pear scab, leaf blight, codling moth</i> | FERBAM - 1½ pounds, or BORDEAUX - 2-6-100 plus DDT (50% WP) - 2 pounds, or SEVIN (50% WP) - 1 pound, or SEVIN 4 FLOWABLE - 1 pint, or GUTHION (25% WP) 1 to 1½ pound. |

Note: Fungicides are not necessary in late cover sprays when good early control of scab and blight has been achieved.

| | |
|--|---|
| Fifth Cover | |
| <i>Leaf blight, scab, codling moth</i> (time to be announced - based on second brood codling moth emergence) | Same insecticides and fungicides as for <i>fourth cover</i> . |

Days Between Final Spray and Harvest

Insecticides: DDT - 30; GUTHION - 15; PARATHION - 14; KALTHANE - 7.

Fungicides: FERBAM - 7; COPPER - 0; STREPTOMYCIN UP TO PETAL FALL.

PEACH SPRAYING SCHEDULE

| Time and Pests | Materials per 100 gallons |
|---|---|
| Dormant | |
| <i>Peach leaf curl</i> | (In fall after leaf drop or spring before bud swell) FER-BAM - 1½ - 2 pounds, or BORDEAUX - 6-6-100. In spring <i>only</i> - LIME-SULFUR - 5 gallons. |
| Pink | |
| <i>Plant bugs</i> | DDT (50% WP) - 2 pounds or DIELDRIN (50% WP) - ½ pound. |
| Bloom | |
| (Balloon pink through bloom) <i>Brown rot (blossom)</i> | LIME-SULFUR (balloon pink only) - 2 gallons, or PHY-GONXL - ½ pound, or SULFUR PASTE - 6 pounds, or WETTABLE SULFUR - 5 pounds. Continue at 2-4 day intervals if wet, rainy weather prevails. |
| Petal Fall | |
| <i>Brown rot</i> | WETTABLE SULFUR - 5 pounds, or SULFUR PASTE - 6 pounds. Note: Use if brown rot control is necessary in petal fall and shuck split. |
| | <i>plus</i> |
| <i>Oriental fruit moth, plant bugs</i> | PARATHION (15% WP) - 1½ pounds or DDT (50% WP) - 1½ pounds, or SEVIN (50% WP) - 2 pounds, or SEVIN 4 FLOWABLE - 1 quart. |
| Shuck Split | |
| (Usually 10-12 days after Petal Fall) <i>Curculio, oriental fruit moth</i> | DIELDRIN (50% WP) - ½ pound + DDT (50% WP) - 1½ pounds, or PARATHION (15% WP) - 1½ pounds, or GUTHION (25% WP) 1 to 1¼ pounds, or SEVIN (50% WP) - 2 pounds, or SEVIN 4 FLOWABLE - 1 quart. |

To control lesser peach tree borer and peach tree borer, use THIODAN (50% WP) - 1 - 1½ pounds per 100 gallons, or THIODAN (25% EC) - 1 - 1½ quarts, or PARATHION (15% WP) - 2 pounds, or GUTHION (25% WP) - 1¼ pounds. Make three applications the first 10 days after the shuck split spray, the second 3 weeks later, and the third 3 weeks after the second. Multiple applications are necessary for best results; however, if a single application is to be made during the season, use THIODAN (50% WP) at 3 pounds per 100 gallons, applied 5 weeks after shuck split. Apply as a coarse dilute spray with a gun to the lower parts of scaffold limbs, crotches, and trunk to the ground. Use about one-half gallon of spray per tree at each application. DDT is not effective in controlling lesser peach tree borer. GOOD COVERAGE, PARTICULARLY OF SUSCEPTIBLE AREAS INCLUDING CROTCHES, CANKERS AND BASE OF TREE, IS A MUST FOR BORER CONTROL.

The timing of the cover sprays varies each year, depending on the development of the broods of oriental fruit moth. Dates for applying cover sprays are announced by your agricultural agent.

Peach Spraying Schedule (Continued from page 38)

| Time and Pests | Materials per 100 gallons |
|---|---|
| First Cover | |
| (10-12 days after shuck split) | |
| <i>Peach scab, brown rot, curculio, oriental fruit moth</i> | SULFUR PASTE — 6 pounds, or WETTABLE SULFUR — 5 pounds, plus DIELDRIN (50% WP) — ½ pound + DDT (50% WP) — 1½ pound, or PARATHION (15% WP) — 1½ pounds or GUTHION (25% WP) — 1 to 1¼ pounds or SEVIN (50% WP) — 2 pounds, or SEVIN 4 FLOWABLE — 1 quart, or DDT (50% WP) — 1 pound + PARATHION (15% WP) 1 pound. |
| Second Cover | |
| (14 days later) | |
| <i>Oriental fruit moth</i> | PARATHION (15% WP) — 1½ pounds, or GUTHION (25% WP) — 1 to 1¼ pounds, or SEVIN (15% WP) — 2 pounds or SEVIN 4 FLOWABLE — 1 quart, or DDT (50% WP) — 1 pound + PARATHION (15% WP) — 1 pound. |
| Third Cover | |
| <i>Brown rot, oriental fruit moth</i> | WETTABLE SULFUR — 5 pounds, or SULFUR PASTE — 6 pounds, or CAPTAN — 2 pounds plus same insecticides as for second cover. |
| <i>Caution</i> — Use only one application of DDT within 6 weeks of harvest. Do not use DDT within 30 days of harvest if peaches are to be sold as fresh fruit or are to be transported outside the state of Michigan. | |
| Fourth Cover | |
| (10-14 days later) | |
| <i>Brown rot, oriental fruit moth</i> | Same fungicides as third cover, plus GUTHION (25% WP) — 1 to 1¼ pounds, or PARATHION (15% WP) — 1½ pounds (or equivalent active ingredient of FLOWABLE PARATHION) or SEVIN (50% WP) — 2 pounds, or SEVIN 4 FLOWABLE — 1 quart. |
| Pre-Harvest Covers | Same fungicides as third cover, plus wetting agent at manufacturer's directions, plus same insecticides as for fourth cover. |
| (10-14 days after fourth cover. Repeat as often as needed until harvest) | |

Caution — Since dates of harvest of peaches will vary considerably, depending on the variety, special consideration should be given to the interval between final spray and harvest, DEPENDING ON THE CHEMICAL USED AND THE PEACH VARIETY.

Days Between Final Spray and Harvest

Insecticides: DDT — 30; DIELDRIN — 30; GUTHION — 21; PARATHION* — 14; SEVIN — 1; THIODAN — 30.

Fungicides: CAPTAN — 0; SULFUR — 0.

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

PLUM SPRAYING SCHEDULE

See end of schedule for intervals between final spray and harvest.

| Time and Pests | Materials per 100 gallons |
|--|--|
| Green Tip <i>Black knot</i> | LIME SULFUR – 10 gallons. Note: Prune out and <i>burn</i> all knots in the dormant season and repeat in early June. |
| Pink <i>European red mites</i> | GENITE (50% EC) – 1½ pints or TEDION (25% WP) – 1 pound or TEDION (25% EC) – 1 quart or MITOX (40% WP) – 1 pound. |
| Bloom <i>Black knot, brown rot</i> <i>Brown rot</i> | LIME SULFUR – 2 gallons (early bloom) or PHYGON – ½ pound, or SULFUR PASTE – 6 pounds, or WETTABLE SULFUR – 5 pounds. Use PHYGON or SULFUR as a dust or spray at 2 to 4 day intervals if wet weather prevails. |
| Petal Fall <i>Brown rot, leaf spot, leafrollers, curculio</i> | FERBAM – 1 pound plus WETTABLE SULFUR – 3 pounds. plus PARATHION (15% WP) – 1½ pounds plus DIELDRLIN (50% WP) – ½ pound. |
| If leafrollers are not a problem, use only DIELDRLIN (50% WP) – ½ pound. | |
| Shuck Split (Usually 10 to 14 days after <i>petal fall</i>) <i>Leaf spot, brown rot, black knot and/or brown rot</i> | FERBAM – 1½-2 pounds, or FERBAM – 1 pound plus WETTABLE SULFUR – 3 pounds, or LIME SULFUR – 2 gallons (check compatibility with insecticides) plus |
| <i>Mites</i> | TEDION (25% WP) – 1 pound or TEDION (25% EC) – 1 quart or KELTHANE (18-5% WP) – 2 pounds or KELTHANE (18-5% EC) – 1 quart. |
| <i>Curculio</i> | DIELDRLIN (50% WP) – ½ pound. |
| First Cover (10 days after <i>shuck split</i>) <i>Leaf spot</i> | FERBAM – 1½-2 pounds or FERBAM – 1 pound plus WETTABLE SULFUR – 3 pounds. plus |
| <i>Curculio</i> | DIELDRLIN (50% WP) – ½ pound. |

If lecanium scale is a problem, spray with PARATHION (15% WP) at 1½ pounds or GUTHION (25% WP) – 1¼ pounds when crawlers first observed (usually June 25 to July 15). Make a second application 10 to 12 days later.
For lesser peach tree borer and peach tree borer, see section on borers under peaches.

Plum Spraying Schedule (Continued from page 40)

| Time and Pests | Materials per 100 gallons |
|---------------------------------|--|
| Second Cover (10-14 days later) | |
| <i>Leaf spot</i> | FERBAM — 1½-2 pounds <i>plus</i> |
| <i>Leafhoppers</i> | DDT (50% WP) — 1½ pounds <i>or</i> PARATHION (15% WP) 1½ pounds. |

Special Apple Maggot sprays: LEAD ARSENATE — 2 pounds *or* GUTHION (25% WP) — 1¼ pounds. If maggot is a problem, the timing of sprays is the same as in the Apple Spraying Schedule.

| | |
|--------------------------------------|--|
| Third Cover (1 month before harvest) | |
| <i>Leaf spot, brown rot</i> | CAPTAN — 2 pounds. |
| <i>Brown rot only</i> | SULFUR PASTE — 6 pounds, <i>or</i> WETTABLE SULFUR — 5 pounds. |

| | |
|--|--|
| Fourth Cover (10-14 days before harvest) | |
| <i>Leaf spot, brown rot</i> | CAPTAN — 2 pounds. |
| <i>Brown rot only</i> | SULFUR PASTE — 6 pounds, <i>or</i> WETTABLE SULFUR — 5 pounds. |

Days Between Final Spray and Harvest

Insecticides: DDT — 30; DIELDRIN — 30; GUTHION — 15; KELTHANE — 7; LEAD ARSENATE — 30; PARATHION — 14; TEDION — apply no more than 4 applications after petal fall if the rate is 1 pound of TEDION (25% WP) *or* 1 quart of TEDION (25% EC) per 100 gallons.

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

RED TART (SOUR) CHERRY SPRAYING SCHEDULE

See end of schedule for intervals between final spray and harvest.

| Time and Pests | Materials per 100 gallons |
|---|--|
| Dormant | |
| <i>European brown rot</i> (1-2 weeks before bud breaks) | MONCALCIUM ARSENITE — 3 pounds. Note: Use only in problem orchards North of Ottawa County along Lake Michigan. |

Case-bearers, mineola moth, bud moth, and peach twig borer are generally controlled by sprays applied in *petal fall*. If preferred, dormant applications can be made, using DN-289 at 2 quarts *or* ELGETOL 318 at 2 quarts per 100 gallons. If these pests are a current problem, use PARATHION (15% WP) — 1 pound, *or* GUTHION (25% WP) — 1 pound, *or* DIAZINON (25% WP) — 1 pound at delayed dormant.

Red Tart Cherries Spraying Schedule (Continued from page 41)

| Time and Pests | Materials per 100 gallons |
|---|--|
| Bloom | |
| <i>European brown rot</i> (Problem orchards) | BORDEAUX — 4-6-100. |
| <i>Common brown rot and blossom blight</i> | PHYGON XL — ½ pound, or SULFUR PASTE 6 pounds, or WETTTABLE SULFUR — 5 pounds. |
| Petal Fall (or when first leaves unfold) | |
| <i>Leaf spot</i> | GLYODIN — 1½ pints <i>plus</i> FERBAM — ½ pound, or GLY- OXIDE — ½ pound <i>plus</i> FERBAM ½ pound, or CYPREX — ¼ to ½ pounds* |
| | <i>plus</i> |
| <i>Cherry fruit worms, mineola moth, case-bearers, bud moth, curculio, peach twig borer, leaf-rollers</i> | GUTHION (25% WP) 1 to 1¼ pounds, or PARATHION (15% WP) — 1½ pounds or actual parathion in flowable form. |
| Where curculio is the only insect problem, use DIELDRLIN (50% WP) at ½ pound per 100 gallons at petal fall. | |
| First Cover (10-14 days after petal fall) | |
| <i>Leaf spot, curculio</i> | Same fungicides as <i>petal fall plus</i> DIELDRLIN (50% WP) — ½ pound. |
| If Forbes scale is a problem, use GUTHION (25% WP) — 1¼ pounds, or SEVIN (50% WP) — 2 pounds, or SEVIN 4 FLOWABLE — 1 quart in the second and third cover sprays. | |
| Second Cover (10 days after first cover) | |
| <i>Leaf spot</i> | GLYODIN — 1½ pints <i>plus</i> FERBAM — ½ pound, or GLY- OXIDE — ½ pound <i>plus</i> FERBAM — ½ pound, or ACTI- DIONE — 1 part per million, or CYPREX — ¼ to ½ pound; or FIXED COPPER to give 0.75 of a pound actual COPPER <i>plus</i> HYDRATED LIME — 3 pounds. Note: ACTIDIONE IS AN ERADICANT CHIEFLY, DO NOT USE UNTIL FRUIT IS ¾-INCH IN DIAMETER. |
| <i>Curculio, cherry fruit fly**</i> | LEAD ARSENATE — 2 pounds, or DIAZINON (25% WP) — 2 pounds, or GUTHION (25% WP) 1 to 1¼ pounds, or SEVIN (50% WP) 2 pounds, or SEVIN 4 FLOWABLE — 1 quart. |

*CYPREX at ¼ pound in most years will control leaf spot when proper timing and thorough coverage is practiced. Use ½ pound — FERBAM when ACTIDIONE or ¼ pound of CYPREX is used with LEAD ARSENATE.

**Second Cover usually coincides with cherry fruit fly emergence. The emergence of cherry fruit fly will be announced by your county agricultural agent.

Red Tart Cherries Spraying Schedule (Continued from page 42)

Time and Pests

Materials per 100 gallons

If DIAZINON, GUTHION, or SEVIN are mixed with fixed COPPER and LIME, spray immediately, since their effectiveness will be reduced if left standing in the tank.

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

Third Cover

Leaf spot, cherry fruit fly

The same fungicides and insecticides as for *second cover*.

Do not use LEAD ARSENATE within 30 days of harvest for cherries to be sold on the fresh market or to be transported outside Michigan. Cherries processed in Michigan may be sprayed with LEAD ARSENATE as late as 14 days before harvest. Cherries sold as fresh fruit that have been treated with LEAD ARSENATE 30 days before harvest may have to be washed to comply with the established tolerance.

After Harvest Cover

Leaf spot

BORDEAUX — 4-6-100, ACTIDIONE — 2 parts per million, CYPREX — $\frac{1}{4}$ to $\frac{1}{2}$ pound.

Days Between Final Spray and Harvest

Insecticides: DIAZINON — 10; DIELDRIN — 30; GUTHION — 15; LEAD ARSENATE — 30 (fresh fruit) — 14 (Processing); SEVIN — 1.

Fungicides: ACTIDIONE — 4; COPPERS — 0; CYPREX — 0; FERBAM — 7; GLYODIN — 7; GLYOXIDE — 7.

SWEET CHERRY SPRAYING SCHEDULE

See end of schedule for intervals between final spray and harvest.

Time and Pests

Materials per 100 gallons

Bloom

Common brown rot Blossom blight

Early Bloom — BORDEAUX — 4-6-100, or PHYGON XL $\frac{1}{2}$ pound, or WETTABLE SULFUR — 5 pounds, or SULFUR PASTE — 6 pounds. If wet weather prevails, additional sprays or dusts of PHYGON or SULFURS will be necessary.

Petal Fall

Leaf spot and brown rot

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

Curculio, black cherry aphid

DIELDRIN (50% WP) — $\frac{1}{2}$ pounds *plus* PARATHION (15% WP) — 1 pound, or GUTHION (25% WP) — 1 to $1\frac{1}{4}$ pound.

Sweet Cherry Spraying Schedule (Continued from page 43)

| Time and Pests | Materials per 100 gallons |
|--|---|
| First Cover (10-14 days later) <i>Leaf spot and brown rot curculio, black cherry aphid, red banded leaf-roller</i> | Same fungicides and insecticides as <i>petal fall</i> . |
| <p>Lesser peach tree borer and peach tree borer cause serious injury to cherry trees. Treatment is complicated because of the reduced interval between treatment dates and harvest. Spray all bark areas from ground level to scaffold limbs with THIODAN (50% WP) at 1½ pound per 100 gallons at 5 weeks before harvest and repeat again 3 weeks before harvest. Or, spray 4 weeks before harvest and repeat at 15 days before harvest, using GUTHION (25% WP) at 1 pound or PARATHION (15% WP) at 2 pounds per 100 gallons. Immediately after harvest, treat with THIODAN (50% WP) at 1½ pounds per 100 gallons. Multiple applications are needed for best results; however, if only a single application is to be made during the season, use THIODAN (50% WP) at 3 pounds per 100 gallons, applied 4 weeks before harvest. CONTROL DEPENDS UPON GOOD SPRAY COVERAGE.</p> | |
| Second Cover (10-14 days later) <i>Leaf spot and brown rot</i> | Same fungicides as <i>petal fall</i> . plus GUTHION (25% WP) 1 to 1½ pound; or PARATHION (15% WP) – 1½ pound. |
| Third Cover (Based fruit fly emergence) <i>Leaf spot and brown rot</i> | Same fungicides as <i>petal fall</i> or WETTABLE SULFUR – 5 pounds, or SULFUR PASTE – 6 pounds. plus LEAD ARSENATE – 2 pounds with corrective or GUTHION (25% WP) – 1 to 1½ pound, or DIAZINON (25% WP) – 2 pounds. |
| <p>When LEAD ARSENATE is used with WETTABLE SULFUR and SULFUR PASTE, include ½ pound of FERBAM as a corrective for each 2 pounds of LEAD ARSENATE. No arsenical corrective is needed when using CAPTAN or FERBAM. The timing of spray applications for cherry fruit fly will be announced by your county agricultural agent.</p> | |
| Fourth Cover (12-14 days after Third Cover) <i>Leaf spot and brown rot</i> <i>Brown rot</i> | Same fungicides as <i>petal fall</i> , or Same fungicides as third cover. plus Same insecticides as third cover. |

Sweet Cherry Spraying Schedule (Continued from page 44)

| Time and Pests | Materials per 100 gallons |
|------------------|--|
| Post Harvest | |
| <i>Leaf spot</i> | FERBAM - 1½ to 2 pounds, or ACTIDIONE - 1 to 2 parts per million, or CYPREX - ¼ to ½ pounds. |
| <i>Borers</i> | See directions in first cover. |

Days Between Final Spray and Harvest

Insecticides: DIAZINON - 10, DIELDRIN - 30; GUTHION - 15; LEAD ARSENATE - 14* (30); PARATHION - 14; THIODAN - 21.

Fungicides: SULFURS - 0; CAPTAN - 0; FERBAM - 7.

* () interval if sold outside the state or for fresh fruit.

GRAPE SPRAYING SCHEDULE

See end of schedule for intervals between final spray and harvest.

| Time and Pests | Materials per 100 gallons |
|--|---|
| Bud Swell | |
| <i>Grape flea beetle, climbing cutworms</i> | DDT (50% WP) - 2 pounds. |
| <i>Dead arm</i> (when shoot growth is 1-2 inches, and repeat when shoot growth is 4-6 inches.) | CAPTAN - 2 pounds (100 gallons per acre). Note: THIS IS TO CONTROL CURRENT CANE AND LEAF INFECTION IN PROBLEM VINEYARDS. |
| First Cover (Shoots 4-8 inches long) | |
| <i>Black rot</i> | FERBAM - 1½ pounds or ZINEB - 1½ pounds. Not needed if second Dead Arm spray is applied. |
| Second Cover (Blossom opening) | |
| <i>Black rot</i> | FERBAM - 1½ pounds, or ZINEB - 1½ pounds. |
| <i>Black rot, powdery and downy mildew</i> | FIXED COPPER - (1½ pounds actual copper) + 6 pounds HYDRATED LIME, or BORDEAUX - 4-4-100. <i>plus</i> |
| <i>Berry moth</i> | DDT (50% WP) - 1 pound + PARATHION (15% WP) - 1 pound. |

If using FIXED COPPER or BORDEAUX, spray immediately after mixing, since these materials will reduce the effectiveness of the insecticides when left standing in the spray tank.

Grape Spraying Schedule (Continued from page 45)

| Time and Pests | Materials per 100 gallons |
|---|--|
| Third Cover (Immediately after bloom) | |
| <i>Black rot</i> | Same fungicides as second cover <i>or</i> |
| <i>Black rot, powdery and downy mildew</i> | Same fungicides as second cover <i>plus</i> |
| <i>Berry moth, leaf-hopper, rose chafer*</i> | Same insecticides as for second cover. |
| <hr/> | |
| Fourth Cover (10-14 days after Third Cover) | |
| <i>Black rot</i> | Same fungicides as second cover. <i>or</i> |
| <i>Black rot, powdery and downy mildew</i> | Same fungicides as second cover <i>plus</i> |
| <i>Berry moth, leaf-hopper, rose chafer*</i> | Same insecticides as for second cover. |
| <hr/> | |
| * If rose chafers are a problem, use DDT (50% WP) — 2 pounds, <i>plus</i> PARATHION (15% WP) — 1 pound. | |
| <hr/> | |
| Fifth Cover (Time to be announced) | |
| <i>Black rot</i> | FERBAM — 1½ pounds, <i>or</i> ZINEB — 1½ pounds. <i>plus</i> |
| <i>Leafhopper, berry moth</i> | GUTHION (25% WP) — 1½ pounds, <i>or</i> SEVIN (50% WP) — 2 pounds, <i>or</i> SEVIN 4 FLOWABLE — 1 quart, <i>or</i> SEVIN (50% WP) — 1 pound + DDT (50% WP) — 1 pound, <i>or</i> SEVIN 4 FLOWABLE — 1 pint + DDT (50% WP) — 1 pound, <i>or</i> PARATHION (15% WP) — 1 pound + DDT (50% WP) — 1 pound. |
| <hr/> | |
| Timing for second brood berry moth is announced by your county agricultural agent. | |
| <hr/> | |
| Sixth Cover (10-14 days after fifth cover) | |
| <i>Berry moth</i> | GUTHION (25% WP) — 1½ pounds, <i>or</i> SEVIN (50% WP) — 2 pounds <i>or</i> SEVIN 4 FLOWABLE — 1 quart. |
| <hr/> | |
| Seventh Cover** (about Aug. 7) | |
| <i>Berry moth</i> | SEVIN (50% WP) — 2 pounds <i>or</i> SEVIN 4 FLOWABLE — 1 quart, <i>or</i> GUTHION (25% WP) — 1 pound. |

Grape Spraying Schedule (Continued from page 46)

| Time and Pests | Materials per 100 gallons |
|----------------------------------|--|
| Eight Cover** (about Aug. 20) | |
| Berry moth | SEVIN (50% WP) — 2 pounds or SEVIN 4 FLOWABLE — 1 quart, or GUTHION (25% WP) — 1 pound. |

**Seventh and eighth cover sprays are necessary only when third brood berry moth is present. Check vineyard for third brood. Need for these covers will be announced by your county agricultural agents.

Days Between Last Spray and Harvest

Fungicides: FERBAM — 7; COPPERS — 0; ZINEB — 7.

Insecticides: DDT — 40; GUTHION — 10; PARATHION — 14; SEVIN — 0.

STRAWBERRY SPRAYING SCHEDULE

See end of schedule for intervals between final spray and harvest.

| Time and Pests | Materials per 100 gallons |
|--|---------------------------|
| <p>To reduce white grub and root weevil injury and to avoid root aphid injury in strawberry plantings — Just before planting, treat the upper 3 inches of soil with ALDRIN, CHLORDANE or DIELDRIN, at the rate of 5 pounds actual ALDRIN, DIELDRIN, or 10 pounds actual CHLORDANE per acre. These insecticides may be applied as dusts, sprays, granular formulations or insecticide-fertilizer mixtures. The chemical should be broadcast (sprayed, dusted or drilled) and thoroughly mixed with the soil immediately after the application is made. About 40 percent of the effectiveness may be lost in 5 hours if the chemical is allowed to remain 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.</p> | |

Fall

| | |
|------------------------------------|---|
| Stem-end fruit rot, leaf blight | MERCURY fungicide at manufacturer's full strength rate for apple scab control. Susceptible varieties: Dnnlap, Fairland, Jerseybelle, Redcrop, Redglow, Robinson and Sparkle (Paymaster). Note: Apply when plants are completely dormant and before mulching. Thorough coverage is essential — use 200 gallons per acre. |
|------------------------------------|---|

Spring

| | |
|--|---|
| Stem-end fruit rot, 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. |
|--|---|

Strawberry Spraying Schedule (Continued from page 47)

| Time and Pests | Materials per 100 gallons |
|---|---|
| First Cover (New leaves expanded and blossom buds visible). | |
| <i>Stem-end fruit rot, leaf blight, leaf spot</i> | FIXED COPPER – 1½ pounds actual COPPER + HYDRATED LIME – 6 pounds, or CAPTAN – 2 pounds. <i>plus</i> |
| <i>Spittlebug</i> <i>Tarnished plantbug, leafroller</i> | GUTHION (25% wettable) – 1 pound, or DDD (50% Wettable) – 2 pounds + DIELDRIN (50% Wettable) – ½ pound. |

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

If FIXED COPPER and LIME is used with GUTHION, spray immediately.

If insects were controlled in the *first cover*, an insecticide may not be necessary in the *second cover*.

| | |
|--|--|
| Second Cover (4-5 days after spittlebug hatch) | |
| <i>Gray mold, leaf blight</i> | CAPTAN – 2 pounds. |
| <i>Gray mold</i> | THYLATE – 2 pounds <i>plus</i> |
| <i>Spittlebug, tarnished plant bug, leafroller</i> | GUTHION (25% Wettable) – 1 to 1½ pounds, or SEVIN (50% Wettable) – 2 pounds or SEVIN 4 FLOWABLE – 1 quart. |

| | |
|---|---------------------------------|
| Third Cover (Berries one-half grown) | |
| <i>Gray mold, leaf blight</i> | Same fungicide as second cover. |
| <i>Gray mold</i> | Same fungicide as second cover. |

| | |
|--|---|
| Pre-Harvest Cover (At least 10 days before harvest) | |
| <i>Gray mold, leaf blight</i> | CAPTAN – 2 pounds, or CAPTAN DUST (7.5% CAPTAN) 40 pounds per acre – |
| <i>Gray mold</i> | THYLATE – 2 pounds, or THYLATE DUST (7.5% THYLATE) at a rate of 40 pounds per acre. |

If insects are present in troublesome numbers, include DIAZINON (25% wettable) at 2 pounds or GUTHION (25% wettable) at 1½ pounds per 100 gallons in this application.

Strawberry Spraying Schedule (Continued from page 48)

| Time and Pests | Materials per 100 gallons |
|--|---|
| During Harvest Period <i>Gray mold</i> <i>fruit rot,</i> <i>leaf diseases</i> | Same fungicides as suggested in pre-harvest sprays. |
| Note: During harvest, rainy periods are conducive to gray mold fruit rot development. If THYLATE is applied within three days of harvest, residues must be removed by washing. CAPTAN may be used up to harvest. | |

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

Days Between Final Spray and Harvest

Insecticides: DDT - 5, DIELDRIN - Use only before *bloom* or after harvest in bearing plantings. GUTHION - 5, SEVIN - 1.
Fungicides: CAPTAN - 0, THYLATE - 3. Remove residues of THYLATE from strawberries by washing if application is made within 3 days of harvest.

BRAMBLE SPRAYING SCHEDULE

See end of schedule for intervals between final spray and harvest
 Red Raspberries, Black Raspberries, Dewberries and Blackberries.

| Time and Pests | Materials per 100 gallons |
|--|---|
| Delayed Dormant <i>Anthracnose</i> (First leaves exposed $\frac{1}{2}$ - $\frac{3}{4}$ inch. <i>or</i> | LIME SULFUR - 10 gallons <i>or</i> |
| When a few leaves have unfolded from the bud. | LIME SULFUR - 5 gallons. |
| Caution: If unable to apply the first-mentioned eradivative 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 time. | |
| Pre-Blossom (when blossom buds are breaking or new canes 6 - 8 inches long) <i>Anthracnose</i> | CAPTAN - 2 pounds. |

Bramble Spraying Schedule (Continued from page 49)

| Time and Pests | Materials per 100 gallons |
|---|---|
| <p><i>Spur blight</i> (red raspberry)</p> | <p>BORDEAUX – 3-3-100 followed by a second spray 10-14 days later,</p> <p style="text-align: center;"><i>plus</i></p> |
| <p><i>Leafroller, sawfly,</i> <i>fruit worm, cane</i> <i>borers</i></p> | <p>GUTHION (25% WP) – 1-1 pounds.</p> |
| <p>If BORDEAUX is used with GUTHION, spray immediately.</p> | |
| <p>First Cover (at petal fall)</p> | |
| <p><i>Anthracnose</i></p> | <p>CAPTAN – 2 pounds,</p> <p style="text-align: center;"><i>plus</i></p> |
| <p><i>Aphids, leafrollers,</i> <i>cane borers</i></p> | <p>GUTHION (25% WP) – 2 pounds <i>or</i> MALATHION (25% WP) – 2 pounds.</p> |
| <p>Pre-Harvest (10-15 days before harvest)</p> | |
| <p><i>Aphids, leafrollers,</i> <i>cane borers</i></p> | <p>MALATHION (25% WP) – 2 pounds <i>or</i> GUTHION (25% WP) – 1 to 1 pounds.</p> |
| <p>Post-Harvest (5 to 10 days after harvest)</p> | |
| <p><i>Aphids, mites</i></p> | <p>PARATHION (15% WP) – 2 pounds <i>or</i> the equivalent active ingredient of FLOWABLE PARATHION.</p> |

The need for this application is determined by observation of pests. Do *not* use PARATHION on brambles at any other time.

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

Days Between Final Spray and Harvest

Insecticides: GUTHION 14, MALATHION 1

Fungicides: CAPTAN 0.

CURRANT AND GOOSEBERRY SPRAYING SCHEDULE

See end of schedule for intervals between final spray and harvest.

| Time and Pests | Materials per 100 gallons |
|---|---|
| <p>Dormant (for both currants and gooseberries)</p> | <p>DN-289 – 1 quart, <i>or</i> ELGETOL 318 – 1 quart.</p> |

Bramble Spraying Schedule (Continued from page 50)

| Time and Pests | Materials per 100 gallons |
|---|---|
| Green Tip (For gooseberries only) <i>Powdery mildew</i> | Eradicative application LIME-SULFUR — 5 gallons THOROUGH COVERAGE IS ESSENTIAL FOR GOOD CONTROL OF POWDERY MILDEW. |
| First Cover (As soon as the fruit has set) (For gooseberries only) <i>Powdery mildew</i> | Eradicative and protective LIME-SULFUR — 2½ gallons <i>plus</i> PARATHION (15% wettable) — 1½ pounds, or MALATHION (25% wettable) — 2 pounds. |
| <i>Currantworm, aphids</i> | PARATHION (15% wettable) — 1½ pounds, or MALATHION (25% wettable) — 2 pounds. |
| Second Cover (2 to 3 weeks after bloom) (For both currants and gooseberries) | |
| <i>Leaf spot*</i> | FERBAM — 2 pounds <i>plus</i> |
| <i>Currantworm, aphids</i> | MALATHION (25% wettable) — 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

See end of schedule for intervals between final spray and harvest.

| Time and Pests | Materials per 100 gallons |
|---|--|
| Dormant (when buds begin to swell) <i>Mummy berry</i> | PREMERGE — 1½ quarts, or rake and cultivate planting floor to cover the mummified berries, or broadcast AERO CALCIUM CYANAMID (57% special grade 150-200 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, <i>do not</i> use aero calcium cyanamid dust. | |
| First Cover (Immediately after bloom or as soon as curculio is active) <i>Curculio, tip borer</i> | SEVIN (50% WP) — 2 pounds, or SEVIN 4 — 1 quart, or GUTHION (25% WP) — 1 to 1¼ pounds, or PARATHION (15% WP) — 1½ pounds or either METHOXYCHLOR DUST (5%) or SEVIN DUST (5% or MALATHION DUST (4%) at 40 pounds per acre. |
| Second Cover (10 days after <i>first cover</i>) <i>Curculio, fruit worm, tip borer</i> | Same insecticides as <i>petal fall</i> . |
| Third Cover (10 days after <i>second cover</i>) <i>Fruit worm</i> | Same insecticides as <i>petal fall</i> . |
| 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 Cover (When fruit fly appears) <i>Fruit fly</i> | The same chemicals are suggested as for <i>third cover</i> . |

The time to make this 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.

Days Between Final Spray or Dust and Harvest

Insecticides: GUTHION — 14; MALATHION — 1; PARATHION — 14; SEVIN — 0.

RESIDUE TOLERANCES OF PESTICIDES ON FRUITS

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

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

- Rule 1. Do not use dosage rates *above* those suggested in the spraying schedule for the specific fruits, or in the table on pages 54 to 58.
- Rule 2. Do not use pesticides and growth regulators on crops not cleared by the Food and Drug Administration.
- Rule 3. Do not use pesticides closer to harvest than suggested in the spraying schedules for specific fruits, or in the table on pages 54 to 58.

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 tabulated on pages 54 to 58 is up-to-date as of January 1, 1963. Minor changes may occur during the growing season. County agricultural agents will be notified when these occur.

Pesticides suggested for use in this table are grouped into the following chemical classes: Unrelated Materials, Chlorinated Hydrocarbons, Cholinesterase-Inhibiting Compounds, and Carbamate Compounds.

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

POSSIBLE DANGER FROM PESTICIDES DRIFT

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

TABLE 1 — RESIDUE INFORMATION CONCERNING USE OF PESTICIDES ON FRUITS
FUNGICIDES

| Material (Common Formulation) | Tolerance (parts per million by weight) * | Maximum dosage rate per 100 gallons of spray† | Days between final spray and harvest | Crops | Remarks |
|----------------------------------|---|---|--|--|--|
| <i>Unrelated Materials</i> | | | | | |
| Lead arsenate (97%)..... | 7 | 2 lb. | 30 | Apples, cherries, peaches, pears, plums | Cherries to be processed in Michigan may be sprayed with lead arsenate up to 14 days of harvest. Rotenone and Ryania are exempt from the requirement of a tolerance, but should not be used within one day of harvest. |
| Rotenone (4% W.P.)..... | | | 1 | Any fruit as needed | |
| Ryania (50% W.P.)..... | | | 1 | Apples | |
| <i>Chlorinated Hydrocarbons</i> | | | | | |
| Chlorobenzilate (25% W.P.)... | 5 | 1½ lb. | 14 | Apples | Do not use a sticker or spreader with DDD or DDT on grapes after the fruit is the size of buck-shot. If more than five applications of DDT are made on apples, reduce the dosage below 2 pounds and/or increase the interval between final spray and harvest. |
| Chlorobenzilate (25% W.P.)... | 5 | 1½ lb. | 7 | Pears | |
| DDD (50% W.P.)..... | 7 | 2 lb. | 30 | Apples, cherries, pears, plums, peaches | |
| DDD (50% W.P.)..... | 7 | 2 lb. | 40 | Grapes | |
| DDD (50% W.P.)..... | 7 | 2 lb. | 5 | Strawberries | |
| DDD (50% W.P.)..... | 7 | 2 lb. | 14 | Brambles, blueberries | |
| DDT (50% W.P.)..... | 7 | 2 lb. | 30 | Apples, cherries, pears, plums, peaches | |
| DDT (50% W.P.)..... | 7 | 2 lb. | 40 | Grapes | |
| Dieldrin (50% W.P.)..... | .25 | ½ lb. | 30 | Cherries | |
| Dieldrin (50% W.P.)..... | .1 | ½ lb. | 14 | Grapes | |
| Dieldrin (50% W.P.)..... | .25 | ½ lb. | 45 | Apples, pears | |
| Dieldrin (50% W.P.)..... | .1 | ½ lb. | 30 | Peaches, plums | |

| | | | | | |
|--|------|--------|----------|---|--|
| Dieldrin (50% W.P.)..... | .1 | ½ lb. | See note | Strawberries | Use only before bloom or after harvest in bearing plantings. Do not use Endrin later than First Cover. Do not repeat applications of Kelthane on cherries, plums, peaches, or apricots within 30 days of one another. Up to four applications of 1 lb. of Tedion 25% may be applied to apples and pears after petal fall. Two similar applications may be made on stone fruits after shuck-split. No waiting period is established between final application of Tedion and harvest. Use no more than 1 lb. per 100 gallons after bloom. Do not make more than two applications of Thiodan after shuck-split on stone fruit. |
| Endrin (75% W.P.)..... | N.R. | ½ lb. | See note | Apples, pears | |
| Kelthane (18.5% W.P.)..... | 5 | 2 lb. | 7 | Apples, pears, cherries, plums, grapes | |
| Kelthane (18.5% W.P.)..... | 10 | 2 lb. | 14 | Peaches, apricots | |
| Kelthane (18.5% W.P.)..... | 5 | 2 lb. | 2 | Strawberries, brambles | |
| Methoxychlor (50% W.P.)..... | 14 | 3 lb. | 3 | Brambles | |
| Methoxychlor (50% W.P.)..... | 14 | 3 lb. | 7 | Apples, cherries, pears, plums | |
| Methoxychlor (50% W.P.)..... | 14 | 3 lb. | 14 | Blueberries, grapes, strawberries, currants, gooseberries | |
| Methoxychlor (50% W.P.)..... | 14 | 3 lb. | 21 | Peaches, apricots | |
| Ovex (50% W.P.)..... | 3 | ½ lb. | 30 | Apples, pears, peaches, plums | |
| Tedion (25% W.P.)..... | 5 | 1 lb. | See note | Apples, cherries, peaches plums, pears, apricots | |
| Thiodan (50% W.P.)..... | 2 | 1½ lb. | 30 | Apples | |
| Thiodan (50% W.P.)..... | 2 | 1½ lb. | 21 | Cherries, plums | |
| Thiodan (50% W.P.)..... | 2 | 1¼ lb. | 30 | Peaches, apricots, nectarines | |
| Thiodan (50% W.P.)..... | 2 | 2 lb. | 8 | Strawberries | |
| <i>Cholinesterase-Inhibiting Compounds</i> | | | | | |
| Demeton or Systox (26% Em.).. | .75 | ¾ pt. | 21 | Apples, pears, strawberries | Do not use more than three applications of Demeton on apples, pears, or peaches. |
| Demeton or Systox (26% Em.).. | 1.25 | ¾ pt. | 21 | Grapes | |
| Demeton or Systox (26%)..... | .75 | 1 pt. | 30 | Peaches | |

TABLE 1 — RESIDUE INFORMATION CONCERNING USE OF PESTICIDES ON FRUITS — (Continued)
FUNGICIDES

| Material (Common Formulation) | Tolerance (parts per million by weight) * | Maximum dosage rate per 100 gallons of spray† | Days between final spray and harvest | Crops | Remarks |
|---|---|---|--|--|--|
| <i>Cholinesterase-Inhibiting Compounds (Con't.)</i> | | | | | |
| Demeton or Systox (26%)..... | N.R. | 1 pt. | See note | Cherries | Demeton may be used only once and not later than petal fall on cherries. |
| Diazinon (25% W.P.)..... | .75 | 2 lb. | 5 | Strawberries | |
| Diazinon (25% W.P.)..... | .75 | 2 lb. | 10 | Cherries, plums | |
| Diazinon (25% W.P.)..... | .75 | 2 lb. | 14 | Apples, pears | |
| Diazinon (25% W.P.)..... | .75 | 2 lb. | 10 | Grapes | |
| Diazinon (25% W.P.)..... | .75 | 2 lb. | 20 | Peaches | |
| Ethion (25% W.P.)..... | 1 | 1 | 60 | Apples, pears | Do not make more than three applications of Ethion on apples and pears nor more than two ap- plications on peaches and plums. |
| Ethion (25% W.P.)..... | 1 | 1 | 60 | Grapes | |
| Ethion (25% W.P.)..... | 1 | 1½ | 45 | Plums | |
| Ethion (25% W.P.)..... | 1 | 1 | 30 | Peaches | |
| Ethion (25% W.P.)..... | 1 | 2 | 7 | Strawberries | |
| Guthion (25% W.P.)..... | 2 | 1¼ lb. | 5 | Strawberries | Do not make more than 8 applica- tions of Guthion per season. |
| Guthion (25% W.P.)..... | 2 | 1¼ lb. | 15 | Apples, pears, cherries, plums, apricots | |
| Guthion (25% W.P.)..... | 2 | 1¼ lb. | 21 | Peaches | Guthion (25% W.P.) can be used on grapes at 1 lb. per 100 gal. up to zero days of harvest. |
| Guthion (25% W.P.)..... | 2 | 1¼ lb. | 10 | Grapes | |
| Guthion (25% W.P.)..... | 2.0 | 1 lb. | 14 | Brambles | |
| Guthion (25% W.P.)..... | 2.0 | 1¼ lb. | 14 | Blueberries | |
| Malathion (25% W.P.)..... | 8 | 2 lb. | 3 | Apples, pears, currants, goose- berries, cherries, grapes, plums, strawberries | |

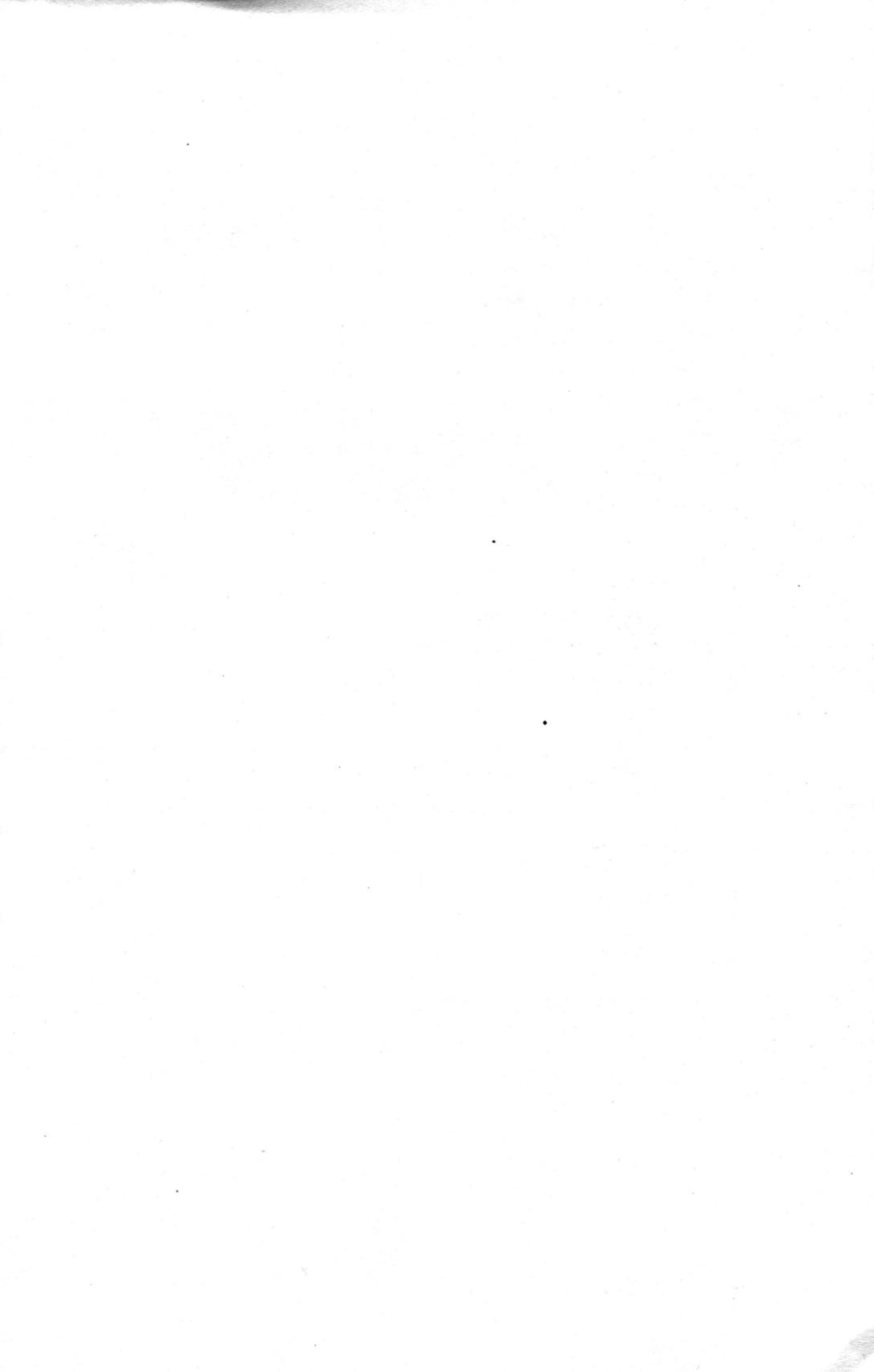
| | | | | | |
|----------------------------------|------|----------|----|---|--|
| Malathion (25% W.P.)..... | 8 | 2 lb. | 7 | Peaches, apricots | |
| Malathion (25% W.P.)..... | 8 | 2 lb. | 1 | Blueberries, brambles, currants, gooseberries | |
| Parathion (15% W.P.)..... | 1 | 2 lb. | 14 | Apples, charries, pears, plums, strawberries, peaches, grapes, blueberries | |
| Parathion (15% W.P.)..... | 1 | 2 lb. | 15 | Gooseberries | |
| Parathion (15% W.P.)..... | 1 | 2 lb. | 30 | Currants | |
| Phosdrin (20% Em.)..... | .5 | 1½ pt. | 1 | Apples, pears | |
| Phosdrin (20% Em.)..... | 1 | 1½ pt. | 1 | Peaches, strawberries, plums | |
| Phosdrin (20% Em.)..... | N.R. | 1 pt. | 5 | Grapes | |
| Phosphanidon (4 lb. per gal.) .. | N.R. | ½ pt. | 60 | Apples | |
| Tepp (40% Em.)..... | 0 | 1 pt. | 3 | Any fruit as needed | |
| Trithion (25% W.P.)..... | .8 | 1 lb. | 30 | Apples, pears, cherries, plums, peaches, grapes | Do not apply Trithion at intervals closer than 30 days. |
| Trithion (25% W.P.)..... | .8 | 2 lb. | 30 | Strawberries | |
| Sevin (50% W.P.)..... | 10 | 2 lb. | 1 | Apples, pears, peaches, grapes, plums, cherries, strawberries | |
| Sevin (50% W.P.)..... | 10 | 2 lb. | 0 | Blueberries | |
| <i>Unrelated Compounds</i> | | | | | |
| Actidione..... | N.R. | 2 p.p.m. | 4 | Cherries | |
| Captan..... | 100 | 2 lb. | 0 | Apples, pears, strawberries, bram- bles, cherries, plums, prunes, apricots, peaches | |
| Coppers..... | | | 0 | Any fruits as needed | Copper is exempt from the require- ment of a tolerance. |
| Cyprex..... | 5 | ½ lb. | 0 | Red tart cherries | |
| Cyprex..... | 5 | ¾ lb. | 7 | Apples | Apple pomice from Cyprex sprayed trees cannot be used for animal feed. |
| Dichlone (Phygon XL)..... | 3 | ½ lb. | 1 | Apples | |
| Dichlone (Phygon XL)..... | 3 | ½ lb. | 7 | Peaches | |
| Dichlone (Phygon XL)..... | 3 | ½ lb. | 3 | Cherries, plums, prunes | |
| Glyodin..... | 5 | 1 qt. | 0 | Apples | |
| Glyodin..... | 5 | 1½ pt. | 7 | Cherries (sour) | |
| Glycide..... | 5 | 10 oz. | 0 | Apples | |

TABLE 1 — RESIDUE INFORMATION CONCERNING USE OF PESTICIDES ON FRUITS — (Concluded)
FUNGICIDES

| Material (Common Formulation) | Tolerance (parts per million by weight) * | Maximum dosage rate per 100 gallons of spray† | Days between final spray and harvest | Crops | Remarks |
|-------------------------------------|---|---|--|--|---|
| <i>Unrelated Compounds (Con't.)</i> | | | | | |
| Glyoxide..... | 5 | 8 oz. | 7 | Cherries (sour) | Mercuries should not be used later than petal fall on apples and should not be applied to strawberries when fruit is present. |
| Karathane..... | N.R. | ½ lb. | 21 | Apples | |
| Mercuries..... | N.R. | | See note | Apples, strawberries | |
| Streptomycin..... | N.R. | 100 p.p.m. | See note | Apples, pears | |
| Sulfur..... | | | 0 | Any fruit as needed | Do not apply streptomycin later than petal fall. Sulfur is exempt from the requirement of a tolerance. |
| <i>Carbamate Compounds</i> | | | | | |
| Ferbam..... | 7 | 1½ lb. | 7 | Apples, cherries, pears, plums, prunes, grapes | Remove residues of Thylate from strawberries by washing if application is made within 3 days of harvest. |
| Ferbam..... | 7 | 2 lb. | 14 | Currants, gooseberries | |
| Thiram (Thylate)..... | 7 | 2 lb. | 0 | Apples | |
| Thiram (Thylate)..... | 7 | 2 lb. | 3 | Strawberries | |
| Zineb..... | 7 | 2 lb. | 7 | Apples | |
| Zineb..... | 7 | 2 lb. | 7 | Grapes | |

*N.R.—No residue remains on crop when the product is used precisely as directed. No tolerance established.

†These dosage rates refer to maximum allowable amounts for dilute spraying and are not necessarily suggested amounts. Refer to fruit spraying schedules and package labels for suggested amounts on specific crops.



CONTENTS

| | |
|--|----|
| Compatibility Chart | 2 |
| Use Chemicals Safely | 4 |
| Poison Control Centers | 5 |
| Effective Application | 7 |
| Chemical Thinning of Apples and Peaches | 9 |
| Chemical Thinning of Peaches | 12 |
| Mouse Control in Orchards | 12 |
| Fungicides | 14 |
| Insecticides | 19 |
| Accessory Materials | 24 |
| Liquid Pesticides and Surfactants, or Wetting Agents | 24 |
| Correctives for Spray Injury | 25 |
| Russetting of Apples by Cold and Chemicals | 26 |
| New Insecticides | 28 |
| Chemical Control of Apple Scab | 29 |
| Schedules | |
| Apples | 32 |
| Pears | 36 |
| Peaches | 38 |
| Plums | 40 |
| Red Tart Cherries | 41 |
| Sweet Cherries | 43 |
| Grapes | 45 |
| Strawberries | 47 |
| Bramble Fruit | 49 |
| Currants and Gooseberries | 50 |
| Blueberries | 52 |
| Residue Tolerances | 53 |

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