ABSTRACTS OF REPORTS FROM THE 42nd ANNUAL WESTERN COOPERATIVE SPRAY PROJECT

Imperial Hotel, Portland, Oregon

January 10-12, 1968

These abstracts of progress reports on research conducted on the principal insect and disease pests of tree fruits in the states of California, Colorado, Idaho, Montana, Oregon, Utah and Washington, and the Province of British Columbia, are not intended to be recommendations of the project. Official recommendations can only be made by public service entomologists and plant pathologists from their respective areas.

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Abstracts of Reports from the
42nd Annual Western Cooperative Spray Project

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S E C T I O N I

INSECT AND MITE PESTS OF POME FRUITS

APPLE INSECTS AND MITES

Codling Moth

Fred Dean:

The experimental insecticide Shell SD-8447 was very effective against codling moth at concentrations of 1/2 and 1/4 lb/100 gal. Bioassays were made in which samples of twigs and fruit were taken from sprayed trees each week after the spray application and adult moths and young codling moth larvae exposed to the treated samples in the laboratory. Residues of SD-8447 were very effective against both adults and larvae for six weeks after the application. The 1/2-lb concentration was slightly more effective than the 1/4-lb concentration.

D. O. Hathaway and B. A. Butt:

Sterile-male codling moths were released at the rate of 16,576 per acre in a 93-acre apple orchard. Releases started April 7 and continued through September 26. Nineteen live female traps in the release orchard caught 537 native males and 33,557 released males for a ratio of 1:62. An average of 28 natives and 1,766 released males were caught per trap with a range of 4,712 to 205 released moths and 144 to 0 native moths per trap.

Codling moth damaged .261% of the fruit in the release orchards by September 30. Most of this damage was limited to areas near prop piles. An untreated plot 3/4 mile away was harvested about June 20 because 39.82% of the apples were damaged. Chemically-controlled orchards in the release area averaged .238% damage from codling moths.

L. D. White:

Pupal and adult codling moths were irradiated with Co-60 at 25,30,35,40 and 45 krads, then mated with normal moths. As radiation dosage increased, eggs/♀ decreased regardless of sex or stage treated. Oviposition rate among ♀♀ mated with treated ♂♂ was unaffected. Among treated ♀♀, however, the oviposition rate at 35 to 45 krads increased.

Longevity of ♂♂ treated as adults was unaffected. However, increased dosages to ♂ and ♀ pupae and ♀ adults increased longevity and decreased the mortality rate.

H. R. Moffitt:

In a continuing study on the occurrence and degree of insecticide resistance in the codling moth, dosage mortality curves for azinphosmethyl, carbaryl, DDT and diazinon have been established for a susceptible strain. Curves for these same materials for field population collected from the Wenatchee area are compared with those obtained for the susceptible strain.

Populations from the various apple-growing areas of Washington will be periodically tested in order to detect resistance as early in its development as possible.

B. A. Butt and J. Franklin Howell:

A movie has been prepared by entomologists at Yakima, Washington and agricultural engineers at Yakima, Washington and Forest Grove, Oregon to illustrate the methods of rearing, sterilizing and releasing moths to effect a codling moth control program.

This movie shows the various steps in rearing moths, both on apples and on an artificial medium. The procedures for sterilizing, marking and distributing the moths are illustrated. Various steps in developing the aerial release mechanism are shown.

J. Franklin Howell:

Blacklight and sex pheromone traps are competitive when close together. The competition is measured via changes in the sex ratio of moths caught in blacklight traps. By manipulating the distance between the two traps, a point is established where the pheromone catch no longer subtracts from the blacklight catch. This point is an estimate of the attraction-distance of the sex pheromone.

S. C. Jones:

Shell Gardona was tested in last years field trials and gave excellent control of the codling moth at fairly high concentrations on a three application basis. The Gardona concentrations were reduced in this years field trials. The sprays were applied on June 1, June 23 and July 25. The control was poor at the lower dosages and fair at the higher dosage. Unsprayed plots ranged from 66.6% to 99.1 wormy apples. Aside from the lower dosages the difference in the control between 1966 and the 1967 seasons was probably due to the high temperatures over an extended period. A fourth application would have been necessary under this years conditions.

M. M. Barnes:

The codling moth may be effectively controlled by applications designed virtually to eliminate the first brood. A single or at most two, applications of Guthion, properly times, serves to maintain the population at such a low level that subsequent treatments are not needed. Such reduced programs serve to minimize requirements for mite control. However, proper timing of the treatment is necessary and information is required on possible development of a second brood in case of insufficient suppression of first brood. To provide this, a small trap with a 4 watt fluorescent ultra violet lamp was developed, which catches fewer extraneous insects, than larger lamps, and which is 5-6 times more efficient than a pan of fermenting bait. A further advantage over odour traps is a constant level of attraction. This unit has now been made completely portable through the development of a portable power supply which contains 1) clocked control of the period the trap operates; 2) daylight shutdown; 3) trap operation for 21 nights (dusk plus 3

hours) on a single charge of an automobile battery. These time controlled, portable, power supply units were tested in 1967 with the standard light trap, but with two types of lamps. Four replications, with trap rotation, showed that the unfiltered 4W (F4T5BL) 110V AC fluorescent lamps was superior (P = .05) to a 4W (360BL) 24V DC Glow-lamp for codling moth in an experiment of 101 trap nights in a light population. The fluorescent tube also caught fewer extraneous insects, 55 per trap night as compared with 68 for the DC lamp. 65% of the catch of the fluorescnet lamps were males, 72% in the case of the glow-lamp. For fruit tree leafroller, the glow-lamp was somewhat superior (96 to 74 per trap night) and each caught 65% male.

L. A. Falcon:

A granulosis virus propagated in larvae of the codling moth, Carpocapsa pomonella (L.), reared on semisynthetic diet caused high mortality of C. pomonella larva when sprayed on apples (Golden Delicious variety) in an isolated 1-acre orchard near Placerville. In 1966, 4 trees were sprayed 5 times with virus at 3.8×10^{11} capsules per gallon. In 1967, 28 trees were treated 7 times with a dosage of 1.2×10^{11} capsules per gallon. During both years larval mortality was estimated at about 96% in the virus treated areas. Most of the mortality due to virus occurred in 1st instar larvae either before visible feeding damage had occurred or after the first had been "stung". Of the larvae that succeeded in entering the virus sprayed fruit, some died before vacating the fruit, and others as mature larvae or pupae in cocooning sites. The results showed the virus to be a potentially useful selective biotic control agent for codling moth.

R. W. Zwick & F. W. Peifer:

On a 28-day schedule, Zolone EC was the most effective cover material where 89% of the unsprayed fruit was stung or wormy. UC 34096, Nia 10242, Imidan at 1#, Guthion at 0.5# and carbaryl at 1# followed in order of reduced control. DDT + parathion and Perthane at 3# could not be recommended in orchards subject to heavy attack.

M. D. Proverbs:

In 1966, sterile codling moths were released in a commercially operated apple orchard. Control was excellent, but the sterile moths and the release sites were more numerous than required. In 1967, release sites were reduced to 5 per acre (1/5 of the 1966 total) and the sterile moths to an average of 450 per acre per week (1/14 of the numbers released in 1966). By harvest, codling moth had injured 0.09% of the apples. This represents good control, but not so outstanding as 1966 when damage was limited to one wormy apple per acre.

Sex trap records showed that the ratio of sterile males to wild males fell from an intended ratio of 40:1 to a low of 9:1 during peak emergence of wild adults in late May and in mid August. This would account for the greater injury recorded in 1967.

H. F. Madsen & K. Williams:

Guthion at the standard dosage of 5 lb. 25% W. P. per acre was compared with Guthion 2 1/2 lb., Guthion 1 1/4 lb. and Guthion 2 1/2 lb. plus Superior oil 5 gallons per acre in an orchard heavily infested with codling moths. Good control was obtained with Guthion at 5 lb. per acre and at 2 1/2 lb. per acre. Control was poor with the 1 1/4 lb. dosage and with the 2 1/2 lb. of Guthion combined with oil. Residue analysis showed that the deposits on leaves and fruit were proportional to the amounts applied and that persistence was similar when Guthion was applied alone. When combined with oil, however, the initial deposit was reduced about 25% and the persistence of Guthion was greatly reduced.

Orchard Mites

R. W. Zwick & F. W. Peifer:

The most effective experimental compounds against European red mite during the foliage season were: CIBA 8514 (outstanding), Nissol WP, Geigy 19851 EC, Zolone, NC 5016, DuPont 1991, TH 367-I. Morestan at 6 oz., consecutive Karathane LC applications, and ethion, of registered compounds, were excellent to good against red mites. Tedion EC and Tranid (1.5#) were the most effective against 2-spotted mites of 8 compounds evaluated.

The effects of several pre-bloom and cover spray programs on phytophagous and predator (Typhlodromus and Zetzellia) mite populations were followed on a number of plots and two commercial orchards. Briefly, overwintering mortality, delayed dormants, and pre-bloom sprays all contribute to predator mite mortality and populations are much reduced early in the season from the levels noted late the previous autumn. Typhlodromus survived early Karathane and carbaryl sprays and generally developed earlier population peaks than Zetzellia, which peaked later. Typhlodromus surveved Diazinon better than Zetzellia, but the latter was more resistant to Guthion (1/2#) in 2 and 3 covers. Two covers of Imidan allow predator survival, but a carbaryl thinning spray and 3 covers delay Zetzellia buildup and almost annihilate Typhlodromids. Zetzellia was more affected by DDT-parathion and Perthane than Typhlodromus, but generally more resistant to OP and carbamates. Typhlodromus survives 2 Karathane LC applications, but is adversely affected by a single dimethoate (1 pt EC) spray. Zetzellia appears to be the dominant predator in abandoned or sporadically-sprayed orchards, while Typhlodromus dominates in those regularly-sprayed commercial orchards in which predators are found.

S. C. Hoyt:

Azodrin, C8514, Dow 213 and Omite showed considerable promise for the control of mites. Dow 213 and Omite were of particular interest because they consistently allowed a high percentage of survival by the predator T. occidentalis. Axodrin also controlled apple aphids and the codling moth. Nissol, while not as effective as the above materials, showed some promise as an acaricide. In more limited tests NC5016 proved effective against mites.

Temik applied as a granular formulation failed to control McDaniel spider-mite. The failure was possibly due to a lack of wetting because of the irrigation methods. Acaralate also failed to control the McDaniel spider mite.

In many orchards practicing integrated control it was necessary to improve the predator:prey balance during late July or early August by an application of Morestan. A single application in most cases was adequate and the predators prevented a resurgence of mites. Where apple rust mites were present during the early season as food for the predators, no mite problems were encountered.

Frequency distribution studies were run for T. occidentalis with McDaniel spider mite, apple rust mite and European red mite.

Fred Dean:

Azodrin® and UC-20047A gave excellent control of McDaniel and European red mites as they have for the last three years. New acaricides that showed promise against orchard mites in 1967 were Fisons NC-5016, CIBA C-8514, Union Carbide UC-3496, and Morton Chemical EP-333 and EP-332. Nissol 25% EC gave poor results against McDaniel mites when used at 1 pt/100 gal but gave excellent control at 2 pts in the third cover spray. Bay-58733 was extremely phytotoxic to Red and Golden Delicious. Poor control of mites was obtained with Geigy GS-19851 and Union Carbide UC-30045.

Temik® was tested as a systemic soil acaricide against orchard mites on mature Winesap apple trees. The Temik granules were spread beneath the trees and soaked into the soil with sprinkler irrigation. In one plot 2 lb/tree was applied on June 1 and in another plot 1 lb/tree was applied June 1 and July 20. No damaging population developed on either treated plot during June and July. McDaniel mites increased to a maximum of 15 mites per leaf in August on the single application plot. On the 2-application plot the mites were held to less than 8 per leaf in August.

Typhlodromid mite predators held the orchard mites in check again in 1967 where a minimum of acaricides and other sprays were used. The predators were not quite as effective in some orchards as they were in 1966, probably because of weather conditions. A prolonged period of unusually high temperatures late in August allowed McDaniel mites to increase very rapidly and it required about two weeks for the predators to increase sufficiently to again become effective.

S. C. Jones:

Chemagro 58733, and 58733 plus Morestan, and Ciba NC 5016 both gave excellent control of the European and Two-spotted mites. However, serious foliage burn resulted from 58733 and the combination of 58733 and Morestan.

The mite population was also considered in the Gardona codling moth plots where an acaricide was omitted. These plots were heavily infested by both the European and Two-spotted mites.

C. S. Davis, J. H. Black and K. W. Hench (Pacific Mite):

Six oils were tested on red and golden delicious apples for control of Pacific mite in Kern County. Three treatments of Volck supreme kept the population to almost zero for the season. PGSO-2 and Orchex-796 gave satisfactory control with three treatments for the season. Mobile XMTY-94B, Orchex-696 and PGSO-1 required four treatments to maintain control. In these last three oil treatments mite feeding caused some leaf damage.

R. S. Downing (European Red Mite):

Dormant oil was applied by concentrate sprayer at the 1/2 inch green stage to Red Delicious apples at the following dosages per acre: 4, 6, and 8 gallons. All three rates gave good control of the European red mite.

Pink bud sprays of Dowcow 213, 4 and 8 oz. 50% W.P., Micasin 1 lb. 50% W.P., Milbex 1 lb. 50% W. P., dormant oil 1 gal., and Superior oil 1 gal., applied by hand gun sprayer gave good control of the European red mite on Golden Delicious apples. NC-5016 1 lb. 20% W.P. and Galecron 1/2 pt. 50% E.C. were not effective.

R. S. Downing (European Red Mite):

An application of NC-5016, 2 1/2 or 3 lb. 20% per 100 gallons on June 13 gave excellent control of the European red mite. Dowcow 4 oz. 50% W.P., Galecron 3/4 pt. 50% E.C., and Micasin 1 lb. 50% W. P. gave good control of European red mite for 1 month following an application on June 13. NC-5016 caused fruit and foliage injury to Rome Beauty apples, but not to Winesap, Jonathan, McIntosh and Spartan apples.

W. C. Batiste:

Miticides were applied to red delicious apples at Watsonville, California on August 31, 1967. EP-333, G. S. 19851, and NC 5016 gave adequate control of European red mite. The control was comparable to that in Morestan plots. Azodrin, Bayer 58733 and Tranid were somewhat less effective and Gardona was ineffective. Two-spotted mite was affected little except by Gardona which caused an increase in its numbers. Bayer 58733, inadvertently applied at the high rate of 2.0 pounds 50% W.P. per 100 gallons, caused extensive leaf drop.

R. S. Downing (Integrated Mite Control):

Ten commercial apple orchards were selected for a study on integrated control of the McDaniel mite. Predacious phytoseiid mites were present during the dormant season in each of the ten orchards. A spray of either dormant oil, oil plus Ethion or Morestan was applied pre-bloom in each orchard for European red mite control. In 6 of the 10 orchards, the phytoseiids reached a population density sufficient to control McDaniel mite, and summer miticides were not necessary. In three of the orchards, the phytoseiids did not increase sufficiently, and summer miticides were necessary to control either European red mite or McDaniel mite. Of the spray chemicals applied in the orchards, Kelthane, Morocide and Sevin were most toxic to the Phytoseiids.

R. S. Downing (Phytoseiid Mites):

A number of acaricides were evaluated as to their toxicity to the predacious phytoseiid mite, Neoseiulus caudiglans. Their ratings are as follows: Pink bud sprays - Dowcow 213, low toxicity; Milbex, Micasin, dormant oil, Superior oil, moderate toxicity; NC-5016, Galecron, high toxicity. Summer sprays - Elgetol, low toxicity; Imidan, Guthion, Ethion, Morocide, Morestan, NC-5016, Galecron, high toxicity.

● European Fruit Scale and San Jose Scale

C. V. G. Morgan:

Field and laboratory tests in 1967 showed that the insecticides recently recommended for control of the San Jose scale would also control the European fruit scale. Oil alone at 4 gallons per 100 controlled both scales when applied during the period of dormancy up to the tight cluster stage. The addition of lime sulfur was not necessary, and the removal of this material was desirable because of its phytotoxicity and toxicity to predaceous mites.

In heavy infestations of San Jose scale, summer sprays of parathion or diazinon are necessary in addition to the dormant spray. The European fruit scale, which has but one generation per year, requires only the dormant spray to obtain satisfactory control.

C. V. G. Morgan:

Previous studies have shown that pre-storage treatments of scald inhibitors or dipping in a solution of alcohol increased the mortality rate of San Jose scale in storage. In 1967 a third treatment, dewaxing the apples and then waxing with a formulated wax, was evaluated for effects on San Jose scale. The process mechanically removes scale from the cheeks and shoulders of the apples, but does not hasten the mortality rate of the scale in storage. The process does not remove scale from the calyx or stem end of the fruit.

● Eye-Spotted Bud Moth and Fruit-Tree Leaf Roller

H. F. Madsen:

In an orchard where no codling moth sprays have been applied for six years, mites are held under control by predators, but eye-spotted bud moth and fruit-tree leaf roller have increased to damaging numbers.

Pre-bloom sprays of Guthion at 5 lb. 25% W.P. per acre and Guthion at 2 1/2 lb. per acre gave excellent control of these two pests. Dormant oil at 6 and 8 gallons per acre did not give satisfactory control. Oil at 6 gallons and Guthion at 2 1/2 lb. did not reduce predaceous phytoseiid mites over the untreated control. No phytoseiid mites were found on trees treated with Guthion at 5 lb. per acre. None of the treatments adversely affected the predatory bugs Deraeocoris and Campylomma.

PEAR INSECTS AND MITES

Pear Psylla

R. W. Zwick & F. W. Peifer:

Dormant applications of Perthane and oil, Dilan and oil or Perthane + Lethane proved very effective. Lab tests employing oil emulsions of from 2 - 20% failed to reduce significantly the viability of recently oviposited psylla eggs when pear twigs and associated psylla eggs were dipped in the (various) oil-emulsion concentrations. A delayed dormant application of TH 367-I in a superior oil gave excellent control. Summer applications of CIBA 8514, CIBA 14704, Nissol EC and WP, Zolone, Imidan + Volck Supreme, Perthane + Volck Supreme and N-4543 + Volck Supreme gave good to excellent control. A post-harvest application of Dilan EC looked promising. Temik 10% granular provided approximately 10-week control of psylla when applied at the rate of 2 oz. of product/inch of tree-trunk diameter.

P. H. Westigard:

A. Chemical Control. (1) Prebloom applications of Morestan, Perthane & Oil, TH 367-I, Zineb (6 lbs.), Polyram (6 lbs.), Dithane M45 (6 lbs.), N4543, and Nissol provided good control. (2) Summer applications of Zolone and Nissol also provided commercial control. Soil applied systemics, including Temik, NIA 10242, Cygon and Meta-Systox-R failed to control this species in heavy clay soil but there were indications that in lighter soil types, soil applications of Temik, or Meta-Systox-R may be useful.

B. Biological Studies. (1) Winter mortality of adult psylla was estimated at 67%. (2) First generation mortality of eggs was estimated at between 40-80%. (3) Summer populations (2nd generation predominately) were reduced below honeydew injury levels by predators by mid-July.

W. C. Batiste:

Experiments conducted late in the 1966 season indicated that pear psylla were somewhat resistant to guthion in an orchard at San Jose. Laboratory methods for testing insecticides on psylla were developed and a program is currently underway to determine if there are seasonal changes in susceptibility of psylla to guthion or dieldrin. No changes have been detected to date. Much higher amounts of guthion are required to kill field-collected psylla than a laboratory-reared strain. Field-collected psylla suspected to be guthion-resistant were only slightly more difficult to kill than other field-collected psylla.

Fred Dean:

Satisfactory control of pear psylla was obtained with two summer applications of Nissol, N-4543, and highly refined spray oils of widely varying viscosities. NIA-10242 was also effective but with shorter residual activity than the other materials tested.

H. F. Madsen and K. Williams:

Several oils were evaluated for their control of pear psylla and their effect upon the trees. Based upon kill of adults, Orchex 796 (1.0% emulsifier) and Volck Supreme oil gave the best control, PGSO-1 and PGSO-2 were intermediate, and Orchex 796 (0.46% emulsifier) and Orchex 696 were the least effective. All of the oils gave good control of pear psylla nymphs and European red mite. The oils also prevented leaf burn during hot weather in August.

The oils caused enlargement and corkiness of the bark lenticels and the oil-sprayed pears showed dark green lenticels. This green color did not persist when the pears were ripened. The oil sprays did not affect the flavor of the pears and there was no influence on their storage life.

R. D. McMullen:

Five insecticides were tested as dilute sprays for pear psylla control. The percent reduction of nymphs following a June 26 application was as follows: C-8514 and C-8353, 97%; NC 5016, 86%; Perthane, 77% Nissol, 66%.

In large field plots using a concentrate sprayer, Imidan gave excellent control following single applications. Predaceous mirid bugs were not markedly reduced by the treatment.

R. D. McMullen:

A study of the distribution of pear psylla eggs and nymphs on mature d'Anjou pears showed that they were evenly distributed, but there was a significant difference between trees in population levels. From mid-March to mid-May, the fruit bud spur is the most suitable sample unit. From the end of May until the growing season is over, young leaves on rapidly growing current years twigs are the most suitable sample units.

Everett Burts:

In laboratory screening trials Lethane 60 and Lethane 384 and Lethane 384 Special were very toxic to overwintered adult pear psylla when applied as topical sprays. The addition of oil to the spray increased the activity of the Lethanes while the addition of Perthane had little effect. Other materials that provided excellent kill of adult pear psylla were C 8514 (Galecron), Nissol, M 2060, Thanite, the superior type oils and TH 367-I. Fenflourazol and Bayer 58733 were moderately active against this insect.

In laboratory tests resistance to Perthane was demonstrated in several populations of overwintering pear psylla. The only susceptible samples were collected from Levenworth and Dryden. The resistance involves only a 4 to 8 fold tolerance over the apparently susceptible strains.

In orchard plots Lethane 384 and Lethane 384 Special provided a quick knockdown of pear psylla adults when included in the dormant spray. Failure of these materials to perform well in some plots indicates their effectiveness during cool weather. The addition of oil to Perthane and the

combination of oil with several of the organophosphorous compounds provided good control of Perthane resistance pear psylla adults in most cases both as aerial and as ground sprays. TH 367-I was also very effective in these trials.

Materials that showed activity as summer sprays against pear psylla in screening trials included EP 332, C 8514 and TH 367-I. Several other materials tried showed little or no activity. Spring and early summer applications of granular Temik to the soil around mature Bartlett trees were effective in reducing the damage of psylla to fruit and foliage but did not keep populations very low on trees next to untreated orchards.

In several large plots, seasonal programs of summer oil in combination with organophosphorous insecticides provided good control of pear psylla and spider mites. Three applications were necessary in most plots and best results were obtained when populations were kept low. Attempts to bring heavy populations under control were less successful. Oil alone also proved quite effective against pear psylla although more sprays were necessary. A seasonal program of three sprays of Nissol provided excellent control of pear psylla and spider mites.

Several surfactants toxic to pear psylla in laboratory screening tests were found to be less effective when applied to orchard trees.

● Codling Moth

W. C. Batiste:

A field experiment was conducted at San Jose to evaluate new insecticides on codling moth and other pests of pears. Applications of sprays were made on May 19, June 29, and August 4. The first two applications were timed for codling moth based on ultra violet light trap catches. The third spray was directed mainly against psylla and mites. The percentages infested fruit at harvest were: Imidan, 0.0%; Gardona, 0.0%; guthion plus Volck's supreme oil, 0.5%; Nia. 10242, 0.5%; G.S. 13005, 1.8%; EP-333, 3.0% and untreated check, 22.8%. Imidan and guthion plus oil were quite effective on pear psylla. EP 333, Gardona, Nia. 10242, and G.S. 13005 suppressed psylla but were less effective. EP 333, guthion plus oil, Nia. 10242, and Gardona controlled European red mite, but G.S. 13005 and Imidan were less effective. EP 333, G. S. 13005, and guthion plus oil controlled two-spotted mite, while Nia. 10242, Gardona, and Imidan caused an increase of this mite.

● Orchard Mites

P. H. Westigard (Two-Spotted Mite):

Morton EP 332, EP 333, Zolone (2 2/3 pts), GS 19851 (1 qt.) provided outstanding control for a period in excess of 4 weeks when applied against heavy summer populations.

In studies concerned with the establishment of economic levels of infestation for this species, it was found that the tolerable infestation level had to be lowered due to the high summer temperatures.

P. H. Westigard (Carpini Mite):

Good to excellent control of this species was obtained with EP332, EP333, NC5016, GS19851, and CIBA 8514.

P. H. Westigard (European Red Mite):

A prebloom spray of TH3761 provided excellent control of this species. The standard program of Morestan at 4 lbs/acre was disappointing in many orchards when applied at the pink bud stage.

In summer applications, good commercial control was obtained with the following materials: EP 332 (1 1/2 lb.), EP 333 (1/2 lb.), Zolone (1 1/3 pts.), NC 5016 (1 1/2 lbs.), GS 19851, Omite, CIBA (1/2 pt.).

K. S. Hagen, C. S. Davis, W. C. Batiste:

Alfalfa was planted as a cover crop in a Bartlett pear orchard. The alfalfa was strip-cut periodically to drive natural enemies of mites from the alfalfa into the pear trees. No significant differences in populations of two-spotted mite and European red mite were detected between the pear-alfalfa plots and plots where no cover crop was present. Guthion was used across these plots at its regular rate and at one-half strength. No significant difference in spider mite populations was found between the two guthion treatments. Predaceous mites were more abundant in unsprayed plots, but mite injury was excessive in all treatments.

J. E. Dibble (Two-Spotted Mites, European Red Mite and Pear Psylla):

Orchex 696 and 796, PGSO-2, Volck, 796 plus lime sulfur and Volck plus sulfur were applied at 5 and 2.5 gallons per acre. In each case the oils at 2.5 gpa were not as effective as 5 gpa for mite control when applied in a complete coverage dilute spray. The heavier oils did not generally appear to be better than the light oils. 796 plus lime sulfur (both at 2.5 gpa) performed substantially better than Volck plus lime sulfur. Psylla nymph control was very good with all oils and combinations.

A second trial with the same treatments showed less favorable 2-spot control with the lighter oils. The 5 gpa rate was equivalent to the 2.5 gpa rate of the heavier oils. Again 796 plus lime sulfur gave better control than the Volck combination and equivalent to the best oil by itself. (Cooperator: Chester Hemstreet, Lake County)

J. E. Dibble (Two-Spotted Mite and European Red Mite and Pear Psylla):

Four narrow range oils (Orchex 696 and 796, PGSO-1 and 2) and Volck supreme were applied at 2,4, and 6 gpa. The 2 gpa rates were not satisfactory for two spotted mite or psylla control. Four and 6 gpa showed relatively close results with 6 consistently better. PGSO-1 at all rates did not perform as well as the other oils. (Cooperator: Chester Hemstreet, Lake County)

J. E. Dibble (Two-Spotted and European Red Mite and Psylla):

Orchex 696 and 796, PGSO-2, Volck, and 796 plus lime sulfur were compared with 796 with .25, .50, 1 and 2% emulsifier. All treatments were applied at 5 gpa except the combination which went on at 2.5 gpa each. The two heavier oils gave better control than the lighter ones. However, the 796 with the .5% emulsifier gave the best control of the different emulsifier rates. The 1 and 2% freshly emulsified oils gave control equal to the heavier oils. The .25 was the least effective. All oils gave good control of the European red mite. The 2 heavier oils and 796 with 1 and 2% emulsifier gave the poorest psylla control. The combination of 796 and lime sulfur gave very good control. A second trial using the same treatments showed good mite control with all treatments except 796 with .25% emulsifier. Fair to good psylla nymph control was also obtained with all treatments except the .25% 796. 796 containing .50% emulsifier again displayed the best control of both mites and psylla. (Cooperator: Chester Hemstreet, Lake County)

J. E. Dibble (Two-Spotted Mite):

Orchex 796 and Volck supreme were applied 1, 2 or 3 times through the growing season and at 1.5, 3 and 5 gpa. A 100 gpa spray rate was used. The 1.5 gpa rate gave the poorest control. This control was generally poorer where the 2nd and 3rd applications were not made. The 3 gpa rate was substantially better than 1.5 and the 5 gpa rate was the best except where only one application (early) was made. (Cooperator: Chester Hemstreet, Lake County)

R. W. Zwick & F. W. Peifer (Pear Leaf Blister Mite):

Carbaryl (1#), endosulfan(3/4#), and 4 gal lime sulfur applied the latter part of September all gave excellent control of pear leaf blister mite and were slightly superior to 1# Diazinon when evaluated the following spring.

C. S. Davis, C. L. Hemstreet and W. C. Batiste (Pear Leaf Blister Mite and Pear Rust Mite):

Diazinon plus oil, Thiodan plus Ethion plus oil and Thiodan plus oil applied in the delayed dormant gave the best early season control of pear leaf blister mite in Lake County. These same treatments and Ethion plus oil gave the best early season control for pear rust mite. Both blister mites and rust mites were infesting the foliage in July. Other materials tested in the delayed dormant were: Chlorobenzilate plus oil, Trithion plus oil, Lime sulfur plus oil, and four oils: Volck supreme, Orchex-696, Orchex-796 and PGSO-2.

P. H. Westigard (Pear Rust Mite):

Both foliar and soil applications of pesticides were made and based on leaf counts the most effective materials included Tranid, Temik (2 ozs. per inch of trunk), NIA10242, and EP332. Based on fruit russet at harvest, Temik at 3 rates (1/2, 1, 2 ozs. per inch of trunk), NIA10242, EP332 and Cygon were most effective.

James Schafer and L. C. Terriere (Predaceous Mites, *Typhlodromus occidentalis*, Pears and Apples):

T. occidentalis collected from commercial orchards in Milton-Freewater and Hood River, Oregon, and from Dr. Stan Hoyt, Wenatchee, Washington, were screened for susceptibility to 12 commercial and experimental insecticides or acaricides. The tests were performed by holding the predaceous mites and *T. telarius* on treated bean leaf discs. All toxicants were tested in the wettable powder form using a Potter Spray Tower. Deposits of parathion, tedion, DDT and Kelthane greater than those normally found in the field were ineffective against predators. Ethion, Guthion, Diazinon, Imidan and Morestan were moderately toxic in the 48 hour test while Sevin, Gardona and Fenoflurazole were highly toxic. There was evidence that the mites were tolerant of several of the acaricides and there was no significant difference between the strains from the three locations. Compared to *T. fallacis*, collected from hops, the *T. occidentalis* was at least 100 times more tolerant of most of the acaricides or insecticides.

S E C T I O N II

INSECTS AND MITES OF STONE FRUITS

CHERRY INSECTS AND MITES

● Cherry Fruit Fly

S. C. Jones:

American Cyanamid Cygon, Chipman Zolone, Shell Gardona and Niagara 10242 were tested against the cherry fruit fly. Even though over 750 cherry fruit flies were released in these plots no maggots were found in over 19,000 cherries examined individually and this included a check plot. Flies were also released in the check plot. Cherry samples were taken for examination during the month of July after the flies had ample opportunity to infest the cherries. Montmorency cherries in this orchard showed a few maggots by mid-August many weeks after the final spray.

Don R. Merkley:

Two chemicals were screened during 1967 which had not been previously checked for their effectiveness against the cherry fruit flies. Guthion and C-8353 (a CIBA product) gave significant control during mid-season and pre-harvest applications. Due to extreme moisture conditions in early June, no emergence was detected, but a precautionary application of Diazinon was made over the entire plot. The second, and third applications were made with Parathion - at 0.5 lb. ai/100 gallons of water; Diazinon - 0.75 lb. ai/100; Guthion - 1.0 lb. ai/100, and C-8353 at 1.5 lb. ai/100 gallons.

The fourth application was made just prior to harvest with Perthane at 1 quart 25% EC/100 gallons of water.

All materials were applied at 7 to 10 day intervals, and with the exception of C-8353, gave 100% control. The C-8353 plot had less than 1/2 of 1% wormy cherries.

● San Jose Scale

E. W. Anthon:

Humble oil, Orthophos and Collier oil gave excellent control of San Jose scale when applied as delayed dormant sprays. Niagara's 10242 and Imidan did not give satisfactory control.

● Fruit-Tree Leaf Roller - Sweet Cherry

R. W. Zwick & F. W. Peifer:

Delayed dormants of oil plus a petal-fall of an insecticide was the most effective program in preventing damage to cherries by fruit-tree leaf roller larvae. If the delayed dormant is omitted, a petal-fall application

is more effective than a popcorn application of the same material.

European Red Mite

E. W. Anthon:

Excellent control of mites was obtained on prunes and cherries with one early application of Temik.

PEACH INSECTS AND MITES

Leafhopper - Peaches & Nectarines

D. Rough, J. J. Joos, F. M. Charles and C. S. Davis:

Two experiments were conducted in San Joaquin County to find controls of Fiberiella florii, a leafhopper vector of yellow leaf roll disease of peach and buckskin disease of cherry. Shoots were dusted or sprayed and allowed to dry. Three organdy sleeve cages were placed on shoots for each treatment, each cage containing 10 adult leafhoppers. Malathion spray or dust and parathion spray killed all leafhoppers within 24 hours. Diazinon and Sevin spray killed all leafhoppers within 48 hours. In five days, Ethion killed all leafhoppers, Sevin dust had 2 alive, DDT spray had 1 alive, Guthion spray 1 alive, Thiodan spray 4 alive.

Green Peach Aphid

E. W. Anthon:

Under greenhouse conditions Bay 77049 and 78182, Shell's SD 14045 and Union Carbide's 34096 applied at 1 pound per 100 gallons of water gave excellent control of green peach aphids for three weeks. Bay 77049 at 1/2 pound gave excellent control for two weeks.

In the field the following materials gave excellent control of this aphid: Morton EP 332 at 1/2 pound, Asodrin at 1 pint and NIA 10242 at 1/2 pound per 100 gallons of water.

McDaniel Mite

E. W. Anthon:

The following materials gave good control of this mite: Asodrin, Galecron, Tranid, Dessin, Bay 58733, Morestan plus Bay 58733, Omite, Nissol and Tranid plus oil. Two applications of Humble and Collier oil gave good control. Karathane, Meta-Systox and Kelthane did not give good control.

Peach Twig Borer

E. W. Anthon:

Peach twig borer larvae were gathered from the field and successfully reared on artifical diet to the moth stage. Caged moths placed over peach limbs in the field successfully mated and laid eggs on peaches. However, under

laboratory conditions moths failed to mate and lay fertile eggs.

Experiments conducted under tree caged conditions in the field proved that female moths produced a sex pheromone that would attract male moths to caged females.

Peach Silver and Plum Nursery Mites

E. W. Anthon:

The following materials gave good control of these mites: Humble and Collier oil, Bay 77049, Galecron, Tranid, Dessin, Bay 58733, Morestan plus Bay 58733, Omite, Nissol, Kelthane, Morton EP 333 and Fison's 5016. Niagara's 10242 gave good control of peach silver mites on peaches.

Two-Spotted Mite

E. W. Anthon:

Under greenhouse conditions the following materials gave good control of this mite: Fison's NC 5016, Bay 77049, Shell's SD 14045, Union Carbide's 34096 and Ciba's 8514.

Integrated Mite Control Program

E. W. Anthon:

Three integrated plots of peaches in the Wenatchee areas were continued this year. Imidan was used as spray in two orchards and Thiodan and parathion in the other orchard. The Imidan plots were successful as far as mites and twig borers were concerned, but aphids and earwigs were not controlled. The Thiodan and parathion plot built up a heavy McDaniel population by mid-July.

Three plots of prunes in the Yakima areas were continued in an integrated control program. One plot with only a delayed dormant oil and ethion application was successful. One plot with an oil and eithion application was severely damaged by leafhoppers.

The third prune plot had a delayed dormant application of ethion, oil and DDT plus an early July application of Thiodan to control plum nursery mites. This orchard ended the year with good mite control.

San Jose Scale

Fred Dean:

Several brands of highly refined spray oil ranging in viscosity from 68 to 140, were tested against San Jose scale on peach trees. Dormant sprays were applied February 23 at the rate of 2 gal/100 gal. Oil of 140 viscosity gave 100% control while the lighter oils gave mortalities of 97.5% or above.

PLUM INSECTS AND MITES

Plum Aphids

S. C. Jones:

Both Chipman Zolone, and Ciba Galecron were effective in controlling the plum aphids with a single application applied May 16.

APRICOT INSECTS AND MITES

Lecanium Scale

E. W. Anthon:

The following materials gave excellent control of Lecanium scale when applied as a delayed dormant spray: Humble oil, Collier oil and the combinations of these two oils with parathion and diazinon. Parathion and NIA 10242 and 10242 in combination with oil gave good control. Diazinon alone gave fair control but Imidan did not give satisfactory control of this scale.

PRUNE INSECTS AND MITES

San Jose Scale and European Red Mites

J. E. Dibble:

Four narrow range oils (Orchex 696 and 796, PGSO-1 and 2), Volck supreme and dormant oil emulsion were applied in the delayed dormant season. All oils were applied at 2,4,6, and 9 gpa except the dormant oil which went on at 8 and 12 gpa. Each treatment was applied at 400 gpa. Scale control was unsatisfactory at 2 gpa. Mite egg control was poor at 2 and 4 gpa with the lighter oils but good at 6 and 9. The heavier oils showed acceptable control at 4 gpa but were better at 6. The 9 gpa rate was not any better than the 6 gpa rate. The dormant oil at 8 gpa was approximately (slightly less) equal to the 6 gpa rate of the other oils. (Cooperator: George Post, Sutter County)

Brown Almond Mites

J. E. Dibble:

Orchex 696 and 796, PGSO-1 and 2, Volck, Volck plus trithion, Volck plus Kelthane and Kelthane alone were applied at 90 gpa. Kelthane and PGSO-1 alone gave the poorest control with the other treatments all giving satisfactory results. (Cooperator: George Post, Sutter County)

S E C T I O N III

INSECT AND MITE PESTS OF NUT CROPS

FILBERT INSECTS AND MITES

Aphid and Bud Mite

S. C. Jones:

Insecticides tested against the filbert aphid and bud mite were: Shell Azodrin, Fisons NC 5016, Niagara Thiodan and Meta-Systox-R. Applications of Azodrin applied on May 16 and June 26 gave control for the season. NC 5016 burned the foliage and the later application was omitted. Meta-Systox-R was painted on the tree trunks and also sprayed on the filbert tree trunks. A single application of either method controlled the aphids for the season. The application was made on May 18. Two applications of Niagara Thiodan gave seasonal control of the aphids. None of these treatments controlled the filbert bud mite.

ALMOND INSECTS AND MITES

European Red Mite and Strawberry Mite

C. S. Davis and L. T. Browne:

Seven oils (light medium summer oil, Orchex-696, Orchex-796, Mobile XMTY-94B, PGSO-1, PGSO-2, and Volck Supreme) were tested for control of European red mite and strawberry mite on almonds in Fresno County. All oils gave control of European red mite for 23 days. All oils gave satisfactory initial control of strawberry mite, but all oils required retreatment 23 days following the first application. The heavy oils had less strawberry mites on the leaves at the time of the second application than the lighter oils. All oils caused darkened spots on the foliage. Soil moisture was low at time of application.

WALNUT INSECTS AND MITES

European Red Mite and Walnut Aphid

M. M. Barnes:

Withdrawal of the registration of Aramite and resistance problems with other materials, increases need for further development of acaricides for use on walnuts. Materials which performed well against European red mite include Galecron, Omite, GS19851 and Morestan. Resistance problems continue to be critical in obtaining satisfactory control of the walnut aphid. The following materials provided control for periods ranging from 3-5 weeks: Zolone, Morestan, Niagara 10242 (Furadan), GS13005, and Azodrin.

San Jose Scale and Walnut Aphid

C. S. Davis, D. E. Ramos and W. C. Batiste:

In Stanislaus County, three months after spring treatments, San Jose scale populations were reduced to zero on bark samples with oil plus either diazinon or parathion. Oil plus either Trithion or Ethion gave satisfactory control. Scale insects increased in the check (phosphamidon). Oil plus either Trithion, Ethion, parathion or diazinon, and phosphamidon gave excellent control of walnut aphid for three months.

Pacific Mite

C. S. Davis, L. C. Hendricks, and W. C. Batiste:

Four weeks of control of Pacific mite were obtained with Omite, Kelthane and Kelthane plus oil in Merced County. Trithion plus oil and chlorobenzilate plus oil gave control for three weeks. Chlorobenzilate and Volck supreme gave control for two weeks. Orchex-796, PGSO-2 and Trithion gave control for one week. Oils used alone or oils plus pesticides gave a slight amount of spotting on the leaves.

Mites

C. S. Koehler and W. C. Batiste:

Tree implants of the systemic insecticides Meta-Systox-R, Bidrin and phosphamidon suppressed walnut aphid and two-spotted mite, but the effects on walnut husk fly were not evaluated because of insufficient pest populations.

Walnut Husk Fly

W. C. Batiste:

Laboratory experiments were conducted to evaluate soil applications of insecticides for control of overwintering populations of walnut husk fly. The treatments had no effect on the number of larvae pupating from the current season nuts, but adult survival from pupae of the previous season was reduced. Heptachlor spray or granules were more effective than dieldrin spray or chlordane spray or granules. EPN was not effective.

S E C T I O N IV

DISEASES OF STONE FRUITS

PRUNE DISEASES

Brown Rot of Fruit

Iain C. MacSwan:

Three sprays of lime sulfur (1 gal./100 gals.) applied to Milton prune trees at 7-day intervals before harvest significantly reduced breakdown of fruits by brown rot when the fruit was kept in common storage. The last spray was applied seven days before harvest. Phygon (1/2 lb./100 gals.) applied on the same spray schedule did not provide adequate control of fruit breakdown by brown rot.

PEACH DISEASES

Leaf Curl

Iain C. MacSwan:

Difolatan applied to Improved Elberta trees at the rate of 4 lbs./100 gals. in November and January by either airblast or handgun sprayer gave excellent control of leaf curl. Fair control was obtained from one spray applied by airblast sprayer in November. Because the agitator in the handgun spray tank was inadvertently inoperative when the November spray was applied, control of leaf curl was poor. The importance of adequate agitation in spray tanks was demonstrated.

S E C T I O N V

DISEASES OF POME FRUITS

APPLE DISEASES

● Scab

Iain C. MacSwan:

Red Delicious: DuPont 1991 (8 oz./100 gals. plus Surfactant F) gave excellent control of scab. Applications were made at pre-pink, full bloom, calyx and covers. One spray of Difolatan (6 1/4 lb./100 gals. plus Volck Supreme Oil 2-5 gals./100 gallons) applied at delayed dormant gave equivalent control. Scab in both the DuPont 1991 and Difolatan plots was significantly less than that in the Cyprex plus Karathane plots. No apparent phytotoxicity to leaves, fruit or other tissue occurred in any of the plots.

Rome: DuPont 1991 (8 oz./100 gals. plus Surfactant F) applied at pre-pink, pink and 1st and 2nd covers provided excellent control of scab-significantly better than the standard Cyprex plus Karathane sprays (both 3/4 lb./100 gals.)

In one test in which the pre-pink and pink applications were not applied because of the late arrival of some materials and the only sprays applied were first and second covers, Delan (1 lb./100 gals.) provided good scab control - equivalent control to the standard Cyprex plus Karathane program. No apparent phytotoxicity to leaves, fruit or other tissue occurred in any of the plots.

● Powdery Mildew

Iain C. MacSwan:

Rome: DuPont 1991 applied at pre-pink, pink and 1st and 2nd covers gave control equal to that of the standard Cyprex plus Karathane (both at 3/4 lb./100).

In one test (see above under "scab") where sprays were applied only at 1st and 2nd covers, Delan (1 lb./100 gals.), Bayer 89693 (16 fl.oz./100 gals.) and Bayer 49854 (1 lb./100 gals.), provided fair control of mildew - equivalent to the control provided by the standard Cyprex plus Karathane (both 3/4 lb./100 gals.).

Jonathan: Control of mildew equal to that provided by the standard Karathane 25 w.p. (3/4 lb./100 gals.) was given by Morestan 25 w.p. (1/2 lb./100 gals.), EL 241 (at 20 ppm, 40 ppm and 60 ppm) and Euparen 50 w.p. (1 lb./100 gals.). Sprays were applied at pre-pink, pink, calyx and 1st and 2nd covers. No apparent phytotoxicity to leaves, fruit or other tissue occurred in any of the plots.

PEAR DISEASES

H. R. Cameron:

Test Crop - Pear trees, Old Home on quince roots.

Application - Chemicals were injected with a McLean Fumigun with an 8-inch point. Injections were made every 8 inches in rows 8 inches apart with alternate rows staggered, resulting in a diamond grid pattern with approximately 230 injections per plot.

Date of treatment - September 1961

Date of Planting - February 1962

Aeration Period - 5 months

Type of test - Field test at Crestbrook Orchard, Medford, Oregon where pear tree decline occurred. Portions of an old orchard were pulled and individual tree sites were treated with soil fumigants before replicated 12 times with an equivalent number of check trees. The orchard was tilled after the trees were pulled (there was a low cover crop of weeds and grasses). Many large roots were broken in the process of pulling the trees. The ground was moist in most sites but wet in a few low spots.

Results - None of the treated sites contained suckers from old roots left in the ground. Suckers from roots appeared in some of the untreated sites.

Trees on sites treated with Vorlex were approximately one year ahead of trees on non-treated sites.

The average increase in cm^2 area of trunk is shown in the table below:

Chemical	Rate of Application gal/A.	Average increase in cm^2 area of trunk 1963-64	1964-66
Vorlex	70	0.04	8.2
Vapam	70	0.02	6.7
DD	70	0.03	6.2
Checks (no treatment)	--	0.01	4.5
Interplants (no treatment)	--	0.01	4.6
Lanstan	20	0.00	4.1

Soil Fumigation Test Conducted by:
Dr. H. R. Cameron
Department of Botany and Plant Pathology
Oregon State University
Corvallis, Oregon

S E C T I O N VI

DISEASES OF NUT CROPS

WALNUT DISEASES

Walnut Blight

Iain C. MacSwan:

Extensive tests of Kocide 101 were conducted in 1967, but the incidence of blight was too low in all tests to allow for assessment of Kocide 101. No phytotoxicity was observed in any of the plots. The tests will be repeated in 1968.

S E C T I O N VII

SPRAY RESIDUES, COMPATIBILITY, PHYTOTOXICITY, BEE POISONING AND POLLINATION, CONCENTRATE SPRAYING AND OCCUPATIONAL EXPOSURE

● Compatibility and Phytotoxicity

APPLES

H. F. Madsen, & K. Williams:

The following materials and combinations were tested for phytotoxicity on 8 apple varieties: CIBA - 8514, NC-5016, Dow 213, zinc chelate, zinc chelate plus magnesium sulfate, zinc chelate plus oil, magnesium sulfate, magnesium sulfate plus oil, magnesium sulfate plus zinc chelate plus oil.

NC-5016 at 20 lb. per acre caused leaf spotting on all the apple varieties and fruit injury to Golden Delicious, McIntosh and Spartan. Magnesium sulfate at 20 lb. per acre when combined with oil caused severe leaf burn and some defoliation on all of the varieties with Golden Delicious, Newtown, Rome and Jonathan showing the most severe damage. There was no fruit injury to these varieties at harvest. None of the other materials or combinations were phytotoxic.

S. C. Hoyt:

Azodrin caused moderate defoliation of Golden Delicious and fruit injury to Red and Golden Delicious apples. The degree of injury on Red Delicious was related to fruit size with the smallest apples having the most severe injury. Applications of Acaralate resulted in fruit damage on Golden Delicious apples.

R. W. Zwick & F. W. Peifer:

Some bark, leaf, blossom or fruit damage resulted from the application of the following pesticides or pesticide combinations: Apples: Azodrin Bay 58733, Bay 58733 + Morestan, dimethoate, Dessin + Volck Supreme, Guthion + dimethoate + Ziram, and Phosphamidon. Pears: Karathane + Nutra-Phos + Solubor, Morestan + DDT + Cyprex, Morestan + DDT + Ziram, Oils - 60 or 140 vis., Oil (superior type) + Ethion, Perthane + Karathane + Ziram, and TH 367-I.

PEARS

Everett Burts:

Tests conducted indicate that a zinc nutrient spray may be preceded or followed by a dormant oil treatment as recommended for insect and mite control within 4 days without causing any detectable injury to Bartlett or D'Anjou pears.

Nissol was found safe as a summer spray on Bartlett and D'Anjou applied alone or in combination with Ziram, Parathion, Guthion or Diazinon.

Aerial applications of Perthane plus oil were found safe at oil rates as high as 4 gallons per acre on dormant Bartlett and D'Anjou pear trees. Seasonal programs involving several summer sprays of oil or oil in combination with Guthion, Imidan or nicotine sulfate did not cause detectable injury to fruit or foliage of Bartlett or D'Anjou pear. A program of nine oil sprays at 2 week intervals starting at petal fall caused a greening of the tissue around the lenticels of Bartlett pear but did not effect storage quality, ripening rate or taste of the fruit.

Several surfactants toxic to pear psylla in laboratory screening tests were phytotoxic when applied to orchard trees; they caused both fruit and foliage burning.

P. H. Westigard:

The following materials caused moderate to severe damage to pear fruit foliage: CIBA 8514, Moresta, Zolone, Orchex 796 (2% emuls), Volck Supreme (2 gals.), PGSO-1 (2 gals.), TH-367 I, Omite, NC 5016, and TX 1209.

J. Beutel, C. Hemstreet, J. Dibble and J. Doyle:

Five summer oils were applied at various rates and times to bearing Bartlett pears in Lake County, California to determine degree of fruit injury.

Oil sprays caused persistent green spots around lenticels of the skin on mature green and yellow ripened pears. Injury down graded fruit for fresh shipment, but caused no problems for cannery usage. Injury occurred on 1-35% of the fruit in one orchard and 0-9% in another. Oil injury had no effect on internal fruit quality or storage life.

Light, narrow range oils caused more injury than heavier, narrow range oils. Injury was most severe where oils were applied within 2-3 weeks of harvest at 5-6 gal. oil/A. (concentrate or dilute). Minimal damage occurred with 3 applications of 3-4 gal. oil/A.

J. E. Dibble:

Spray rates of 9, 90 and 360 gpa for mite and psylla control. Regardless of the spray oil or rate per acre used, 90 and 360 gpa were slightly to somewhat better than 9 gpa. In a long series of counts 90 gpa was as often slightly better than 360 in control performance as was 360 over 90. (Cooperator: Chester Hemstreet, Lake County)

Ulo Kiigemagi and L. C. Terriere (Spray Residues):

Persistence of oil deposits on pear foliage: The persistence of four different summer oils was compared under Southern Oregon Summer conditions. The oils were applied at the rate of 2 gal./acre and samples taken at

at various intervals. All samples were analyzed by gas chromatography.

Oil type	Oil deposits (ug/cm^2) [a/]				
	0 days	3 days	7 days	14 days	28 days
Humble 70	29	23	19	15	11
Volck Supreme	38	29	23	19	15
Collier's PG SO-1	23	17	12	8	4
Collier's PG SO-2 [b/]	39	30	26	19	13

a/ Average of three covers.

b/ Average of 1st and 3rd covers.

Varying the amount of emulsifier used did not significantly change the deposits or the persistence of Humble 70 oil.

PEACHES

J. E. Dibble (Phytotoxicity of narrow range and supreme oils in combination with wettable sulfur):

Although leaf injury in the form of shotholing, yellowing, and defoliation occurred in a range from slight to severe, very little of this effect was measurable 2 weeks after application. These trees were definitely under a moisture and cultural stress. The 796 plus sulfur (applied at 10 gpa) and the PGSO-2 and Volck plus sulfur (each applied at 100 gpa) showed slightly less phytotoxicity than the lighter oils plus sulfur. (Cooperator: David Ramos, Stanislaus County)

J. E. Dibble (Phytotoxicity of oils plus other insecticides and oil plus sulfur):

Orchex 696 and 796, PGSO-1 and 2, and Volck were applied in combination with guthion, Kelthane, and sulfur. The lighter oils plus guthion gave a slightly more phytotoxicity than this combination involving the heavier oils except where Volck, guthion and Kelthane were applied together. Wettable sulfur plus oil showed the opposite -- the heavier oils giving slightly more phytotoxicity in this combination than was true with the light oils. None of the damage was serious although trees suffering water stress were effected to a somewhat greater degree than those recently irrigated. No injury was observable 2 weeks after application. (Cooperators: David Ramos and Norman Ross, Stanislaus County)

J. E. Dibble (Phytotoxicity of Narrow Range and Volck Supreme Spray Oils in Combination with Guthion, Parathion, Trithion, Diazinon and Sevin):

All oils in combination with Guthion showed noticeable but not severe leaf spotting, yellowing and some defoliation. The only exception to this was when the rate of oil was reduced from 6 gpa to 3 gpa. Here only a trace of injury could be found. These oils, plus parathion, also caused injury but not quite as bad as with Guthion. Trithion would be next in line -- with diazinon showing only a trace. No symptoms were observed when the oils were compared with Sevin. All trace of injury was gone 2-3 weeks after application. (Cooperator: George Post, Sutter County)

J. E. Dibble (Spray Residues on Pear Leaves and Fruit, Almond, Walnut and Peach Leaves):

Some 275 residue samples were taken this past season in order to determine deposit levels of the different oils as well as at different rates. This is an effort to determine deposit levels necessary for mite and scale control and that amount causing phytotoxicity. Method of application and deposit amounts so obtained were also of interest.

PRUNES

J. E. Dibble: (San Jose Scale and European Red Mites):

Applications made at 6 gpa (straight oil), 12,45,75 and 400 gpa each with 6 gallons of oil were made at delayed dormant. Coverage, deposit and control were good in all cases. The 6 and 12 gpa rate appeared initially not to spread or cover as effectively as the higher concentrate rates but resulted in near to the same control for both scale and mites. (Cooperator: George Post, Sutter County)

ALMONDS

J. E. Dibble (Brown Almond Mite):

Application of Trithion, Diazinon, Volck, Orchex 796 and Diazinon plus oil were made at the spray rates of 13, 40, 100 and 400 gpa. All treatments were made at the recommended rates for the respective materials. Each material and gallonage gave extremely good control. (Cooperators: Thomas Aldrich, Colusa County and George Post, Sutter County)

C. S. Davis and L. T. Browne (Oil Sprays):

Dark spotting of almond foliage was quite apparent from applications of seven foliage spray oils in Fresno County. Soil moisture was low at the time of application. The oils used were: Light medium summer oil, Mobile XMTY-94B, Orchex-696, Orchex-796, PGSO-1, PGSO-2 and Volck Supreme.

WALNUTS

C. S. Davis and L. C. Hendricks (Oil Sprays):

Small dark spots were observed on walnut foliage in Merced County when sprayed with Volck Supreme, PGSO-2 or Orchex-796. Spotting was also observed when these oils were combined with pesticides. Pesticides applied alone caused little or no spotting to the foliage.

CHERRIES

C. S. Davis, F. M. Charles and J. J. Joos (Oil Sprays):

No phytotoxicity was apparent on Bing cherry foliage in San Joaquin County when sprayed with postharvest applications of light medium summer oil, PGSO-1, PGSO-2, Orchex-696, Orchex 796 or Volck supreme. All foliage had been previously heavily infested with two-spotted mites, but were wiped out by predators. Soil moisture was adequate at time of application.

Occupational Exposure

Aage B. Anderson:

During the past three years fires and accidents involving large volumes of pesticides have occurred in Washington State creating potential health hazards. The control of these potential health hazards and possible contamination to the environment was managed by local health departments, fire departments and state peace officers.

The Western Regional Toxicology Laboratory, Public Health Service and the Washington State Health Department Pesticide Laboratory has served as advisors to these agencies and evaluated methods of pesticide waste disposal.

The histories of the pesticide-involved-accidents and fires have established areas where persons responsible for hazard control should be knowledgeable of several factors that aid in securing and preventing pesticide wastage from contaminating the environment.

In addition, the possibility of excessive exposure to clean up personnel was studies in the most recent Wenatchee fire. Exposure was found to be minimal under the controlled conditions of pesticide removal.

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