ABSTRACTS OF REPORTS FROM THE 41st ANNUAL WESTERN COOPERATIVE SPRAY PROJECT

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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 in any way to constitute recommendations of the project. Official recommendations can only be made by public service investigators from their respective areas.

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Abstracts of Reports from the
41st Annual Western Cooperative Spray Project

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INSECT AND MITE PESTS OF POME FRUITS

APPLE INSECTS AND MITES

Codling Moth

H. F. Madsen:

In an integrated control plot, Imidan at 4 lb. 50% per acre resulted in 1.5% wormy fruit at harvest while Guthion at 2.5 lb. 25% per acre gave 0.4% wormy fruit. McDaniel mite was present in high numbers throughout the season, but never reached epidemic proportions. Predaceous phytoseiid mites were found on both Imidan and Guthion sprayed trees, but in very low numbers.

H. F. Madsen:

Pheromone traps baited with live female codling moths were evaluated as a means of control. Plots which contained one pheromone trap per tree captured large numbers of male codling moths during the season. At harvest, there was no difference between trees containing the traps and untreated check trees. The infestation was over 50% regardless of treatment. Plots which contained both pheromone traps and blacklight traps also failed to give codling moth control.

M. D. Proverbs:

In 1966 the method of sterile codling moth release was used for the first time in a commercial orchard. A total of 224,000 gamma-sterilized male moths and 196,000 sterilized females were released in a 3-acre section of the test orchard. Sex trap records showed an average ratio of 286 sterile male moths to 1 native male throughout the season. At harvest, only 3 infested apples were found on one tree in the release section of the orchard. Light infestations were found on 10 trees in the adjoining part of the orchard which received two codling moth sprays.

It was evident that the numbers of sterile moths released were greater than required for control. Flight studies with marked moths also indicated that the number of release sites could have been reduced.

J Franklin Howell:

Male codling moths pass a spermatophore into the bursa copulatrix of the female each time they mate. The female mating frequency can be determined by dissecting the bursa copulatrix and counting the number of spermatophores present. In field-collected females 0-11 spermatophores have been recovered. The average is 1-2 per female and data obtained suggests that the female mates only once during a 24-hour period.

Codling moths trapped in bait pans are generally considered to be reproductively older than moths trapped in blacklight traps. Provided the codling moth is polygamous, the females recovered from bait pans should contain more spermatophores than those recovered from blacklight traps. My data indicates there is no difference in spermatophore count.

Sterile males released in an orchard at a ratio of 30 sterile males to 1 wild female would seemingly provide maximum opportunity for polygamous females to mate an optimum number of times. Data available shows no increase in spermatophore counts in a release orchard vs. a non-release orchard.

Darrell O. Hathaway and B. A. Butt:

More than 600,000 sterile-male codling moths were released in a 15-acre apple orchard at Yakima, Washington in 1966. The moths were released at weekly intervals from April 26 to September 16. Overflooding ratios of sterile to native males in the orchard were estimated at 270:1 and 177:1 by sex attractant and blacklight traps, respectively. Some sterile males migrated from the release orchard, accounting for a ratio of 20 sterile to 1 native moth in a 2-acre untreated block 400 ft from the release orchard. Codling moths damaged 0.03% of the fruit in the release orchard and 0.3% in the untreated block.

B. A. Butt:

At Yakima, Washington, the Agricultural Engineering Division and Entomology Research Division are exploring methods for automated sexing of codling moth pupae by size and for segregation of age of pupae by color. Both methods of separation show promise.

Fred P. Dean:

Experimental insecticides SD-8447 and GS-13005 were tested for control of codling moth. Tests were made by the field-laboratory method in which samples of leaves and fruit were taken from sprayed trees each week after the spray application and exposed to adult and young codling moth larvae in the laboratory. Residues of both test materials gave nearly 100% mortality of adults and larvae for five weeks (the duration of the test) after the spray application.

This is a report of research and not a recommendation of any materials tested.

R. W. Zwick and F. W. Peifer:

In an orchard producing 92% wormy or stung fruit on unsprayed trees, the most effective compounds applied four times at 28-day intervals were Nia 10242, Guthion (1½#), and Imidan. Carbaryl (1½#), Shell 8447, and DDT-OP were slightly less effective, but considered adequate for commercial protection. DDT alone and diazinon would be marginal and ethion could not be considered satisfactory.

L. D. White:

Male and female codling moth adults were sterilized by exposure to 40 krads of gamma radiation from a Co-60 source. These were released in a young, semi-isolated orchard of 29 trees (24 apple and 5 pear) located at Yakima, Washington after a single pre-season spray of Parathion at 1 lb/100 gal. was applied in the spring to reduce the suspected high overwintering codling moth population (estimated at 50% during 1965).

Releases of 500 sterile moths were made each day (except Sundays) beginning May 16 and continuing through Sept. 14. A total of 60,385 sterile moths were released during the season. Overflooding ratios of sterile to native males were estimated as 22:1.

A total of 10,655 apples (including windfalls) and 1703 pears (including windfalls) was harvested, of which 1.08% and 1.82% were infested with codling moth larvae.

Considering the level of 1965 infestation in this orchard and the high 1966 codling moth infestation in other local orchards having no insect control programs, the above data appear encouraging.

S. C. Jones:

Shell SD-844, 75% W. P., dosages of .75 lbs., 1 lb., and 1.5 lbs. ai/100 was very effective against the codling moth. Results based on an average of three single tree replicates were as follows: .75 lb., 1.3% worms; 1 lb., .03% worms; 1.5 lb., .01% worms. Check 1, 26% worms; Check 2, 36% worms and Check 3, 34% worms. DuPont 1179, 90% W. P., 1/2 lb. ai/100, 3.16% worms; Thirocron EC (2.5 lbs./1 gal.) 3 pts./100, 8.66% worms.

Orchard Mites

Fred P. Dean:

Azodrin®, UC-20047A (Tranid®), and Naugatuck D-014 were very effective against McDaniel and European red mites, holding the mites to small numbers throughout the season with two applications. Bayer 5417 and Bayer 58733 were also very effective with three seasonal applications. Bayer 5417 caused spotting of the fruit. UC-19786 (Dessin) was effective against McDaniel mites but less effective against European red mites. NIA-10242 gave good control of European red mites but was ineffective against McDaniel mites.

Temik® was tested as a systemic soil acaricide against orchard mites on mature Winesap apple trees. The Temik® granules were broadcast beneath the trees May 9, at the rates of 1, 2, and 4 lb per tree and soaked into the soil with sprinkler irrigation. The 1-lb dosage held the mites to small numbers until about August 1, while the 2- and 4-lb treatments were effective for three weeks longer. The Temik® treatments were less effective after mid-August than the standard spray treatment of two applications of binapacryl, May 19 and July 19.

Orchard mites were controlled by the predaceous mite Typhlodromus occidentalis in apple orchards where insecticides and acaricides were held to a minimum. In one orchard, which had a relatively large number of predators at the beginning of the season, the phytophagous mites were nearly eliminated by August 1. This orchard received no insecticide sprays during the season but was sprayed with dinocap 3 lb actual/acre May 18 and June 1. In another orchard there were very few predators at the beginning of the season but laboratory-reared Typhlodromus were introduced into the trees at various times. McDaniel mites were practically eliminated by August 22. This orchard received no acaricides but was sprayed with azinphosmethyl May 19 and diazinon July 15. The trees in these orchards were not seriously injured by mite feeding.

R. S. Downing:

Shell Neutrol Dormant Oil, Volck Supreme and Orchex 796 were applied at the half-inch green or at the pink bud stage. All oils gave good control of the European red mite, fair control of the apple rust mite, and did not cause any appreciable reduction in the numbers of predaceous phytoseiid mites.

The main difference between the oils was their effect on the trees. Shell Neutrol did not cause any visible injury whereas Orchex 796 caused swollen bark lenticels that eventually cracked on common and Red Delicious apples. Volck Supreme caused similar injury to Red Delicious but not to common Delicious.

R. S. Downing:

The results of a survey of 30 orchards showed that predaceous phytoseiid mites were present in 7 of them. An integrated program of mite control was attempted in two of the seven orchards. In Orchard A where the spray program consisted of dormant oil, tetradifon at the pink, and Guthion and Diazinon in the summer, the European red mite began increasing in mid-June, the phytoseiids in mid-July, but the McDaniel spider mite was not a problem. In Orchard B where the only difference in the spray program was a thinning spray of carbaryl, and ethion with oil in the dormant, the phytoseiid mites did not start increasing until early August. By that time the McDaniel spider mite had increased and caused some defoliation but began declining shortly after the increase of phytoseiids. European red mite in Orchard B were similar in numbers to those in Orchard A.

R. S. Downing:

Delicious apple trees that have been sprayed during the last five summers with Pennsalt Superior Oil for orchard mite control showed the first signs of injury this year. After an oil application on July 9, most of the primary leaves of these trees yellowed and dropped.

Of the newer miticides, CIBA 8514 50% E.C. 1 pt. per 100 gal. was most effective followed by Phenoflurazole 25% W.P. 1 lb. and Milbex 50% W.P. 1 lb. Omite 30% W.P. 1 lb. per 100 gal. was the least effective but probably should have been used at a higher concentration.

Volck Supreme Oil at 6 or 3 gal. per acre gave good initial but poor residual control of the apple rust mite.

R. W. Zwick and F. W. Peifer:

Delayed dormants of Volck Supreme at 2% and DFG dormant at 3.2% gave the best control of overwintering European red mite eggs. Two lighter oils at 2% were almost as effective. Animert, Morestan, and tetradifon at this time were ineffective against overwintering eggs.

Of experimental acaricides evaluated, Nissol (1 Pt) and CIBA 8514 gave excellent control and were not phytotoxic. Shell 9129 gave excellent control, but produced serious tree injury at petal-fall. Animert EC was slow in knockdown early, but gave residual control. Tranid was excellent and long-lasting in some applications, poor in others. Dessin gave effective knockdown but only three to four weeks of effective control. RP 11974 residual action appeared effective, but knockdown slow. Morestan (3/4#) and Omite were effective against red and two-spotted mites. Bromopropylate (GS 19851), chlorobenzilate, Kelthane (WP or MF), Nia 10242, Upjohn 7414, Thiocron, and Du Pont 1179 were poor or inconsistent against red mites. The former three chlorinated hydrocarbons were effective and Nissol (3/4 Pt), CIBA 8514, Nia 10242, ethion-oil poor against late-season two-spot mite buildups.

In the orchard with four 28-day covers against codling moth, Guthion, carbaryl, Nia 10242, Imidan, and DDT-OP all reduced predatory mites and buildups of either red or two-spotted spider mites occurred. Typhlodromids appeared to be the most effective two-spot predators; Zetzellia mali the most efficient red mite predator.

Delayed dormants of oils allowed high predator mite (Typhlodromus, Zetzellia, Tydeus) populations by season's end and few red and no two-spot mites were left on the trees by early October. Omite, ethion, and Kelthane plots were lowest in predators. Late season control of a two-spotted mite infestation by typhlodromids was noted in a commercial orchard which had minimal early dinocap but several OP and one Kelthane or Dessin applications.

Stan Hoyt:

Integrated control of mites utilizing the predator, Typhlodromus occidentalis was highly effective. A variety of materials in plots from the Canadian border to the lower Yakima Valley allowed sufficient survival of predators to maintain control of the McDaniel spider mite and European red mite. A moderate population of rust mites in the early season was an asset to the program providing a source of food for the predators when spider mites were scarce. The principal materials which interfere with the program by killing predators are Sevin, Kelthane, Morocide, and high rates of Guthion.

Stan Hoyt:

The most outstanding miticides for the control of the McDaniel spider mite were C 8514, EP 334, NC 5016, and Temik. Good control was provided by Nissol, Dowco 213, Tranid, Omite, SD 9129, U 7413, and U 7414. The less

effective compounds included Dessen, EP 332, G-38, G 13005, and AC 69049.

Stan Hoyt:

Prebloom sprays of Nissol, Tranid, and M 2060 were effective through mid-July. C 8514 was slightly less effective. As summer sprays C 8514 and Nissol provided excellent control, while Dowco 213 and Omite gave good control. Tranid and SD 9129 were also effective, but varied from good to fair.

Stan Hoyt:

SD 9129 gave exceptionally good control of the apple rust mite with a long residual effect. Other compounds giving control were C 8514, Nissol, Dowco 213, Omite, M 2060, Temik, U 7413, U 7414, ethion, and Trithion. Tranid and Dessen were relatively ineffective. Thiodan at 1/2 pound per 100 had previously given good control, but during 1966 this rate failed in several instances. Higher rates were effective.

Donald W. Davis:

Northern Utah had an extremely serious mite year during 1966. Most of the damage was done by the McDaniel mite. The summer was hot and dry, with heavy mite populations in most orchards during August. The mite season extended into September more than usual.

The acaricidal work was limited to one replicated experiment at North Salt Lake City. This orchard has had a long history of mite problems, with known resistance to several acaricides. All dosages given, are in rates of actual per 100 gallons of full volume applications, except for Milbex which is given in the amount of formulated material. UC20047A (16 oz) was effective for a two month period, and was the best material used. Azodrin (4 oz) and CIBA 8514 (12 oz) rated number two and three respectively, with control lasting for about seven weeks. Morestan (4 oz), Trithion (8 oz), Omite (6 oz) and UC19786 (16 oz) were about equally effective, with the control lasting about four weeks. Morocide (4 oz) and Milbex (500 grams of formulation) controlled the mites for about three weeks. Tedion (4 oz) was a complete failure, probably due to resistant mites.

In addition to the acaricidal work, studies were conducted with the predatory mites associated with the McDaniel mite. The commonest Phytoseiidae found on apple trees were Typhlodromus occidentalis, with some T. mcgregori. Life history and feeding tests were conducted with T. occidentalis. Even under starvation conditions, T. occidentalis would not feed on pollen. Apparently under Utah conditions, this species is strictly predatory.

San Jose Scale

C. V. G. Morgan:

San Jose scale is usually controlled with a dormant spray in British Columbia, but when infestations are severe, one or more summer sprays may be necessary. Of the foliage sprays, light viscosity oils are one of the

most effective for killing the San Jose scale. Because of problems with compatibility when mixed with other pesticides, they are difficult to program into the orchard spray schedule. Parathion is also an effective summer spray and will kill any stage of the scale including the overwintered black caps. It is not necessary to time this spray by the appearance of crawlers. Diazinon is nearly as effective as parathion against the San Jose scale.

C. V. G. Morgan:

Previous work has demonstrated that the San Jose scale dies on apples when the harvested fruit is held in standard cold storage or in controlled atmosphere storage. Certain pre-storage treatments aid in killing scale and shorten the period for complete mortality in storage. The alcohol flotation bath used to remove water cored apples kills a large percentage of the scale and those that survive die in a much shorter period than those on nontreated apples. Anti-scale inhibitors act more slowly but they do aid in hastening the death of the scale in storage. Subjecting apples to both treatments can reduce by a third or more the storage period necessary to kill all the scale on infested apples.

Rain Beetles

R. W. Zwick and F. W. Peifer:

Some mortality of Pleocoma spp grubs at shallow depths was noted at high EDB soil fumigant rates. The application rates or method of dispersal used to date do not control the deeper larvae however, and commercial control does not appear to be economically feasible at this stage.

Pear Thrips

R. W. Zwick and F. W. Peifer:

Pink sprays of insecticides reduce thrips pansy spot marking of Newtown apple more than delayed dormant or petal-fall applications.

PEAR INSECTS AND MITES

Pear Psylla

R. W. Zwick and F. W. Peifer:

Excellent early season psylla control was obtained with dormant applications of Perthane EC. Good to excellent summer control of pear psylla resulted from applications of RP 11974 EC, Polyram at 4 lb/100, Stauffer N-4543 at 2 lb/100, Nissol, Morestan, Perthane WP, Dilan and combinations of Guthion + ethion, Guthion + carbaryl (½ rate of each), Guthion + Perthane (½ rate of each), Guthion + Volck Supreme oil and Guthion + Humble 6390 (50 vis oil). Temik (UC 21149) gave long lasting psylla control when applied as a 10% granular material at the rate of 0.5 lb of product per young pear tree.

H. F. Madsen:

Orchex 796 oil, Volck Supreme Oil, and Pennsalt Superior Oil were tested for control of the pear psylla. The materials were applied at a dosage of 5 imp. gal. per acre. The plots received one spray at the delayed dormant stage followed by two summer sprays. Volck Supreme Oil and Pennsalt Superior Oil gave good control following the three-spray program. Orchex 796 oil failed to adequately control pear psylla adults and the trees were rapidly reinfested. All three oils caused enlarged and corky lenticels on one- and two-year-old wood.

R. D. McMullen:

DDT, Ryania and Guthion were evaluated for their effect upon pear psylla and pear psylla predators. As compared to an untreated check, DDT reduced the predator complex 12% and the number of pear psylla increased 240%. Ryania reduced the predator complex 43% and the pear psylla 16%. It is probable that the reduction in pear psylla following Ryania is due to selective nontoxic action to certain efficient predators rather than toxicity to pear psylla. Guthion reduced the predator complex by 59% and the number of pear psylla increased 163%.

R. D. McMullen:

Shell Neutrol Dormant Oil, dormant oil plus Perthane, Perthane alone, and Dilan all gave good control of the pear psylla when applied on March 28, 5 days after the first psylla eggs were found. Morestan applied at the same time gave good control but was significantly less effective when applied a month later in April.

Summer sprays of Perthane, Dithane M-45, Perthane plus Dithane M-45 and Perthane plus Polyram 80 all gave excellent control of the pear psylla. Two sprays were applied, the first on June 14 and the second on June 29. Polyram 80 applied alone gave significantly poorer control than the other treatments.

Peter Westigard:

Perthane was applied to most Rogue Valley pear orchards in early February. The results indicated good adult control. Variations in control were related to variation in droplet size by different aircraft. Generally, poor control was obtained in orchard borders and near aerial obstructions. Excellent control was obtained by ground application. In spring time trials Nissol, Guthion plus oil, and Guthion plus Perthane provided economic control.

Fred P. Dean:

Aerial applications of ULV sprays were tested against pear psylla adults in the spring before egg laying began. Perthane LC 4 lb/gal at 1.5 gal/acre was very effective; malathion concentrate 95% at 3 pt/acre and azinphosmethyl LC 2 lb/gal at 1.0 gal/acre were only partially effective.

Temik® was tested as a systemic soil insecticide for control of pear psylla. The Temik® was broadcast over the root area of mature Bartlett pear trees at the rates of 10, 20, and 40 oz per tree on May 6. The 10-oz dosage was less effective than the standard spray treatment of Perthane® June 28 and oil July 19. The 20- and 40-oz treatments gave excellent seasonal control.

Everett Burts:

Several materials were tested as dormant sprays for the control of overwintering adult pear psylla. Only Dilan was found to be comparably effective with Perthane. Even Perthane did not perform as well as it did last year. The increase of adults in some plots after the applications indicates that the sprays were applied too early, before the psylla had emerged from hibernation. Better control resulted when the applications were made after the first eggs had been deposited.

In the area control plots Perthane applied during the late dormant period proved quite effective in reducing overwintering psylla populations. Ground sprays were more effective than aerial applications but in some areas ground spraying was not practical due to the inavailability of water and the presence of snow in the orchards. Timing the application was the most critical phase of the program and required a detailed sampling of each area to determine psylla development. Later applications, with respect to psylla development, gave better control than did earlier ones. Rainy and unsettled weather seriously interfered with spraying and reduced the effectiveness of the program in some areas. In the Orondo area psylla populations were resistant to Perthane and Dilan therefore this program was ineffective. In general psylla control in the Yakima Valley plot was very good and growers in this area were able to maintain better control of pear psylla with fewer sprays than were used the previous year. Dormant sprays also aided in psylla control in the Dryden plot but the kill was not generally as good as was obtained in Yakima. Most growers in both areas were well satisfied with the results and plan to continue the program next season. The dormant spray will probably be used more extensively next year as growers in more areas get organized and become familiar with the program. This year over 14,000 of the 22,000 acres of pears in the State were treated.

Nissol was further evaluated for the control of pear psylla this season. It was found to be ineffective as a dormant spray against overwintering adults but continues to show promise as a summer spray against nymphs. This material is most effective during warm weather but has a short residual life and two applications 10 to 14 days apart may be necessary to control heavy populations. N-4543, C-8514 and TH-346-1 also were active against pear psylla in screening tests during the summer.

Orchard Mites

Peter Westigard:

Because of low summer temperatures buildup in densities of this species was delayed until mid-August. Materials applied at that time which gave outstanding control include EP-334, C-8514, and Tranid.

Peter Westigard:

In summer trials to evaluate the effect of various fungicides and chelating agents on control of the European red mite, both Maneb and Zeneb provided economic control for over 6 weeks. Experimental compounds which were effective included Traniel, Dessin, Omite, N 4543, Nissol, U7414, EP 334 and C8514.

Peter Westigard:

In trials for control of the pear rust mite, outstanding control was obtained with NIA 10242, Manzate Zineb and Ethion. Somewhat less effective were tranid, Omite, Morocide and Trithion. Imidan, Ferban, Polyram and Perthane were not effective.

S E C T I O N II

INSECTS AND MITES OF STONE FRUITS

CHERRY INSECTS AND MITES

Cherry Fruit Fly

S. C. Jones:

Sevin 50% W.P., Nia 10242, 50% W.P., and Thirocron EC (2.5 lbs./gal.) were tested at 1 lb. ai/100. Sevin and Nia 10242 received sprays on May 24, June 6 and June 15. Thirocron plots were sprayed on May 24 and June 6. The third spray was omitted because of slight foliage injury. Near perfect control was obtained from all three materials.

Fruit-Tree Leaf Roller

R. W. Zwick and F. W. Peifer:

Heavier oils in the dormant and delayed dormant were generally more effective than lighter oils in preventing hatching of eggs in laboratory and field. A delayed dormant of 3.4% oil and petal-gall of DDT-parathion reduced fruit damage more than several other programs used.

PEACH INSECTS AND MITES

Peach Twig Borer

Darshan Singh Sarai:

Seasonal history of peach twig borer was investigated from May 15 to October 15, 1966, in peach and apricot orchards in Penticton (J. Kerluke and M. Kopas) and Cawson (W. Ritichie) area. This study shows that there are two to three generations per year of peach twig borer in British Columbia. It appears from this study that voltinism in peach twig borer is controlled not only by length of favorable temperature conditions but also by the availability of the fruit for food. Present study emphasizes the importance of food, as larvae which fed on fruit in August developed and completed third generation in British Columbia, whereas those which fed on bark built hibernacula. Probably the presence of hibernacula in August led previous workers in British Columbia to assume that the whole August brood of larvae was overwintering.

The principal control of peach twig borer is direct insecticide application against the feeding larvae. Spray Calendar recommendations for the Interior of British Columbia have been a pink or petal fall spray against overwintered larvae. A spray to kill second generation larvae has not been recommended. Research has shown that a spray is effective when applied near the pink stage (Bailey, 1948 and Quist, 1963). This is explained by the fact that overwintered larvae leave their hibernacula at about this time and crawl about in search of buds or young shoots, which increases their chances of contacting insecticide.

Present studies suggest that the early pink is the best time to kill overwintered larvae while petal fall is late because by that time larvae are in the shoots. A spray to control second generation larvae proved very effective when applied between June 22 to June 27, 1966. This spray gave good control on peach and apricot even in orchards where the pink spray was missed. Endosulfan (thiodan) gave better results than DDT. Summers (1949) found that DDT appeared to be failing to control peach twig borer in California. Possibly this insect is developing resistance to DDT.

E. W. Anthon:

Under laboratory controlled conditions twig borers have been successfully reared on artificial diet from eggs through the adult moth period. Moths have successfully mated and laid eggs in cages placed over peach limbs in the field.

Oriental Fruit Moth

E. W. Anthon:

Tests conducted in the field show the following materials to give good control of this insect: Guthion, NIA 10242, DDT + parathion, Sevin and Thiodan.

Lecanium Scale

E. W. Anthon:

The materials which gave the best control of this pest were as follows: Geigy 13005, Imidan and Diazinon. Humble oil and Volck oil alone and Humble oil in combination with parathion also gave good control of this scale.

San Jose Scale

E. W. Anthon:

Stauffer's N 4543, Shell's 9129 and parathion did not give satisfactory scale control. Humble oil or Volck in combination with parathion gave excellent scale control.

Green Peach Aphid

E. W. Anthon:

Under field experimental conditions the following materials gave excellent aphid control: Baygon, BAY 65258, DuPont 1179, NIA 10242 and Temik.

European Red Mite

E. W. Anthon:

Morestan, Omite, Shell 9129, BAY 5417 and BAY 65258 gave good control of European red mite on prunes.

McDaniel Mite

E. W. Anthon:

The materials which gave the best control of this mite were Tranid, Omite and BAY 5417. The following acaricides gave good control for three weeks: Dessin, Shell 9129 and Morestan.

Two Spotted Mite

E. W. Anthon:

Under greenhouse conditions the following materials gave good control of this mite: Mobile 327, Temik granules and Kelthane.

Beneficial Arthropods

George Tamaki and R. E. Weeks:

Aluminum bands backed with paper or tarred burlap were placed around the scaffold branches of peach trees infested with the green peach aphid , Myzus persicae (Sulzer), and tested as protective, overwintering sites for beneficial arthropods. The seeding of some bands with the predator Anthocoris melanocerus Reuter, did not prevent eclosion of eggs of the aphid. However, 96% of the arthropods found under the bands were beneficial. Orius tristicolor (White) and spiders were the most abundant predators; Praon sp., a primary parasite, and Charips sp. and Asaphes lucens (Provancher), hyperparasites, were also common. Phytophagous insects found were Keonolla confluens (Uhler), Psylla pyricola Foerster, and Aphalara rumicus Mally.

Integrated Mite Control Program

E. W. Anthon:

Two plots of peaches and two plots of prunes were started in an integrated mite control study. One plot of prunes in Yakima showed good control of McDaniel mite by Typhlodromus occidentalis.

PLUM INSECTS AND MITES

S. C. Jones:

Thiodan, 50% W. P., 1/2 lb./100; Meta-Systox-R (2 lb./1 gal.), 1 pt./100; Nia 10242, 50% W. P., 1/2 lb. ai/100; Thirocron EC (2.5 lb./1 gal.) 1 pt./100 was tested against the plum curl aphid. The materials were applied on three single tree replicates on May 11 at the late petal-fall stage of development. Based on the total counts of terminal infestations for three replications the results were as follows: Thiodan 3; Meta-Systox-R, 0; Nia 10242, 7; Thirocron EC., 12; Checks, 22.

S E C T I O N III

INSECT AND MITE PESTS OF NUT CROPS

FILBERT INSECTS AND MITES

Filbert Aphid

S. C. Jones:

UC-21149 (Temik) showed fair control of the filbert aphid at dosages of 1/2 lb. and 1 lb. of 10% granules per tree applied on the soil under filbert trees. The material was applied in an 18 inch band on the soil at the periphery of the tree on April 18. Experiments conducted on May 16 when the aphid population was at a higher level showed there was no apparent difference between applying the granules on the soil from the tree trunk to the periphery of the tree. In the earlier experiments the granules were watered down immediately after the granules were applied to the soil by a power sprayer at the rate of 50 gallons of water per tree and later by irrigation system to a depth of 14 inches. In the later experiments the granules were watered down immediately after the application of the granules on the soil by irrigation system. Neither UC-21149 or Di-Syston were effective against the filber aphid or bud mite at the later application time.

S E C T I O N IV

DISEASES OF STONE FRUITS

CHERRY DISEASES

Storage Decay
(Pre-harvest Treatment)

Duane L. Coyier and I. C. MacSwan:

Several fungicide treatments were applied by a handgun sprayer to Bing cherry trees seven days prior to harvest. The cherries were harvested and stored in polyethylene bags at 32°F for 21, 30 and 45 days then examined for rot. Additional observations were made for each storage period following incubation at 70°F and 85% R. H.

Results of the test are given in the following table:

Chemical and Dosage Per 100 Gallons	Percent decay at three storage intervals*		
	21 days	30 days	45 days
1. Difolatan, 80% W. P., 1¼ lb.	5.3	10.1	8.4
2. Botran, 50% W.P., 2 lb. Captan, 50% W.P., 2 lb. Chlorox, (200 ppm cl)	11.0	12.8	15.9
3. Captan, 50% W.P., 2 lb.	16.7	25.0	41.3
4. Botran, 50% W.P., 2 lb.	21.1	45.8	37.2
5. Difolatan, 80% W.P., 1¼ lb. Botran, 50% W.P., 2 lb. Chlorox (200 ppm cl)	22.4	33.4	33.9
6. Ziram, 76% W.P., 2 lb.	26.2	28.4	38.9
7. Check (no fungicide)	27.8	83.4	100.0

*Fruit was stored from harvest to indicated time at 32°F, then incubated 5-7 days at 70°F, 85% R. H. Figures indicate total percent fruit decayed at duration of test.

Difolatan treatment provided excellent control of storage diseases of Bing cherries but is not currently registered for use on this crop. No phytotoxicity was observed but an "off-flavor" persisted for the duration of the test period. We believe this was due primarily to an accumulation of spray deposit in the stem cavity.

Combination of Difolatan with other materials reduced its effectiveness against storage diseases. This phenomenon was substantiated by several subsequent tests.

Storage Decay
(Post Harvest Treatment)

Iain C. MacSwan and D. L. Coyier:

Five fungicides or fungicide combinations were applied to harvested Bing cherries for control of storage rots. Best control of rot was obtained by application of Captan 4 Flowable. Percentages of rot allowed by each treatment were: Captan 4 Flowable - 29.2 Difolatan - 37.8, Botran plus Difolatan - 50.2, Boran - 65.7, Check - 73.6.

Three boxes, approximately 20 lbs. each, were used per treatment. Cherries were harvested July 14, treated July 15, stored in poly bags at 32°F until August 5, incubated at 70°F, 85% R.H. for three days and examined August 8.

PEACH DISEASES

Post-Harvest Treatment of Peaches with Botran and Other Fungicides for Control of Rhizopus and Brown Rot

L. E. Lopatecki:

Control of brown rot of fruit artificially inoculated through breaks in the skin was not as effective as that obtained with botran against Rhizopus. Best control of brown rot resulted from botran alone at 2 lb 85W per 100 gal., or a mixture of 1-1/2 lb botran plus 1-1/2 lb difolatan. These materials reduced brown rot 40-44% in fruit held 4 days at 70°F. after treatment. Control with mixtures of botran with captan, manzate, cyprex or phygon were less effective. Control of brown rot in fruit superficially loaded with fungus spores was very much more effective with all materials. While fruit dipped in water was completely rotted after 7 days storage, that dipped in botran alone at the 2 lb rate, or a botran-captan mixture, showed no signs of rot after 10 days at 70°F.

S E C T I O N V

DISEASES OF POME FRUITS

APPLE DISEASES

Apple Powdery Mildew

Duane L. Coyier and Scott B. Kelly:

Several new chemicals were tested for control of powdery mildew on pear and apple seedlings. Most of the new materials provided good disease control but many also caused phytotoxicity. Dessin (UC 19786) provided excellent disease control and relatively minor injury to the foliage. Hercules 10702 (50% E.C.) was also rated high for powdery mildew control but caused serious leaf malformation. Karathane, TH-316-F, U.C. 23271, Morestan and Bayer 47531 (Euparen) provided good disease control with relatively minor or no injury to pear or apple foliage. Omite provided poor control of powdery mildew during an early season test but was considerably better when tested during warmer weather.

Control of powdery mildew by the application Morestan sprays did not equal results reported in previous seasons. The reduced effectiveness of this material may have been due to the addition of Bio-film spreader suggested by the manufacturer to reduce phytotoxicity.

Suppression and Stimulation of Bull's Eye Rot of by Apples by Post-Harvest Dip Treatment with Chemicals

L. E. Lopatecki:

Post-harvest treatment of Newtown apples with fungicides and scald inhibitions reduced bull's eye rot of naturally infected fruit as follows: Cyprex (1/2 lb per 100 gal) 48%; diphenylamine (1000 ppm) 47%; ethoxyquin (1760 ppm) 35%; difolatan (1 lb 50W per 100 gal) 35%; stop mold F (0.6%) 31%; propyl gallate (2000 ppm) nil.

On the other hand, post-harvest treatment of apples with very dilute solutions of alanine or sugars (50-100 ppm) increased rot development, but not to a marked degree.

S E C T I O N VI

DISEASES OF NUT CROPS

WALNUT DISEASES

Walnut Blight

Iain C. MacSwan and P. W. Miller:

In all three tests of bactericides for control of walnut blight, Kocide 101 was as effective as Bordeaux. Considerably less effective were Orthocop and copper carbamate.

Kocide 101 is the first bactericide, in many years of testing, that has provided blight control equal to that of Bordeaux, the standard recommendation.

S E C T I O N VII

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

Compatibility and Phytotoxicity

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

Application of the following pesticides and pesticide combinations resulted in some leaf and/or fruit damage during the 1966 growing season: Apples: Animert EC, ethion WP + petroleum oil, parathion flowable + Karathane WP, and Shell 9129 EC. Pears: BHC WP + Niagara Supreme oil, Karathane WP + Tedion WP + Nutraphos + Plyac, Kelthane WP + Karathane WP + Cyprex WP, Kelthane MF + Perthane EC.

H. F. Madsen and K. Williams:

The following materials and combinations were evaluated for phytotoxicity as concentrate sprays on eight apple varieties: Morestan 3 lb. 25%, phosphamidon 1 qt. 8.0 E.C., Milbex 6 lb. 50%, Imidan 4 lb. 50%, Volck Supreme Oil 6 gal., Orchex 796 oil 6 gal., Pennsalt Supreme Oil 6 gal., parathion 4 lb. 15% plus Volck Supreme Oil 6 gal. All dosages are amounts per acre.

Morestan caused leaf reddening and spotting on Rome, Newtown, Jonathan, Spartan, and Golden Delicious apples. Parathion plus oil caused leaf spotting on Newton, Golden Delicious, Rome, Jonathan, McIntosh and Spartan. Phosphamidon gave leaf spotting on Newtown, Jonathan and Golden Delicious.

Fruit injury was as follows: Morestan - severe russet on McIntosh and Spartan, moderate russet on Golden Delicious. The three oils caused light russet on Golden Delicious, McIntosh and Spartan.

Concentrate Spraying

Everett Burts:

The Econ-o-Mist sprayer, 36TD3, was evaluated for the application of sprays to pear and apple trees. Time was not available to test this machine as thoroughly as it should have been, but an indication of its capabilities was obtained. The machine seems to be adequate for application of sprays during the prebloom and early postbloom periods. Control of pear psylla during the dormant season was comparable to that obtained with other air-blast sprayers and with aircraft. Straight liquid zinc sulfate containing 1.2 lbs. of zinc per gallon was successfully applied at a rate of 12 gallons per acre.

As has been found with most power-take-off driven machines, the Econ-o-Mist sprayer does not have adequate air blast to penetrate large trees during the late summer when the foliage is thick. Control of pear psylla in a dense planting of Bartlett and D'Anjou pears was not satisfactory during July and control of other pests such as spider mites and San Jose scale has

already been shown to be inadequate with machines producing low air volume and velocity and applying materials as concentrate sprays.

The Econ-o-Mist sprayer could best be used in this area as a supplemental machine in conjunction with the standard high volume air-blast sprayers. The advantages of a PTO sprayer and of concentrate spray application are considerable and this machine can be used effectively against many of the insect pests of tree fruits.

Equipment

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

Comparative evaluations of a concentrate sprayer applying 14-20 GPA against a full dilute air carrier sprayer were made from the delayed dormant through second cover applications. Concentrate applications gave poorer overwintering European red mite egg kill and allowed higher red and two-spotted populations on both apple and pear trees. Pear psylla were controlled better by dilute sprayer and less fruit damage was evident at harvest in the dilute-sprayed plots.

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