ABSTRACTS OF REPORTS FROM THE 54th ANNUAL WESTERN ORCHARD PEST AND DISEASE MANAGEMENT CONFERENCE

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These abstracts of progress reports on research conducted on the principal insect and disease pests of tree fruits and nuts 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
54th Annual Western Orchard Pest and Disease Management Conference

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S E C T I O N I

LEPIDOPTEROUS INSECTS

Discussion Leader -- Helmut Riedl

Codling Moth - Apples

Stanley C. Hoyt, Tree Fruit Research Center,
1100 N. Western Avenue, Wenatchee, WA 98801

A codling moth model again accurately predicted first hatch of codling moth eggs. Studies of phenology in the field, however, indicated the prediction of later events was inaccurate.

In orchards with moderate to high populations of codling moth Bay Sir 8514, Guthion and Ambush provided excellent control while Lorsban, pheromone in Conrel fibers and Dimilin did not give adequate protection. High mite populations developed in the Ambush plots, but mites were no problem on other plots.

Placing pheromone traps in the upper 1/3 of the tree canopy resulted in a 3-fold increase in male catch over traps placed at eye level.

Jack D. Eves, AgReCon, Prosser, WA 99350

Three handgun cover sprays on golden delicious resulted in the following effectiveness at harvest for codling moth control: GR 8514 .25 > GR 8514 .5 > Ambush E .1 > GR 8514 .125 > Ambush W .1 > Ambush E .05 > Ambush W .05 > Guthion .25 > W 439 .25 > W 439 .125 > check. The checks had 56.7% larval entries at harvest. GR 8514 shows good promise but should be applied earlier for more effective control.

Commercial application of 3 cover sprays in 100 gal water per acre on Rome apples resulted in the following effectiveness at harvest for codling moth control: Pounce EC .05 > Pounce E .05 > Pounce EC .025 > Pounce E .025 > Guthion .25 > Guthion .125 > check. Checks had 54.5% larval entries at harvest.

Pounce provided moderate control of white apple leafhoppers in spite of the late timing of the 1st application. Pounce provided poor control of apple aphids. Pounce initially had a detrimental effect on predator mites but they were able to rebuild populations later in the season.

H.F. Madsen, Research Station, Summerland, B.C.

Diflubenzuron two first brood sprays followed by a male removal program with sex pheromone traps resulted in 9 percent codling moth infested apples. Two first brood sprays of diflubenzuron and one second brood spray followed by male removal program gave 4.6 percent infested apples.

Codling Moth - Pears

Everett Burts, Washington State University,
Tree Fruit Research Center, Wenatchee, WA 98801

Sprays of Dimilin 25% WP at 2 ounces ai/acre were as effective as sprays of Guthion 50% WP at 2/3 lb. ai/acre in controlling codling moth. The first Dimilin application was timed to first egg lay, the second cover was applied 21 days later and a third spray was timed for beginning of second brood entries. Guthion sprays were applied at time of first entry, 21 days later and for second brood entries. Guthion nearly eliminated Anthocoris sp and Deraeocoris brevis while in Dimilin plots populations of these predators were high and not significantly different from those in an untreated check.

J.E. DeTar and Helmut Riedl, University of California, Berkeley

Monitoring with pheromone traps: Several new slow-release formulations supplied by Hercon Co. were tested in the field as dispensers for the pheromone. These dispensers consisted of layers of plastic through which the pheromone diffused. Performance was equal to or better than the standard ZOECON lure.

Codling Moth - Pears and Apples

S.A. Hoying and Helmut Riedl, University of California, Berkely

Diflubenzuron was shown to be ovicidal in laboratory evaluations on codling moth. Maximum activity of this compound occurs when young eggs (0 - 250°h) are treated; diflubenzuron is increasingly less effective on older eggs (250°-2000°h). Significant carryover effects to the larvae can be seen from eggs treated between 900°-1200°h. Topically treated adults produced eggs which developed and hatched normally.

LC_{50} values of young eggs (0 - 250°h) for 93% technical and 25W diflubenzuron respectively are .207 $\pm$ .143 - .303 and .437 $\pm$ .183 - 1.04 mg ai/1.

Residue persistence against codling moth eggs was tested at ca. weekly intervals on pear foliage exposed to field conditions for 6 weeks. After an initial rapid decline in activity, mortality of codling moth eggs stabilized at 33% for the remainder of the test period.

Johannes L. Joos, Kenneth Schneider, Martin Mochizuki, Luis Falcon,
Clarence S. Davis, University of California Cooperative Extension, Santa Rosa

The Use of a Computer Model in Controlling Codling Moth (Laspeyresia pomenella Linnaeus) in North Coast Counties of California: Daily maximum and minimum temperatures were collected from thermographs in orchards throughout pear and apple growing areas in five north coast counties of California in 1979. These data, when put in a day degree computer model (Bug Off), gave us good predictive capabilities for the life stages of Codling Moth (Laspeyresia pomenella Linnaeus).

Predicted moth flights were correlated with actual moth flights with the use of Pherocon Pheromone Traps®. Egg hatch occurs one to two weeks after peak flight. The computer model gave us an accurate date for hatch, so chemical control could be implemented.

Effectiveness of our program was demonstrated by the reduction of Codling Moth larva found in fruit compared to the previous year of heavy damage. The blocks not under our program showed up to 27% damaged fruit.

R.W. Zwick and G.J. Fields, Mid-Columbia Experiment Station; Hood River, Oregon

Male removal or trap-out plots in a Bartlett pear orchard with a moderate CM problem gave poorer control than 1 OP cover spray. High traps caught more males than eye-level traps. Plot location in the orchard affected damage more than number of trees/trap.

In a 1.8 acre Red Delicious apple block at 8 trees/trap, a seasonal average of 2.6 moths/trap/week reduced damage to 1 percent.

Diflubenzuron and BAY SIR 8514 at higher rates in four covers were equal to three covers of permethrin and did not cause spider mite resurgences on apple. Cryolite was ineffective in this plot.

H.R. Moffitt,[1] P.H. Westigard,[2] S.C. Hoyt,[3] D.O. Hathaway[1]

In studies on the use of the sex pheromone for control of the codling moth through mating disruption, while a high degree of season-long control was achieved on pears, (in cooperation with P.E. Westigard, OSU), significant levels of infestation occurred. As in 1977 and 1978, the Conrel© chopped fiber system containing the sex pheromone was applied by helicopter to selected blocks. This season, because of changes in the formulation, the formulation yielded only about 243 mg per hectare per day versus about 310 mg in 1977 and 1978. Three or four applications were made to earlier-maturing Bartletts and four or five on late-maturing D'Anjous and Boscs. Evaluation was again on the basis of the response of native males to pheromone-baited traps and the infestation in the fruit at harvest.

In the block treated with the pheromone for the third season, the infestation in the Bartletts at harvest was 14.8% and in the Boscs it was 12.2%. This compared to 82.4% and 74.8% in the untreated controls.

In the 10-acre commercial block treated with the pheromone for the second season, the infestation was 4.96% in the Bartletts and 2.0% in the D'Anjous. In the untreated controls, it was 46.0% and 28.2%.

Two small blocks of apples in the Wenatchee area (in cooperation with S.C. Hoyt, TFRC-WSU) were also treated with the pheromone in the Conrel fiber system using the same formulation, dosage, etc., as was used in pears. As in 1978, substantial infestation of codling moth occurred in both blocks. Both blocks were sprayed out with an insecticide for control of the codling moth.

As a result of these studies, it is evident that biological monitoring, using only male response to traps and fruit infestation, is not sufficient to time applications to preclude infestation. Application of the pheromone must be applied in a preventative manner, before mating has taken place. The use of tethered virgin females as indicators of mating will help in evaluation use of the pheromone. (Moffitt, Winterfeld, Hathaway)

A dispenser for applying the Conrel chopped fiber system, containing any pheromone, from the ground has been developed and field tested. This dispenser will be used in selected tests for control of the codling moth and other pests through mating disruption. (Moffitt, Hathaway)

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[1] USDA-SEA/AR, 3706 West Nob Hill Boulevard, Yakima, WA 98902.

[2] OSU, Southern Oregon Experiment Station, 569 Hanley Road, Medford, OR 95720.

[3] WSU, Tree Fruit Research Center, 1100 North Western Avenue, Wenatchee, WA 98801.

J. Franklin Howell, Yakima Agricultural Research Laboratory
Agricultural Research, Science and Education Administration, USDA
Yakima, WA 98902

Male annihilation of codling moth: Trap trees (sprayed trees) were established and males were drawn into the treated trees using synthetic pheromone. No control was obtained in a heavily infested orchard but control was achieved in a commercial orchard where the codling moth population was limited. However, the control obtained was not clearly the result of the treatment. This test will have to be repeated, perhaps several times, to determine if the treatment is effective.

Leafrollers - Apple

H.F. Madsen, Research Station, Summerland, B.C.

Diflubenzuron, Bacillus thuringiensis and insecticidal soap were evaluated for control of fruit tree leafroller and European leafroller as pink and petal fall sprays. B. thuringiensis gave 90 percent reduction of leafroller larvae and prevented fruit injury. Insecticidal soap and diflubenzuron did not provide satisfactory control.

S.A. Hoying, Helmut Riedl and C. Pickel, University of California, Berkeley

Seven insecticides were evaluated for control of a leaf roller complex (primarily Argyrotaenia citrana, and Pandemis pyrusana) near Watsonville, CA. Guthion, Imidan, Pydrin and Pounce provided effective control at standard rates, while Dimilin did not. Kryocide and Sevin provided marginal control. Sevin is the predominant insecticide used against leaf rollers on apple in this area.

Leafrollers - Apple, Pear, Peach and Cherry

H.F. Madsen, Research Station, Summerland, B.C.

The sex pheromones of 4 leafroller species (fruittree, European, obliquebanded and threelined) were field evaluated. Male leafrollers were attracted to their specific pheromone except for obliquebanded which was attracted more frequently to the pheromone of European leafroller than to its own pheromone. Sex pheromone traps show promise as a means of monitoring leafroller populations in pest managed orchards.

Navel Orangeworm - Almonds

J.E. Dibble, University of California, Parlier.

May treatments showed the following materials to give good control of NOW when evaluated at harvest: Guthion, Sevin, Lorsban, Ambush, Pydrin, Imidan, Celation, Orthene and Supracide. Oil alone, though not as good, does show promise as an ovicide. May plus a July treatment is not justifiable over a single May spray. A single July treatment can be as effective as the May treatment. Double hullsplit applications made in July and August were no better than a single early hullsplit treatment.

Hullsplit tests in another orchard having a high NOW population showed Pounce and Pydrin to be slightly better than Imidan plus Adjust, Ambush, Sevin and Guthion.

The use of the parasitic nematode - Neoaplectana carpocapsae at hullsplit was successful in that application in high and low volume sprays did not harm the nematode and did result in NOW mortality.

M.M. Barnes, C.E. Engle, S.C. Welter, and E.F. Laird, Department of Entomology, University of California, Riverside

Permethrin (Ambush or Pounce) provides a high degree of moth mortality (86% reduction in egg laying over 18 days). Results of the past season in a 5-acre block treated with permethrin (0.4 lbs AI/acre) were as follows: 3 applications (May, hullsplit, and hullsplit plus 16 days) gave 94% control reducing infestation from 23% to 1.3%. However, when applied in May, permethrin created such a severe mite problem that 2 treatments (one by ground and one by helicopter) failed to control them. Therefore, emphasis will be placed on its use at initiation of hullsplit and again at about 50% hullsplit. When permethrin has been used during the hullsplit period, normal applications for mite control, as used in Kern Co. have been sufficient. However, use of miticides is necessary in order to provide mite control, if this practice is not part of the usual spray program.

Better results (in large plot speed sprayer trials in a heavy infestation) were obtained with Guthion when applied at the 45 days before harvest timing (46% control) as compared with a May timing (27% control). In some seasons, however, as high as 85% control has resulted from a May spray of Guthion. The difficulty with the May spray with Guthion lies in accurate timing. Improvements are being sought in this matter. A heat summation model of navel orangeworm development is being developed. The threshold for egg development is 55°F. Egg hatch begins after accumulation of 99 degree-days above this threshold and is complete after 110 degree-days. Heat summation data on development from egg hatch to emergence of adults is being obtained. Matters relevant to accurate spring timing of Guthion are: (1) a substantial portion of the eggs laid during the first part of the season give rise to moths before hullsplit occurs; (2) since Guthion does not provide significant moth kill, May timing must be accurate and directed primarily against newly hatched larvae which yield moths emerging at and after hullsplit. The development of a heat summation model will aid in better timing of spring sprays.

Comparisons of insecticides for navel orangeworm control were conducted in small plots at hullsplit timing. These trials show larvicidal action only. Fenvalerate (Pydrin) and AC222-705 head the list in the current trial followed closely by permethrin and Guthion, the latter timed at 45 days before harvest. These were followed in close order by Larvin, Imidan and Sevin.

R.E. Rice

Dormant sprays of Diazinon and oil significantly reduced damage by navel orangeworm to almonds by first reducing infestation of nuts by peach twig borer. The addition of a May spray, applied two weeks after first egg hatch, improved NOW control over the dormant spray alone. Single May sprays without prior dormant sprays were also quite effective for control of both NOW and PTB. Hullsplit sprays did not improve NOW control over single May sprays.

Oriental Fruit Moth - Peaches

R.E. Rice and B.A. Croft

Pheromone traps were used to monitor the seasonal flight activity of oriental fruit moth in several locations in the southern San Joaquin Valley during 1979. Cooperators in this project were W.W. Barnett, W. Bentley, and D. Flaherty in Fresno, Dern, and Tulare counties. Using the OFM model developed at Michigan State University in 1978, developmental rates for four generations of OFM at Parlier averaged 1012 day-degrees (D^0) $\pm$ 18 D^0. These D^0 values are computed from 1st moth to 1st moth in each successive generation, rather than from peak to peak of moth flight. It was found that the calculations were much more accurate starting at the beginning of each generation, because peaks are more difficult to accurately detect within a 2-3 day period.

Pandemis pyrusana (?) - Apples

Stanley C. Hoyt, Tree Fruit Research Center,
1100 N. Western Avenue, Wenatchee, WA 98801

Studies on the biology and control of Pandemis were conducted. Treatments directed against the larval stages were relatively ineffective, but fairly good control was provided by sprays timed at peak moth flight. Effective materials included Guthion, parathion and Penncap M.

Peach Tree Borer - Peach

Fred L. Banham, Canada Agriculture, Research Station, Summerland, B.C. VOH 1ZO

Sex pheromone monitoring: Male peach tree borer moths were attracted to traps containing laboratory prepared rubber septa impregnated with synthetic female moth pheromone but were not attracted to commercially prepared Conrel Clearwing Borer trap kits containing hollow-fiber dispensers charged with a similar synthetic pheromone. Pherocon 1C traps baited with rubber septa caught an average of 18.5 tree borer moths/trap during the season but the Kitterman traps baited with Conrel hollow-fibers caught 0.0 moths/trap.

Peach Twig Borer - Peach

Fred L. Banham, Canada Agriculture, Research Station, Summerland, B.C. VOH 1ZO

Control: One timed summer spray of pirimicarb 50 WP at 250 or 500 g ai/ha did not control first generation peach twig borer moths and larvae attacking peaches. The treatments were applied by airblast sprayer in 562 L 10 days after the first rapid increase of male moths occured in traps baited with synthetic female

pheromone. In plots treated with 250 or 500 g of pirimicarb and in the checks there were total chatches of 33, 18 and 4 moths/trap, respectively, 12 days following treatment. At harvest, fruit injury caused by peach twig borer larval feeding averaged 48.6, 39.8 and 28.7%, respectively.

Jay F. Brunner, Washington State University
Tree Fruit Research Center, Wenatchee, WA 98801

Peach Twig Borer Phenology Model: Observations of the biology of the peach twig borer have been made for two years at the Tree Fruit Research Center. A model describing adult activity (oviposition) and pupation is presented. Estimate of the lower developmental threshold for immature stages is proposed. The proposed model is compared with adult flight activity from California peach and almond orchards.

Peach Twig Borer - Almonds, Peaches & Nectarines

J.E. Dibble, University of California, Parlier

The organic phosphate material Celathion was compared to Diazinon in the dormant and pink bud spray period. An April evaluation of twig strikes in one orchard showed perfect control from the dormant treatments. The pink bud spray resulted in only 68-80% control. In a second orchard where the pink bud spray was applied at the start of this stage rather than at the end as above, control was equivalent regardless of application timing. Celation was as effective as Diazinon on each crop.

Peach Twig Borer - Almonds

R.E. Rice, Univeristy of California, A. Res. and Ext. Center, Parlier, CA

Dormant or May sprays of Imidan or Diazinon at 0.5 lb. a.i./100 gals. and Ambush at 0.05 and 0.10 lb. a.i./100 gals. provided good to excellent control of peach twig borer in terminals. The addition of 1.0 or 2.0 pts. of Buffer-X/ 100 gals. appeared to improve the performance of Imidan. Mite samples at 27 and 41 days post-treatment showed no differences in European red mite counts between treatments; mite populations increased dramatically in the Ambush treatments after 63 days, but not in the other treatments.

Spotted cutworm pheromone

J. Franklin Howell, Yakima Agricultural Research Laboratory
Agricultural Research, Science and Education Administration, USDA
Yakima, WA 98902

In cooperation with pheromone chemistry at Yakima it has been shown that there are one major (Z7-14:Ac) and 2 minor components (Z7-12:Acand Z7-14:OH) in the spotted cutworm pheromone. The major component (Z7-14:Ac) has limited attractancy, therefore minor components were added to test for enhanced attractancy. The addition of Z7-12:Ac did not enhance attractancy. To date the sex pheromone has not been isolated.

Chlorpyrifos 4E for cutworm control - residue analysis

Analysis of undertree debris collected in April 1979 from the 1978 treatments showed that the residues were reduced 81 to 94% overwinter. However, residues of 18.6 to 175.6 ppm remained which indicates that annual applications would result in an accumulation of residue from year to year. The phenol metabolite was higher in the spring than in the fall.

Tentiform Leafminer - Apples

Donald W. Davis, Utah State University

For the fourth season in a row, the tentiform leafminer (Lithocolletis sp.) was serious in many Utah apple orchards. The infestations were less widespread in 1979 than during 1977 and 1978. One orchard averaged more than 15 mines per leaf. The first adult flight took place about two weeks before bloom, the second flight peaked during the last week of June, the third flight came during late July and early August, and a few areas had a fourth flight during late September. Commercial orchardists who made the most insecticide applications to control the pest (using Systox, Thiodan and parathion primarily) tended to have more injury that those using minimum orchard spray programs. One series of replicated applications using Pydrin at .05 and .1 lbs AI, per 100 gallons and Lannate at .5 lbs AI, timed with the late June flight showed control for the remainder of the season with all three treatments. The best control, Pydrin at .1 lb AI, was 58% on September 14.

Winter Moth - Filberts

Richard Penrose, Oregon Department of Agriculture, Salem, Oregon 97310

The winter moth, Operophtera brumata (L.), a looper native to Eurasia and serious pest of fruit and forest trees in the Old World, was first found in the U.S. at Portland, Oregon in late 1978. Detection was made through discovery of misidentified specimens which had been collected some 20 years earlier.

Subsequent surveys have revealed that the pest is present on San Jaun Island and in the city of Vancouver, Washington and in the greater Portland metropolitan area. The latter infestation encompasses several hundred square miles. O. brumata is a univoltine insect feeding on a wide variety of fruit and forest trees. Favored Oregon hosts are filbert and apple. Adults are active in November and December depositing eggs singly in bark crevices, under lichens and in other sheltered sites on the host trees. Larvae eclose in March feeding first on opening buds, later on the undersides of leaves, blossoms and young fruit. Development takes ca. 6 weeks with larvae pupating in the soil by late May.

S E C T I O N I I

ORCHARD MITES

Discussion Leader -- Dave McMullen

European Red Mite - Apples

Stanley C. Hoyt, Tree Fruit Research Center,
1100 N. Western Avenue, Wenatchee, WA 98801

In several tests RO-12-0470, CGA79596, NC22683, Plictran, Carzol, and Vendex 4L provided good control of European red mites. Vydate (1 quart per 100) and SLJ0312 gave good control in some tests, but in others the residual control was weak. Vydate (1-1/2 pints per 100) and L676863 provided some initial knockdown of the mites but weak residual control in all tests. NC22683 is the most promising material for intergrated programs because of the good European red mite control and low toxicity to apple rust mites and predators. Some Phytotoxicity to fruit was observed with RO-12-0470, CGA79596 and SLJ0312.

Metaseiulus occidentalis - Apples

Stanley C. Hoyt, Tree Fruit Research Center,
1100 N. Western Avenue, Wenatchee, WA 98801

Numbers of these predatory mites were slow to develop in 1979, apparently due to kill during the cold weather of December and January. RO-12-0470, Vydate and CGA79596 were highly toxic to M. occidentalis, while SLJ0312 and L676863 were only slightly less toxic. Carzol reduced populations initially but allowed a rapid build up in numbers. Pirimor (1 oz. per 100), NC22683, and Vendex 4L were low in toxicity to predators.

European Red Mites - Pears

Jack D. Eves, AgReCon, Prosser, WA 99350

BayBue 1452 provided better control than Plictran for European red mites on pears in a post harvest application.

McDaniel Spider Mite - Apples

Jack D. Eves, AgReCon, Prosser, WA 99350

SLJ 0312 and Bay Bue 1452 provided good control of McDaniel mites on apples at all rates. Bay Bue 1452 controlled mites faster than SLJ 0312 or Plictran.

Stanley C. Hoyt, Tree Fruit Research Center,
1100 N. Western Avenue, Wenatchee, WA 98801

Vydate (1 or 1-1/2 pints per 100) and Carzol gave weak knockdown and relatively poor residual control of McDaniel spider mite, but Vendex 4L and SLJ0312 were quite effective.

McDaniel Spider Mite and European Red Mite - Prune and Cherry

Jay F. Brunner, Washington State University,
Tree Fruit Research Center, Wenatchee, WA 98801

Control of Spider Mites on Prune: A liquid formulation of Vendex was tested in prune and cherry orchards against spider mites. Both orchards were sprayed early in the growing season with Pydrin to eliminate predatory mites. On prune Vendex provided good control of the McDaniel spider mite. European red mite populations declined due to natural causes, probably unsuitability of host plant, and posttreatment counts did not differ from check. Vendex provided excellent control of McDaniel spider mite on cherry. For resons ven above, no difference in European red mite populations between check and treatments were observed.

Pear Rust Mite - Pears

Stanley C. Hoyt, Tree Fruit Research Center,
1100 N. Western Avenue, Wenatchee, WA 98801

Kelthane, Plictran, Vendex 4L, and ethion provided good control of pear rust mites, while Pydrin, BAAM and flowable sulfur plus oil were relatively ineffective.

Spider Mites - Apples and Pears

R.W. Zwick and G.J. Fields, Hood River, Oregon

BAY SLJ 0312, dicofol, a flowable formulation of Vendex were all effective against ERM-McDaniel-rust mite complex. Bayleton, a mildewcide, has no effect on spider mites, phytoseiid, or stigmaeid predators, but was very destructive to apple rust mites. The dosage rate of Vendex flowable can be halved if oil is added for mite control and is the least upsetting acaricide to phytoseiids. Amitraz WP controlled ERM and rust mite, but was poor against McDaniel-twospotted mites. Fenvalerate at 0.3# AI/A has a slight knockdown effect on spider mites, destroys predatory and rust mites and results in spider mite resurgences three weeks after.

Two-Spotted Spider Mites - Almonds

J.E. Dibble, University of California, Parlier

The effect of May Navel Orangeworm sprays on mite populations can be striking. Guthion, the commonly used material for this time of year, did not present any special problem. Sevin, Lorsban, Ambush and Celathion each encouraged strong mite buildup.

Two-Spotted Spider Mite - Almonds, Peaches and Nectarines

J.E. Dibble, University of California, Parlier

Unregistered compounds Mitac, UC-55248, BUE & SLJ were evaluated against Plictran, Omite and Kelthane + oil. The latter three showed excellent control through 3 weeks as did BUE & SLJ. The U.C. compound and check had to be overtreated at 2 weeks due to high populations. Other tests in almonds showed the same material to give excellent control along with Mitac and Temik.

Two Spotted Spider Mite and European Red Mite - Pears

Everett Burts, Washington State University,
Tree Fruit Research Center, Wenatchee, WA 09901

Full volume sprays of Vendex EC, encapsulated Omite and Vydate EC were as effective as standard formulations of Vendex and Omite EP's against low populations of these two species.

Two-Spotted Mite, European Red Mite, Phytoseiids - Peaches

R.E. Rice

Sprays of Omite 30 W, Vendex 4 L, and Plictran 50 W applied to peaches in mid-summer provided good control of two-spot and red mite through 27 days. Populations of phytoseiids were highest at 27 days in the Vendex 4 L treatment, followed by Omite and Plictran.

Webspinning mites - effects on almonds

S.C. Welter, M.M. Barnes, and I.P. Ting, University of California, Riverside

The relationship between spider mite feeding and almond tree photosynthetic and transpiration rates was investigated in 1979 in the southern San Joaquin Valley, CA. Mite damage was determined for each tree from the mean number of mite-days accumulated per tree, one mite-day being defined as one mite feeding for one day. Eight pairs of trees were monitored from 4/21/79 to 8/31/79 with a dual isotope porometer to determine the tree's photosynthetic and transpiration rates. One tree in each pair was kept relatively mite-free with an acaricide, while the other trees' mite population was allowed to develop unchecked. The mite-infested trees' mean photosynthetic rate was significantly reduced to 84% of the non-infested trees by 8/18. Similarly, the mite-infested trees' transpiration rate exhibited significant reduction to 90% of the non-infested trees. Eighteen replications of 3 different mite levels are followed in realtion to effects on tree growth and productivity as compared with controls.

Effect of 4 Synthetic pyrethroids on a predatory mite, *Typhlodromus pyri* and its prey *Panonychus ulmi* on apple in South East England.

M.T. AliNiazee and J.E. Cranham

A field trial on apples in south-eastern England showed that pre-bloom 'pink bud' sprays of four synthetic pyrethroids - permethrin, cypermethrin, fenvalarate and decamethrin - were all highly toxic to the predatory mite *Typhlodromus pyri*, but had no appreciable toxicity to the dominant spider mite species, *Panonychus ulmi*. The virtual elimination of the predatory mite at this growth stage of apples led to a marked population increase of *P. ulmi* later in the same season. The use of these pyrethroids for insect control is incompatible with intergrated mite management on apples using *T. pyri*.

S E C T I O N I I I

OTHER INSECT PESTS

European Fruit Scale - Apples

G.J. Fields and R.W. Zwick, Hood River, Oregon

Dormant season sprays of oil alone and oil plus diazinon or Supracide applied by handgun, both from the ground and overhead from a hydraulic pruning platform, failed to penetrate tight bark scales on Newtown apples. Crawlers developed and were present on major scaffold limbs and the main trunk. Oil alone, applied by handgun at 48 gallons per acre, failed to give 100 percent control. Four cover season sprays of diazinon kept fruit clean of scale.

Green Peach Aphid - Peach

Fred L. Banham and R. Palmer, Canada Agriculture,
Research Station, Summerland, B.C. VOH 1Zo

Control: Organochlorine-organophosphate resistant strains of the green peach aphid on peaches were effectively controlled at 3 sites by one pink or one summer spray of pirimicarb 50 WP applied at 500 g ai/ha by airblast sprayer in 1123 L. A pink spray of pirimicarb at 250 g ai/ha was significantly less effective than the 500 g rate at 3 days against apterous infestations of this species on the flowers and at 20 days after treatment against alate and apterous infestations on the leaf clusters. A summer spray of diazinon 50 WP at 4.5 kg ai/ha showed a high level of organophosphate resistance against alate and apterous aphids on the leaf clusters 3 days after treatment.

Green Soldier Bug - Stone Fruits (cherry)

Jay F. Brunner, Washington State University,
Tree Fruit Research Center, Wenatchee, WA 98801

Host-plant survey and behavior of the green soldier bug: Surveys during 1978 and 1979 revealed the breeding sites and principal host plants of the green soldier bug. This insect is distributed throughout the fruit growing areas of Washington (Wenatchee valley and Yakima). It is common along river bottoms and natural drainages where its host plants are plentiful. Inquiries and observations suggest that the green soldier bug damages fruit, primarily cherries, in early spring (ca. May 1-May 20). A hypothesis of early season adult behavior based on observed events, fruit injury patterns and breeding sites is proposed.

Pear psylla - Pears

Donald W. Davis, Utah State University

Two series of psylla control experiments were applied during 1979, The first was a comparison of delayed treatments using Pydrin at .1 lb AI and Morestan at .38 lbs AI per 100 gallons. Morestan gave a seasonal reduction averaging about 70% and Pydrin better than 90%. The second series of treatments was applied on July 18 to an orchard which had received a dormant treatment of Perthane plus oil. The applications and rates AI per 100 gallons were BAAM EC 8 oz., BAAM WP 8 oz., Pydrin 1 oz., Pydrin 2 oz., Pounce 2 oz. and Ambush 2 oz. Through August 14 all treatments showed excellent control. Later in the season adult psylla began to build up, especially in the Pounce and Ambush treatments. There were no indications of unusual mite numbers in any treatments.

Everett Burts, Washington State University,
Tree Fruit Research Center, Wenatchee, WA 98801

In dormant sprays containing 1% oil AC222-705 1.5 ounces ai/acre was as effective as Pydrin .3 lb ai/acre. Flowable sulfur increased the effectiveness of oil sprays in delaying oviposition by overwintering adults. In summer screening test SN72-129 .2 lb. ai/100 gal. and AC222-705 .375 ounces ai/100 gal. provided nymph control comparable to BAAM .3 lb ai/100 gal. and Pydrin .075 lb. ai/100 gal. R013-5223 187 g ai/100 gal. was not acutely toxic to nymphs but prevented them from maturing to adults. Highway plant spray was effective in removing honeydew and killed some of the nymphs when applied as drenching sprays with handguns. Nymph kill was proportional to the concentration applied in a test comparing 1 qt., 2 qt. and 1 gal./199 gal. rates.

Jay F. Brunner, Washington State University,
Tree Fruit Research Center, Wenatchee, WA 98801

Modeling Pear Psylla Development: Detailed observations of pear Psylla development in two orchards during the first generation provided data base for constructing a model of pear psylla development and dynamics. Lower developmental and activity thresholds for adults and immature pear psylla are estimated. Mathematical equations describing the development of pear psylla in pesticide-free conditions are proposed. The effect of pear psylla age structure on efficacy of summer applications of BAAM are demonstrated.

Economic impact of pear psylla: Pear psylla populations were closely monitored in two commercial fruit orchards during 1979. Two sprays (dormant and summer spray) were applied to the Bartlett orchard. Honeydew deposits were heavy by harvest but very little fruit marking occurred as noted by the packout of 92%, 6%, 2% for extra fancy, #1's and #2's, respectively. The d'Anjou orchard

received three pear psylla sprays (dormant, pre-bloom and summer). Grading fruit at harvest for psylla russet provided the following results: extra fancy - 87.6%, US #1 - 11%, US #2 - 1.0%, cull - 0.4%. Nymph days total for the Bartlett and d'Anjou orchards were 899 and 501, respectively. Both orchards required one miticide application. Suckering centers of trees prior to miticide applications reduced populations and helped control.

G.J. Fields and R.W. Zwick, Hood River, Oregon

Initial tests indicate about 20 percent of overwintering females are mated prior to entering winter diapause. Some egg deposition occurred from each caged, unpaired female; hatch occurred in 2 of 10 tests.

No significant differences were found in return bloom or fruit set following one year of four levels of psylla infestation on 17-year old trees.

Fall control of adult psylla drastically reduced numbers during October and November. By mid-February, the unsprayed population was only slightly higher than the sprayed. Levels in both plots were high enough to require dormant spray control. Early season sprays for adults with permethrin, fenvalerate, and AC 222,705 all gave excellent results. A lower rate of AC 222,705 over that of permethrin and fenvalerate could be used with equal results. Pink bud stage sprays of oxythioquinox remain the most effective spray to control nymphs hatched from dormant season laid eggs. Amitraz is the only effective cover spray registered for use. Temik, as a soil-applied systemic, was ineffective irrespective of rate or mode of application. Large plot tests with fenvalerate for full season control gave mixed results relative to rate and timing of applications. One program, fenvalerate applied at dormant, delayed dormant, and third cover, was equal overall in psylla control with the standard spray program; however, fruit damage was slightly higher under the fenvalerate program. The control in this study developed a very high predator/parasite population and ended the season with the lowest psylla counts. But fruit damage was extensive--far greater than could be tolerated. Amitraz WP was generally more effective for psylla control than the EC formulation in overall full season comparisons.

Biological control during the cover season returned to an intergrated pear orchard in the upper valley after collapse during the 1978 season. The addition of water cannon irrigation very markedly reduced the honeydew residue on leaves and fruit.

Martin Mochizuki, University of California Cooperative Extension
2555 Mendocino Avenue, Rm. 100-P, Santa Rosa, California 95401

The Impact of Synthetic Pyrethroids on Pear Psylla (Psylla pyricola Forester) And on All Other Insect and Mite Species in a California Pear Orchard By Johannes L. Joos, Martin Mochizuki, Kenneth Schneider, Clarence S. Davis: In 1979 the synthetic pyrethriod, Pydrin^{R}, was granted an emergency registration (EPA-section 18) to be used on pear psylla (psylla pyricola Forester) in California pear orchards up until 10% bloom. Basic monitoring was done in a pear orchard in Scott's Valley, California, where various concentrations of Pydrin were sprayed at different times in the dormant and delayed dormant season. Two other synthetic pyrethroids, Pounce^{R} and Ambush^{R}, were also tested for the control of pear psylla. A plot that was not sprayed for pear psylla and a plot that was sprayed with Supreme Oil^{R} for psylla control were used to determine the effectiveness of the synthetic pyrethroids and the impact on other insect and mite populations in the orchard.

The monitoring methods used were: beat counts, spur counts, and top center shoot inspection for pear psylla; leaf and fruit inspection for mites. In addition, all other arthropods, beneficial or otherwise, that showed up in the sampling were also counted.

Excellent control of pear psylla was achieved with all the Pydrin^{R} treatments. The highest survival of beneficial insects in the Pydrin^{R} treated plots occurred where only one spray (in the dormant season) was used. A higher population of rust mite (Epitrimerus pyri) occurred in the Pydrin^{R} treated plots compared to the plots where only Supreme oil was used.

Dale E. Johnson, 3310 Jefferson Ave., Yakima, WA 98902

Pydrin 1.5 EC was applied in commercial orchard tests at .2 and .4# AI/A in 3 different sequences. Application at .2# in the dormant spray followed with .4# in the delayed dormant and first cover spray gave best control of pear psylla. A single application at .2# in the dormant spray gave poorest control.

Biological control of pear psylla and McDaniel spider mite was negligible from early to mid-season but significant after parasitoids became established from mid- to late season.

BAAM 50 WP gave slightly better summer control of pear psylla than the standard 1.5 EC formulation at 1.5# AI/A in commercial orchard tests.

McDaniel spider mite problems developed in both treatments without consistent differences between treatments.

BAAM 1.5 EC applied in the delayed dormant and 2 cover sprays at the rate of 3 quarts per acre gave better seasonal control of pear psylla than a standard program without BAAM in commercial orchard tests.

McDaniel spider mite problems developed in both treatments without consistent differences between treatments but pear rust mite control was slightly better in the BAAM test block.

Helmut Riedl, J.E. DeTar and S.A. Hoying, University of California, Berkeley

Chemical Control: Two synthetic pyrethroids, fenvalerate and permethrin, and the insect growth regulator, diflubenzuron, were evaluated as part of a seasonal control program on pears. Ten different programs were tested; each consisted of a delayed dormant (or cluster bud) and three cover sprays. As expected, a program with one or more cover sprays of fenvalerate gave almost complete suppression of pear psylla. Permethrin was less effective, and a gradual build-up of pear psylla occurred during the post-harvest period. The standard program Guthion + oil, as well as diflubenzuron + oil, gave good control of psylla and codling moth. All programs which included fenvalerate and permethrin as 1st and 2nd cover sprays caused spider mite outbreaks. When used as 3rd cover spray only after two Guthion applications, no mite build-up occurred. Populations of pear rust mites were also higher in the treatments with synthetic pyrethroids. Macropredators such as spiders, lacewings, predaceous hemiptera and coccinellids were less abundant in treatments with synthetic pyrethroids as cover sprays.

Grape Mealybug - Pears

Everett Burts, Washington State University,
Tree Fruit Research Center, Wenatchee, WA 98801

Delayed dormant or cluster bud sprays of parathion .25 lb. ai/100 gal. gave good kills of mealybug crawlers exposed at the time of application. An early summer spray of parathion was not effective. Crawler emergence occurred from the time of application. An early summer spray of parathion was not effective. Crawler emergence occurred from the time buds began to swell until after petal fall so a single application at either prebloom time did not provide economic control.

Rose leafhopper - Apples

Johannes L. Joos, Clarence S. Davis, John J. Smith,
University of California, Room 100-P, 2555 Mendocino Avenue, Sanata Rosa, CA 95401

The rose leafhopper, Edwardsiana rosae (Linnaeus) is widely known as a pest of plants belonging to the rose family (Rosaceae) in the United States and Canada. The nymphs of the summer generations also feed on prunus, populus, ulmus, and other plants. The rose leafhopper was reported as a major pest on apples in the Sebastopol area in the 1930 and early 1940 period. This insect reappeared in the late season of 1978 and 1979 in extremely high populations causing major injury to leaves, removing over one-third of the green chlorophyll, and in some cases causing leaves to drop prematurely. One other problem observed was the very high deposit of exudate on fresh apple fruit. Although the primary plants affected by the rose leafhopper are roses, which may suffer fatal injury, commercially grown apples could be damaged by premature defoliation, effecting maturity and future bud set for the next years crop, along with exudate fresh fuit problems.

The origin of the rose leafhopper is Europe and has required many years (probably starting in the late 1920's and early 1930's) building against a natural enemy (Predaceous) population.

There are numerous California blackberry (Rubus vitifolius C. & S.) and common blackberry (Rubus laciniatus Willd) plants in the Sebastopol area which harbor large populations of the egg parasite Anagrus spp. which may have reduced populations over subsequent years. Both the Green lacewing (Chrysopa carnea Stephens, or C. nigricornis Burm) and the Brown lacewing, Hemerobius spp. are abundant in the area helping on the control of the rose leafhopper. Disruptions of parasitic enemies from the use of organo-phosphates such as Guthion or Imidan in Codling moth control and mild winter weather may have played an important part in the high populations for the 1978 season.

Preliminary investigations into the chemical control in the late season of 1978 show that either Dimethoate (Cygon of Carbaryl (Sevin) will control this pest.

San Jose Scale - pheromones

R.E. Rice

Synthetic pheromones of San Jose scale were evaluated for efficacy, cap load, longevity, trap design, and trap placement. Various blends and concentrations of pheromone isomers were equal in attractancy during the April flight; one isomer was significantly more attractive than the others in June. A "tent" type trap was considered best for most trapping situations; closed types such as the Jackson and Sectar were not satisfactory. There were no initial differences in numbers of males attracted to load rates of 100 to 1000 µg; at 60 days the 100 µg rate was less attractive and at 120 days all loads were less attractive than fresh caps. More males were consistently trapped in the north tree quadrant than in other areas of the tree. Dispersal and flight studies of males showed dispersal out to 170 ft. from a central release point.

San Jose Scale - Phenology Model

C.D. Jorgensen, Department of Zoology, Brigham Young University, Provo, UT 84602

Rearing data coupled with five years of pheromone trapping results were used to adapt the PETE (Predictive Extension Timing Estimator) phenology model to San Jose Scale. Degree days were estimated using an upper vertical cut-off of 90°F and a lower limit of 51°F. Because of variable overwintering stages in central California, it was necessary to develop three sets predictive phenology curves (Early, Mid, Late). Crawlers were observed from 507°D in 1975 from January 1 to first crawlers--average being 664°D. PETE predicted crawlers from 642°D to 792°D from January 1--average being 674°D. The unusually wide range results from the differences in Early-Mid-Late phenology curves. First adult to first crawler was observed to occur between 248°D and 415°--average being 365°D; while PETE predicted this time from 364°D to 394°D--average being 370°D. Variation in field sampling could then account for much of the difference between observed and predicted.

The model's adaptation was validated with data from California (1979) and Washington (1977-79). Thus far, the limited validation completed looks rather promising in predicting male flights as well as first crawlers. After the males of the first generation have emerged, the predictions become more questionable for second and third generations.

Chlorpyrifos 4E for San Jose Scale control and residue analysis

J. Franklin Howell, Yakima Agricultural Research Laboratory
Agricultural Research, Science and Education Administration, USDA Yakima, WA 98902

Chlorpyrifos 4E applied at the rates of 1/2, 1 and 2 lbs AI/100 gal controlled San Jose Scale. Both 1 and 2 applications were used. With 2 applications there were residues in the fruit, but a delayed dormant application resulted in no residues. However, residues of 0.096 to 0.235 ppm were found in the bark 162 days post application. Residue levels in bark of 2 to 6 ppm after 72 days shows that chlorpyrifos 4E is very persistant on plant tissue, but season long control was not possible with a single application.

Walnut Husk Fly - Persian Walnut

H. Riedl, S.A. Hoying, and J. Joos, University of California, Berkely

Monitoring: The visual and olfactory responses of the husk fly appear to be similar to other Rhagoletis species. Adults responded readily to fluorescent-yellow rectangles, spherical objects and odor-releasing compounds. A synergistic response was noted when a visually attractive trap design was combined with ammonium carbonate bait. This trap-attractant combination is more satisfactory than previous monitoring methods and may have potential for mass trapping.

Comparisons to rotary flight trap catches suggest that the trapping efficiency of the Pherocon AM trap is relatively constant during the first half of the flight period, but that it rapidly decreases later on in the season.

Control: Fenvalerate + Staley's bait No. 7 gave good control but was poor without bait. Laboratory experiments confirmed that contact activity of fenvalerate and permethrin to husk fly adults is low.

California Fire Ant, Solenopsis xyloni - Almonds

J.E. Dibble, E. Romero and S. Haire, University of California, Parlier

This ant can cause substantial feeding damage on nut meats as they lay on the ground after knocking and prior to pickup. Preharvest Diazinon or Lorsban ground sprays showed a greater effect on movement and population numbers than did Orthene, Sevimol and Ambush. Early May sprays for NOW control did apparently result in ant suppression through the summer and harvest - these materials were Guthion, Lorsban, Imidan and possible Orthene and Celathion.

Spotted Cutworm Control on Red Raspberries

Arthur L. Antonelli, Western Washington Research and Extension Center
Puyallup, Washington 98371

Carl H. Shanks, Jr., Southwestern Washington Research Unit, Vancouver, WA 98665

Five insecticides were evaluated for control of spotted cutworm, Amathes c-nigrum, on raspberries in Whatcom County, Washington. Plots were single rows 25 ft. long and 9 ft. apart. Treatments were applied on April 11, 1979 by a power sprayer as cane or soil sprays. Cane sprays were applied at the rate of 223 gal. of water/acre. Soil treatments were applied to a 2 ft.-wide band over the row at the rate of 1 gal. of water/25 ft.

Cutworms were collected at night from each 25 ft. plot. Orthene had the fewest cutworms.

Table 1. Number of cutworms/25-ft. plot

Material[a]	Rate (ai/acre)	A	B	C	D	$\bar{x}$[b]
Orthene 75 SP	1.0	3	0	0	0	0.95 a
Lorsban 4 EC (soil)	1.0	1	3	0	1	1.08 ab
Guthion 50 WP	0.5	1	5	1	0	1.39 ab
Lorsban 4 EC	1.0	2	3	1	2	1.95 ab
Guthion 50 WP (soil)	2.0	1	4	3	2	2.39 b
Check	---	6	3	4	0	2.78 b
Dyfonate 4 EC (soil)	1.0	5	5	3	0	2.80 b
Sevin 2 FC	2.0	4	4	3	1	2.87 b

[a] Materials applied as cane and crown sprays, unless otherwise indicated.

[b] Means transformed to $x+1/2$ for analysis of variance and transformed back to original scale for presentation in table. Means separation by Duncan's multiple range test ($P = 0.05$).

Methoxychlor - Potassium Oleate Sprays For Control Of Winter Moth

N.V. Tonks, Agriculture Canada, Saanichton Research Station, Sidney, B.C.

Foliar sprays of various concentrations of methoxychlor, potassium oleate (Safer's Insecticidal Soap) and combinations of methoxychlor and soap were applied to dwarf apples on April 11 and again on April 25 for control of winter moth larvae. Most larvae were in the first or second instar at the time of the first spray. Two single tree replicates were included per treatment with 12 treatments in randomized complete blocks. Larval counts were made from 10 leaf clusters per tree, collected 7 days after each spray application. Trees were also rated visually for extent of feeding defoliation at the end of May, using a numerical scale of 1 (no defoliation) to 10 (completely defoliated). Results are summarized in the following table:

Treatment	Mean Larvae Per Leaf Cluster		Defoliation Rating
	1st Spray	2nd Spray	
Check	8.7	7.6	9.2
Methoxychlor 0.1%	1.3	0.1	1.0
Methoxychlor 0.05%	1.8	1.0	1.2
Methoxychlor 0.01%	3.0	2.5	3.0
Soap 1%	3.5	3.4	3.2
Soap 0.5%	6.0	7.8	9.7
Methoxychlor 0.1% + Soap 1%	1.2	0.2	1.0
Methoxychlor 0.1% + Soap 0.5%	1.4	0.2	1.0
Methoxychlor 0.05% + Soap 1%	2.7	1.1	1.1
Methoxychlor 0.05% + Soap 0.5%	1.4	0.4	1.3
Methoxychlor 0.01% + Soap 1%	2.8	0.5	1.5
Methoxychlor 0.01% + Soap 0.5%	3.5	1.3	2.0

Unsprayed trees were almost completely defoliated by winter moth. All sprays with the exception of 0.5% soap significantly reduced infestations compared to untreated trees. The least feeding damage occurred on trees sprayed with methoxychlor at 0.1% or 0.05% or with methoxychlor at rates as low as 0.01% combined with soap at 1%.

S E C T I O N I V

CONCENTRATE SPRAYING RESIDUES AND PHYTOTOXICITY

Discussion Leader -- M.T. AliNiazee

Fatty Acids Compounds - A promising New Line of Pesticides

Dr. George Puritch, Research Scientist, Canadian Forestry Service
Pacific Forestry Research Centre, 506 West Burnside Road, VICTORIA, B.C. 8Z 1M5

Fatty acids and their derivatives are natural constituents of every living organism and constitute an essential part of the food chain. A few of the fatty acids, primarily salts, technically soaps, were used commercially as pesticides before the 1940's but were bypassed in favour of DDT and other petro-chemicals mainly due to lack of quality control and high application rates. Research at the Pacific Forest Research Centre, Victoria, B.C. has demonstrated that many of the fatty acid derivatives in addition to the salts are biocidal and that the fatty acid based compounds can provide an entire promising new line of pesticides that are a viable alternative to conventional petro-chemicals. This report presents the results of tests of these bioderivatives on various agricultural pests including mites, cypress tip moth, grey mould, root knot nematode and algae.

Bee Poisoning and Pollination: Honey Bee - Apples

Daniel F. Mayer, WSU, IAREC, Box 30, Prosser, WA 99350
William B. Hudson, WSU, 233 Courthouse, Yakima, WA 98901

Beeline, was applied to 1 acre plots at 5 lbs/acre in 100 gallons of water in each of 2 commercial apple orchards. The material was applied at 75% bloom by ground airblast sprayer. Honey bees were counted by slowly moving around an individual tree and noting the number of bees observed in one minute. The part of the orchard furtherest from the treated area was used as a check. After first drop, the number of fruiting spur setting fruit were counted.

Average number of honey bees/aookem tree minute, and percent of fruit spurs setting fruit.

	Orchard #1		Orchard #2	
	Treated	Check	Treated	Check
Pre-application	22.8	21.4	---	---
Post-application				
8 hours	23.0	23.9	16.9	17.2
2 days	23.6	22.2	29.5	30.1
3 days	24.2	22.7	29.6	27.5
AVERAGE	23.6	22.9	25.3	24.9
Percent of Fruit Spurs Set	91.5	94.4	69.0	63.0

Honey Bee - Peaches

Daniel F. Mayer, WSU, IAREC, Box 30, Prosser, WA 99350
William B. Hudson, WSU, 233 Courthouse, Yakima, WA 98901

Methidathion (Supercide) at one gallon to the acre plus oil was applied to part of a block of J.H. Hale peaches at pre-pink. Ten colonies of honey bees were established for pollination 200 yards from the treatment. Ten counts of honey bees per tree per minute were taken during bloom and averaged (table). Bee colonies were strong with an average of hive entrance counts in excess of 60 per minute. Check number one was near the bee colonies and check number two was near the treatment.

Bloom	Treatment	Check 1	Check 2	Treatment Ground	Check Ground
10%	0.1	0	0	12.5	11.6
50%	1.4	2.1	1.5	----	----
100%	1.5	3.6	1.7	----	----

Phytotoxicity of Insecticides and Acaracides - Pear

Everett Burts, Washington State University,
Tree Fruit Research Center, Wenatchee, WA 98801

RO13-5223 250 EC, 187 g ai/100 gal. caused chlorotic spotting of leaves and fruit russet on Bartlett when applied as full volume spray May 1 and June 29. Omite 30% WP 1/3 lb. ai/100 produced severe foliage bronzing and fruit russet on d'Anjou and Bartlett pears applied as full volume spray July 11. An encapsulated formulation applied at the same ai dosage caused on injury.

Rate of Exposure to Personnel Involved in the Application of Carbaryl to Crops

Jay C. Maitlen and C.R. Sell, Yakima Agricultural Research Laboratory, Agricultural Research, Science and Education Administration, USDA, Yakima, WA 98902

Personnel involved in ground and aerial applications of various formulations of carbaryl to field and tree crops were monitored to determine their exposure to the pesticide. Personnel monitored were the mixer-loader, the applicator, the flagman (aerial applications only) and the bystander (personnel in the area of the application, but not involved). As was expected, the highest rate of exposure was to the mixer-loader, followed in descending order by the flagman, the applicator and the bystander. The highest rate of exposure to the mixer-loader was found on the hands. The powdered forms of carbaryl 50 W and 80 S, produced higher exposure rates to the mixer-loader than did the liquid form, Sevimol.

S E C T I O N V

DECIDUOUS ORCHARD DISEASES

Discussion Leader -- Sherman V. Thompson

Apple Scab

P.W. Weddle, R.R. Hansen, 2486 Rising Hill Road, Placerville, CA 95667

Treatments for apple scab were applied to 48 non-bearing Golden and Red Delicious apple trees, at green tip, first bloom, and petal fall 1979. Forty-five days after petal fall trees sprayed with CGA 64251 10W at 5.0 oz/100, Cyprex 65W at 8.0 oz/100, and CGA 64251 10W at 3.5 oz/100 showed an average of 1.5%, 4%, and 12% scab infected leaves, respectively. Check trees averaged 84% of the leaves infected with scab.

Evaluation of fungicides for brown rot blossom blight and fruit rot control of Fay Elberta peach

B.T. Manji, J.M. Ogawa, E. Bose, and S. Koike, University of California, Davis

Fay Elberta peach at the Kearney Horticultural Field Station in Parlier, California, were used for this trial. A completely randomized plot of six single-tree replications were hand-gun spryaed at blossom and preharvest. Blossom blight and fruit rot data are summarized in Table 1. Some fungicides were applied too early at blossom for maximum effectiveness or required a second application.

Table 1. Evaluation of fungicides for brown rot (Monilinia fructicola) blossom blight and fruit rot control of Fay Elberta peach

Treatment[a]	Conc/100 gal	% Blossom blight[b]	% Fruit rot[b]
DPZ 4424 50W	8 oz.	0.2 z[c]	24.6 vwx
CGA 64251 10W	6 oz.	1.3 z	15.0 vw
Topsin 4 flowable	11.2 fl. oz.	3.6 yz	24.6 vwx
Bravo 500 flowable[d]	4 pt.	5.2 yz	13.7 vw
Benlate 50W	6 oz.	5.5 yz	19.2 vwx
Topsin M 70W	8 oz.	6.1 yz	30.4 wx
Bayleton 50W	4 oz.	6.3 yz	3.4 v
Bayleton 50W	2 oz.	12.8 xy	15.9 vw
Baycor 25W	16 oz.	17.9 wx	20.8 vwx
Quintar 5 flowable	6.4 fl. oz.	19.7 wx	55.4 y
Baycor 25W	8 oz.	24.3 w	23.0 vwx
Ronilan 50W	6 oz.	24.8 w	33.3 wx
Bravo 500 flowable	2 1/8 pt.	34.2 v	38.4 xy
Check	--	50.6 u	79.6 z

[a] One blossom and two preharvest sprays applied with hand-gun sprayer, 4 gal/tree at pink bud (7% bloom) and three and one weeks before harvest.

[b] Average of 200 blossoms on each of six trees. Percent fruit rot is the average of 40 fruit replicated six times. Total of two readings, 3 days and 7 days after incubation at 20 C, RH 85%.

[c] Numbers in vertical column followed by the same letter are not significantly different, P + 0.05.

[d] Bravo 500 flowable, 4 pt - these trees were accidentally sprayed with CGA 64251.

Control of brown rot (Monilinia fructicola) with Benlate (benomyl), captan, and Cela (triforine) in two nectarine cultivars with benomyl resistant population, 1979.

J.M. Owaga, B.T. Manji, S. Koike, and E. Bose, University of California, Davis

Flamekist and Autumn Grand nectarine trees in a commercial orchard in Parlier, California, were used for these trials. The first trials in each cultivar was an airblast plot with four treatments. The second trial was a completely randomized plot of ten single-tree replications for each treatment hand-gun sprayed at blossom. Blossom blight data summarized in Tables 1 and 2.

2.

Discussion

Airblast plot.-- All treatments were significantly better than the check.

Hand-gun plot.-- All treatments except for captan were significantly better than the check.

Preharvest spray application:

Hand-gun plot.-- Trees sprayed at blossom were hand-gun sprayed twice before harvest. Six boxes, each with fifty fruit, were harvested from each treatment and incubated at 20C, RH 85%. Brown-rotted fruit were counted and the data summarized in Table 3.

Discussion:

Flamekist.-- Only Benlate plus captan significantly reduced percent brown-rotted fruit. Control seemed to be affected by the time interval between last application and harvest. Last application was 7/31 and harvest was 8/21. Benlate was effective for 21 days.

Autumn Grand.-- Benlate plus captan and Cela significantly reduced percent brown-rotted fruit. Again control seemed to be affected by the time interval between last application and harvest.

TABLE 1.

EVALUATION OF FUNGICIDES FOR BROWN ROT (MONILINIA FRUCTICOLA) BLOSSOM BLIGHT OF FLAMEKIST NECTARINE - 1979

Treatment	Application[b]	Conc/acre	Avg. Blossom Blight/Tree[a] Hand-gun sprayed	Avg. Blossom Blight/Tree[a] Airblast sprayed
Cela 20% E.C.	PB,FB	48 fl. oz.	1.5 y[c]	-
Benlate 50W	PB	1 1/2 lb.	1.7 y	5.2 y
Captan 50W	FB	8 lb.		
Benlate 50W plus Captan 50W	PB	1 1/2 lb. 8 lb.	3.0 y	6.0 y
Captan 50W	PB,FB	8 lb.	20.2 z	6.4 y
Check	-	--	26.2 z	26.2 z

[a] Average number of blighted blossoms per tree after counting ten trees for each treatment in the hand-gun and airblast plots.

[b] PB = pink bud, FB = full bloom.
Cela: Two blossom sprays, PB,FB
Benlate followed by Captan: Benlate at PB, Captan at FB.

Benlate plus Captan: One blossom spray at PB.
Captan: Two blossom sprays, PB, FB.

Hand-gun sprayer: 4 gal/tree.
Airblast sprayer: 100 gal/acre.

[c] Numbers in vertical column followed by the same letter are not significantly different, P = 0.05.

TABLE 2.

EVALUATION OF FUNGICIDES FOR BROWN ROT (MONILINIA FRUCTICOLA) BLOSSOM BLIGHT OF AUTUMN GRAND NECTARINE - 1979

Treatment	Application[b]	Conc/acre	Avg. Blossom Blight/Tree[a] Hand-gun sprayed	Airblast sprayed
Cela 20% E.C.	PB,FB	48 fl. oz.	0.2 y[c]	-
Benlate 50W	PB	1 1/2 lb.	0.5 y	0.5 y
Captan 50W	FB	8 lb.		
Benlate 50W plus Captan 50W	PB	1 1/2 lb. 8 lb.	0.7 y	1.9 y
Captan 50W	PB,FB	8 lb.	32.1 z	3.3 y
Check	-	--	38.8 z	38.8 z

[a] Average number of blighted blossoms per tree after counting ten trees for each treatment in the hand-gun and airblast plots.

[b] PB = pink bud, FB = full bloom.
Cela: Two blossom sprays, PB, FB
Benlate followed by Captan: Benlate at PB, Captan at FB.

Benlate plus Captan: One blossom spray at PB.
Captan: Two blossom sprays, PB, FB.

Hand-gun sprayer: 4 gal/tree.
Airblast sprayer: 100 gal/acre.

[c] Numbers in vertical column followed by the same letter are not significantly different, P = 0.05.

TABLE 3.

EFFICACY OF PREHARVEST FUNGICIDE SPRAYS IN REDUCING POSTHARVEST BROWN ROT OF NECTARINE FRUIT - 1979

Treatment[a]	Conc/acre	% Brown Rot Fruit[b] Flamekist	Autumn Grand
Benlate 50W plus Captan 50W	1 1/2 lb. 8 lb.	10.6 y[c]	8.0 r
Cela 20% E.C.	48 fl. oz.	20.6 yz	17.4 r
Benlate 50W, Captan 50W	1 1/2 lb. 8 lb.	27.0 yz	22.0 rs
Captan 50W	8 lb.	31.6 z	37.4 s
Control	--	36.6 z	41.0 s

[a] Benlate plus Botran: One blossom (3/2) and two preharvest sprays.
Cela: Two blossom and two preharvest sprays.
Benlate followed by Captan: First blossom spray was Benlate, second was Captan. First preharvest spray was Benlate, second was Captan.

Captan: Two blossom and two preharvest sprays.

	Blossom sprays	Preharvest sprays	Harvest
Flamekist	3/2, 3/7	7/24, 7/31	8/21
Autumn Grand	3/2, 3/7	8/8 , 8/21	9/10

[b] Fruit brown rot evaluated after 12 days for Flamekist and 11 days for autumn grand at 20 C, RH 85%. Percentage is the average of 50 fruit replicated six times.

[c] Numbers in vertical column followed by the same letter are not significantly different, P = 0.05.

Control of blossom and fruit brown rot in an orchard with benomyl-resistant Monilinia fructicola

D. Rough, J.M. Ogawa, B.T. Manji, and E. Bose, University of Calfiornia, Davis.

A Latin square plot design of four treatments and four replications of 80 trees each was established in 14 acres of Loadel cling peaches in 1978. Benomyl-sprayed blocks had significantly greater resistant populations than blocks sprayed with captan or check blocks. In 1979 the benomyl resistant populations remained constant when the blocks were treated similarly to 1978. Half of each block sprayed with benomyl alone in 1978 was sprayed with triforine (Cela) and the other half sprayed with phygon (Quintar). The benomyl resistant population decreased in these blocks. Triforine, phygon, and benomyl plus captan all controlled blossom and fruit rot significantly better than captan. All treatments were significantly better than the check. Some phytotoxicity was observed on the fruit sprayed with phygon. Data summarized in Table 1.

Table 1. Benomyl-resistant populations and brown rot control following orchard applications of fungicides.

1979	% Resistant on blossoms[b]	% Blossom blight		% Resistant on fruit[c]	% Fruit rot	
Treatment[a]	1978	1978	1979	1978	1978	1979[d]
Check	44y	71y	78w	33y	53	22w
Captan	42y	68y	51 x	30y	51	16 x
Benlate	83 z	42 z	-	100 z	32	
Quintar	-	-	6 z	-		6 y
Cela	-	-	1 z	-		2 z
Benlate + Captan	86 z	41 z	27 y	87 z	32	6 y

[a] Two blossom applications with airblast sprayer, 400 gal/acre at 50% bloom and 100 gal/acre at early petal fall. Active ingredient/acre indentical in both applications. Benlate plus captan received only a singel application at 50% bloom. One preharvest spray applied 3 weeks before harvest, 100 gal/acre. Dosage: Captan 50W, 8 lb/acre, Benlate 50W, 1 1/2 lb/acre. Quintar 5F, 25.6 fl oz/acre and Cela 20% E.C., 48 fl oz/acre.

[b] Percent resistant population based on 48 blossoms/treatment.

[c] Percent resistant population based on 50 fruit/treatment.

[d] Fruit evaluated 10 days before harvest.

Eastern Filbert Blight - Filberts

H.R. Cameron and D.J. Sisemore, Dept. of Botany and Plant Path.,
Oregon State University, Corvallis, OR 97331

Eastern Filbert Blight is caused by the canker producing fungus, Anisogramma anomala, whose wind blown and rain-splashed spores initially enter the tree in the winter and spring through buds damaged and blasted open by the big bud mite. After the spore enters the bud it takes from 14 to 16 months before a canker becomes visible in the twig directly below the bud. The spore producing pustules of the fungus break out in lines throughout the canker and release new spores during the winter and spring rains, thus completing the life cycle. The canker continues to spread down the stem each year, later moves into the large limbs, and eventually reach the trunk, whereupon death of the tree may soom follow.

With a knowledge of the disease life cycle, three different approaches to control were employed to determine if disease spread can be checked. The first method involved pruning out all existing cankers in the tree in order to halt canker spread down the stem and also to remove the inoculum source from the tree. The second approach was to eliminate the infection court of the fungus by controlling the big bud mite with the insecticide, Thiodan. The final approach involved the application of three fungicides to prevent the infection of big buds by inhibiting the fungal spore. For this, two copper fungicides (Bordeaux 12-12-100 & Kocide 101) were evaluated to determine their effectiveness as protectants. Lignosan (MBC) injections were also tried in an effort to protect the tree and to inhibit the existing cankers in the tree but the actual injection proved to be quite difficult and was therefore unsuccessful.

Replicates of eight trees were used for each of the five treatments and the number of new cankers in each tree was recorded. The Bordeaux and Kocide sprays produced a significant reduction in the number of new cankers with Bordeaux looking the most promising. Although the Thiodan treatment was not significantly different from the check, there was still a considerable reduction in the number of cankers and it is felt that with better timing of the Thiodan sprays a further reduction in the number of cankers may be observed. The pruning and MBC injections were not very effective in reducing the number of new infections.

EASTERN FILBERT BLIGHT SPRAY TRIALS

Treatment	Avg. # of Cankers/Tree[a]
Bordeaux 12-12-100	3.14 a
Kocide 101 (6-lbs/100)	7.43 1
Thiodan (1-lb/100)	10.12 ab
Pruned & MBC Injection	17.24 ab
Pruned	20.25 ab
Check	3 12 b

[a] Numbers in vertical column followed by the same letter are not significantly different. P = o.05.

Powdery Mildew - Apples

Norman Luepschen, CSU Research Center, Rt. 4, Grand Junction, CO 81503

Low winter temperatures (-14°F) resulted in little survival of overwintering inoculum. Terminal bud mortality was proportional to 1978 mildew control. Overall 1979 incidence of mildew on foliage was low, 70-80% less than the previous year. Benlate and sulfur tank-mix treatments provided excellent control, with Benlate/oil and Benlate alone treatments also performing well. No Benlate tolerance was detected in 1978. All spray treatments resulted in significantly higher apple yields over checks.

JONATHAN APPLE POWDERY MILDEW TEST

	% Mildew		78-79 Winter effect % Mildew
Treatment	1978	1979	Reduction
Check	81.0 a	14.6 a	82
Benlate @ 6 ozs	42.6 b	6.5 b	85
Benlate @ 2 ozs plus 1 qt Volck oil	24.2 c	4.7 b	81
Karathane @ 8 ozs	50.0 b	9.0 a	82
Benlate/S tank mix, 4 ozs + 2 pts. 6E	11.2 d	3.8 b	66

Powdery Mildew - Rome and Jonathan Apples

Sherman V. Thomson, Extension Plant Pathologist, Department of Biology, UMC 45, Utah State University, Logan, Utah 84322

Fungicides were applied to three-year-old Rome and 10-year-old Jonathan apple trees in a commercial orchard in West Mountain, Utah. Treatments were applied as dilute sprays to runoff using a single-nozzle hand gun at 20.7 Bars (300 lb/sq inch). Five applications were made beginning on May 3 (late pink), May 17 (bloom), May 31, June 14, and July 3. Applications were discontinued when terminal growth had ceased. The test in the Rome variety consisted of 2 tree plots replicated 5 times with an unsprayed buffer row and a single unsprayed tree between each treatment. The Jonathan plot consisted of single tree treatments in a single row replicated 5 times. Ten terminals were examined from each tree on August 6 and the percentage of infected leaves on each was determined. Terminals were given a visual severity rating of 0 -- healthy, to 3 -- necrotic leaves. Mildew incidence in 1979 was very light. The data were statistically analyzed using a standard analysis of variance and the least significant difference for mean separation.

Treatment and rate per 100 gal	Powdery mildew infection					
	Rome			Jonathan		
	% infected terminals	% infected leaves	severity[1]	% infected terminals	% infected leaves	severity
CGA 64251 10W 5.0 oz	41.0 a	3.3 a	.9 a	18.6 ab	2.8 ab	.3 a
CGA 64251 10W 3.5 oz	60.3 b	8.4 a	1.0 a	16.9 a	1.6 a	.2 a
Benlate 50W 6.0 oz	69.1 c	10.5 a	1.0 a	53.4 cd	6.3 bc	.5 b
Karathane 18.25W 12.0 oz	88.2 d	20.1 b	1.3 b	40.9 bc	2.8 ab	.4 a
Check	89.9 d	30.6 c	1.4 c	65.8 d	10.2 c	.7 b
LSD .05	1.96	8.32	0.23	22.57	3.93	.237

[1]Severity rating; 0 = healthy, 3 = necrotic leaves.

Mildew incidence was probably reduced due to the extreme winter temperatures of 1979. The incidence was so low on the Jonathan variety that the significance of the results is uncertain. CGA 64251 was very effective in reducing the % of infected leaves on both varieties. Karathane gave little control of mildew on the Rome variety and fair control on the Jonathan variety. Benlate was effective on Rome but not on Jonathan.

Powdery mildew and scab - Golden Delicious and Rome Apples

R.A. Spotts, OSU, Mid-Columbia Experiment Station, Hood River, OR 97031

Nine fungicide treatments were tested in 1979: Baycor 0599 50WP 8 oz.; Bayleton 50WP 4 oz. plus Cyprex 65WP 6oz.; Bayleton 50WP 2 oz. plus Cyprex 65WP 6 oz; Cyprex 65WP 12 oz. plus Karathane 4LC 12 oz.; Sisthane 2LC 2 pt.; Sisthane 25WP 2 lb.; THAT flowable sulfur 52% 2 pt. and 4 pt.; THAT flowable sulfur 52% 2 pt. plus Cyprex 65WP 2oz. All listed rates are per 100 gallons. Treatments were applied to randomized single-tree plots of mature 'Golden Delicious' (3 replications) and 'Rome Beauty' (4 replications) on MM106 rootstock. Trees were sprayed to runoff at 300 psi with a handgun. Approximately 3 gallons of spray were applied to each tree. Spray dates and growth stages were: April 16 (half-inch green); May 3 (early bloom), 14 (petal fall), and 30 (cover spray). All trees received Thiodan 50W 2.4 lb/A (April 16), Diazinon 50W 3.2 lb/A (May 3), Imidan 50W 3 lb/A (May 30 and July 2), and Thiodan 50W 4 lb/A plus Guthion 50W 3/4 lb/A (July 18). Leaf scab and mildew counts were made on the 10 oldest leaves of 10 shoots per tree and fruit scab counts on 25 fruits per tree on July 12. Six primary scab infection periods were recorded during April and May.

Under the light disease pressure in this test, Baycor, Bayleton, Cyprex, Sisthane, and THAT flowable sulfur plus Cyprex gave good control of leaf and fruit scab and powdery mildew. While THAT flowable sulfur plus Cyprex gave good control of leaf and fruit scab and powdery mildew. While THAT flowable sulfur at 4 pt./100 gal gave fair scab and mildew control, THAT flowable sulfur at 2 pt./100 gal did not give acceptable disease control. No phytotoxicity was observed with any fungicide tested.

A Postharvest Disorder on Golden Delicious, Spartan and MacIntosh Apples *Corticium* sp. (?) *Malus sylvestris*

W.J. McPhee, Agriculture Canada, Summerland, B.C. V0H1Z0

A basidiomycete causing severe rotting of Goldens, Macs and Spartans is frequently found in common cold storage in the Okanagan Valley. Symptoms on fruit are very similar to symptons caused by *Gloeosporium perennans* but the organism has a much lower optimum temperature for growth. No basidia or basidiospores have been observed yet but field experiments have been conducted to investigate when infections occur and where infection originates.

Stem Infections on Goldens Caused by *Podosphaera leucotricha* and Its Effect on Sizing

W.J. McPhee, Agriculture Canada, Summerland, B.C. VOH 1ZO

Heavy stem infections caused by *Podosphaera leucotricha* were found in a block of Golden Delicious apples in the Osoyoos area of the south Okanagan in British Columbia. MacIntosh and Spartan blocks in the same general area were also infected but to a lesser degree.

Ten trees were randomly selected within the Golden block and 25 infected and 25 non-infected fruit were labelled per tree. Apple size (diameter) was recorded for each apple on July 20, Aug. 20 and Sept. 10, 1979. Three apples per tree from each of the two groups were analyzed for calcium content.

The effect of the stem infections on sizing and calcium content will be reported.

UNCOMMON INSECTICIDE NAMES USED IN THESE ABSTRACTS

Peropal, Bay BUE 1452 (azocyclotin)
Celathion (chlorthiophos)
Ripcord (cypermethrin)
Mitac, BAAM (amitraz)
Morestan (oxythioquinox)
Dimilin diflubenzuron)

MINUTES OF THE
WESTERN ORCHARD PEST AND DISEASE MANAGEMENT CONFERENCE
54th Annual Meeting
Imperial Hotel - Portland, Oregon
January 16-18, 1980

The 54th Annual Meeting of the Western Orchard Pest and Disease Management Conference was called to order at 0830, January 16, 1980, by Chairman Dick Rice. Committee assignments were announced and followed by introduction of guests and members.

Don Davis, committee chairman for a common name for *Metaseiulus = (Typhlodromus) occidentalis* reported the name Western Predatory mite will be presented to the Entomological Society of America. There was discussion on the three generic names currently being used for *occidentalis*. A decision was made to adopt the generic name proposed in a soon-to-be-published revision of the Phytoseiids by Pritchard.

Jack Arrand introduced Dr. George Puritch, a foresty researcher from British Columbia, who gave a special report on fatty acid compounds as a promising new line of pesticides.

The business meeting was adjourned until 0830, January 18, 1980, when it was again called to order by Chairman Dick Rice. The Treasurer's report was read and the audit was accepted as in order. Minutes of the 1979 meeting were approved as mailed.

Bill Batiste, Resolutions Committee Chairman, proposed the following resolutions:

Be it resolved that:

1. We express our appreciation to the management and staff of the Imperial Hotel for the excellent accommodations and courteous services during the 54th Annual Meeting of the Western Orchard Pest and Disease Management Conference.
2. We express our appreciation to Chairman Dick Rice and especially to Danell Hathaway for his long and faithful service as Secretary/Treasurer and to all the section chairman for their effective service in organizing and conducting this Conference in a successful manner.
3. We extend our thanks to Joe Capizzi and his staff for making arrangements for publication of the abstracts.
4. We express our thanks to Joe Capizzi, Glenn Fisher, and Ben Simko for providing and operating the visual aids equipment which is so important to the success of this Conference.
5. We recognize the long participation in this organization and acknowledge the many contributions made to it by Ralph Downing

who retired this past December from the Agricultural Canada, and we further extend our best wishes to Ralph for a happy and rewarding future.

These resolutions were unanimously adopted by the membership in attendance.

A list of proposed officers for next year's Conference was presented by Hal Moffitt, Nominations Committee Chairman. The list read as follows:

Chairman	- Don Berry
Chairman Elect	- Norman Waters
Secretary/Treasurer	- Gary Fields

Nominations were opened to the floor with no additional names placed on the ballet. The above slate of officers were unanimously elected by acclamation.

Don Joy, speaking for WACA, asked for an opinion on a joint session to be attended by WOPDMC and WACA members. The schedule, as currently stated, was chosen by the membership with instructions to the secretary to write a letter of declination on a joint session to Don Joy.

A motion was made and approved to have only one Special Interests Groups meeting to be held Wednesday, January 15, 1981, at 1500 (3 p.m.).

The membership approved a motion to send a letter of condolence to Don Berry on the death of his mother.

Letters were also approved to be sent to Ralph Downing on his retirement and to the Imperial Hotel in relation to Resolution 1.

The chairmanship of the Conference was turned over to Don Berry in absentia. Dick Rice, immediate past chairman, announced the committee assignments. Discussion leaders for the 55th Conference to be held at the Imperial Hotel, Portland, Oregon, on January 14-16, 1981, are as follows:

Discussion Leaders

1. Lepidopterous Pests - Jack Arrand
2. Orchard Mites - Don Davis
3. Other Orchard Pests - Dick Penrose
4. Concentrate Spraying, Residues, and Phytotoxicity - Art Ratan
5. Decidious Orchard Diseases - Bill McPhee

Committee Assignments

Resolutions	- Bob Lauderdale, Chairman
	Al Guance
	Ron Britt
Auditing	- Bob Fye, Chairman
	Jim Thomas
	Carolyn Pickel
Nominating	- Joy Brunner, Chairman
	Bill Manji
	Pete Westigard

With business completed, the meeting was adjourned at 1120, January 18, 1980.

Gary A. Fields