# ABSTRACTS OF REPORTS FROM THE 55th ANNUAL WESTERN ORCHARD PEST AND DISEASE MANAGEMENT CONFERENCE

Imperial Hotel, Portland, Oregon
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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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INVITATIONAL SPEAKER

# Principles of Resistance Management In Agricultural Arthropods

Presentation by B. A. Croft

## Abstract

Management of insect and disease pests and arthropod natural enemies relative to insecticide resistance will be discussed including 1) theory relative to management and factors influencing resistance such as migration, refrugia, dominence, economic threshold levels and 2) operational factors which can be manipulated, e.g., selection levels, rotations, mixtures, IPM. Application of the theory to current conditions of O-P resistance among key pests, secondary pests and natural enemies of apple in North America and the introduction of synthetic pyrethroid insecticide in apple IPM systems also will be discussed.

# S E C T I O N  I

## LEPIDOPTEROUS PESTS

Section Leader -- Jack Arrand

## McDaniel Spider Mites - Apples

Jack Eves, AgReCon, Prosser, WA

Fifty tree plots were sprayed with Pounce at .1 lb ai/acre in 100 and 400 gal water per acre to evaluate the impact of dilute and concentrate spraying on McDaniel mites and predator mites. McDaniel mite populations in both Pounce plots exceeded the Guthion standard by 4 times. Predator mites were completely eliminated in both Pounce plots while good populations remained in the standard. McDaniel mite populations built up faster and peaked sooner in the concentrate Pounce plot than the dilute plot.

## Two-Spotted Mite and European Red Mite - Almonds

J. E. Dibble, University of California, Parlier

May warm treatments of Lorsban, Pydrin, Diazinon, and Ambush did not significantly cause mite buildup up to one month after application.

## Two-Spotted Mite and European Red Mite - Almonds

J. E. Dibble, University of California, Parlier

Materials being tested for Naval Orangeworm control were evaluated as to their effect on mite populations. The synthetic pyrethroids did not, but for one exception, create any mite problems in a low population orchard.

## Two-Spotted Mite and European Red Mite - Peaches

J. E. Dibble, University of California, Parlier

Dormant applications of Pydrin showed a slight tendency to cause mite increase in June.

## Two-Spotted Mite and Western Predator Mite - Almonds

J. E. Dibble, University of California, Parlier

July application of Omite, Fison NC 21314, Mitac, Mobay SLJ 0312, Dupont DPX 3792 plus oil and Plictron all gave good Two-Spot control. All of the above were harsh on the predator mite. Mobay SJR 8514, Dupont DPX 3792, Kelthane and PGS 0-2, were poor performers in this fairly high population.

## Codling Moth - Apple

R. W. Zwick, Mid-Columbia Experiment Station

Two-and three-spray programs of fenvalerate at 0.05 lb to 0.10 lb AI/A were slightly inferior to azinphosmethyl at 0.5 lb AI/A in a three-spray program, all used in concentrate applications. Sn 72129 WP used at 1.0 and 1.5 lb/100 in five cover sprays gave some control of codling moth but was not as effective as diflubenzuron or dicarbasulf in similar programs.

Preharvest sampling of unsprayed Red Delicious and Newtown apples indicated side entries were almost twice as numerous as calyx entries on both windfall and picked fruit.

Oblique banded leafroller flight was monitored and the overwintering generation flew all during June in unsprayed pear and apple blocks.

## Pandemis pyrusana - Apples

Stan Hoyt, Washington State University
Tree Fruit Research Center, Wenatchee, WA 98001

Methomyl was highly effective for the control of Pandemis applied in the prepink period, early May against late instar larvae, or mid-June applied against adults. At the last timing Penncap M was also effective. Parathion was partially effective as a prepink or mid-June spray while Kryocide, Bactur L, Sevin and dimethoate were ineffective against this species.

## Codling Moth - Apple

Stan Hoyt, Washington State University
Tree Fruit Research Center, Wenatchee, WA 98001

In large block tests low rates (.05 lb. per acre) of Pydrin or Ambush controlled codling moth where initial populations were low but not where high populations carried over from 1979. Mite problems were associated with these low rates. Typhlodromus occidentalis was virtually eliminated for the season by Pydrin sprays but returned relatively quickly in Ambush treated blocks.

## Codling Moth - Pears

Everett Burts, Washington State University, Tree Fruit Research Center
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Two insect growth regulators, Dimilin and Bay Sir 8514 provided complete protection of fruit from larval infestation in the presence of high codling moth pressure. Both materials were applied 3 times against first brood and once against second brood as high volume hand gun sprays. Dimilin was used at 2 ounces of 25% WP and Bay Sir 8514 was used at 3 ounces of 25% WP per 100 gallons.

## Codling Moth - Apples, Pears

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Pat Weddle, Randy Hansen; Weddle, Hansen and Associates
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In an effort to manage codling moth at lower levels without increasing chemical applications, a mass trapping program was begun in three El Dorado County, California, apple orchards in 1979 with one pear orchard added in 1980 (4 traps/ac., 10/ha). Growers were instructed to follow standard chemical treatment programs until pheromone or light trap counts and/or wormy fruit levels indicated that sprays could be reduced. Efforts to optimize cost, time input and trap effectiveness will be discussed.

## Naval Orangeworm - Almonds

Charles E. Curtis, Peter J. Landolt, USDA,SEA/AR,
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5578 Air Terminal Drive, Fresno, CA 93727

Field tests were conducted in commercial almond plantings in Merced County, California to study mating disruption as a control strategy for the navel orangeworm. Males can be confused or have their ability to find a female otherwise disrupted by the permeation of the air in an almond orchard with synthetic component of the sex pheromone, (Z,Z)-11,13-hexadecadienal, released over a period of time from Hercon dispensers. About 5 grams of actual pheromone per acre of trees disrupted mating for about 3 weeks.

In 1979 and in 1980, we obtained very good results in 9-tree and 25-tree plots. Therefore, in 1980 we set up a 15-acre plot and a 20-acre plot with hand application of the pheromone, and a 20-acre plot with aerial application of the pheromone. For various reasons the 20-acre hand applied plot and the 20-acre aerial applied plot did not give the desired results for the full growing season. We did reduce nut damage in the hand applied plot by 56% up to mid-August at which time the test had to be terminated due to lack of quality pheromone. Harvest samples on September 30 showed no difference in nut damage in the treated and check plots.

The results for the 15-acre hand applied plot are very promising. Application rates were 5g/acre on 6-30, 2.5g on 7-24, 2.6g on 8-13 and 4.2g on 8-29. We monitored the effects of the sex pheromone treatment by checking for a reduction or elimination of males caught in sticky traps baited with virgin females, and by checking the mating success of females placed in treated plots. Also, nut samples were collected for damage estimates. Male catches in 10 traps for the 50 nights from June 30 to August 18 were 3 in the test versus 2,045 in the check for a 99.9% reduction. The reduction in mating success was 94.5%. For the 34 nights from August 19 until harvest on September 21, the trap catches were 108 versus 6,386 for a 98.3% reduction. Mating success showed a 79.8% reduction. Nut damage showed a 60% reduction in those samples collected between August 6, and September 2. However, we did not have enough pheromone to do a thorough job of mating disruption during a 10-day period in late August. At harvest we had 6.2% damage in the test versus 8.4% in the check which is only a 27% reduction in nut damage. However, the nut crop in the check was about twice as large as that in the test, and if we correct

for the difference in crop size, this then shows a 61% reduction in nut damage. In addition to not having enough pheromone to put in the plot, high temperatures and high moth populations may have contributed to our problems resulting in high nut damage.

## Peach Twig Borer - Peaches

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First and second brood peach twig borer moths and larvae were effectively controlled on peach by one summer spray of decamethrin 2.5 EC at 40 g ai or azinphosmethyl 50 WP at 1.4 kg ai/ha applied 10 days after captures of first brood male moths in pheromone baited traps attained or exceeded an average of 2 moths/trap/week. At harvest, fruit from blocks sprayed at the first brood flight had 0.8 and 0.9% damage whereas fruit sprayed at both the pink and first brood flight had 0.0 and 0.2% damage, respectively. In the check there was 34.2% damage.

## Peachtree Borer - Peaches

Fred L. Banham, Agriculture Canada, Research Station
Summerland, B.C. V0H 1Z0

Good control of the peachtree borer in 2 ha of peaches was obtained with two truck sprays applied 3 days after the first male moths were captured in sex pheromone traps and again 4 weeks later at peak moth emergence. Sprays of endosulfan 50 WP at 75 g ai/100 L were timed by Pherocon 1C traps at 1/ha baited with laboratory-made septums containing synthetic female sex pheromone.

## Peachtree Borer - Peaches

Fred L Banham, Agriculture Canada, Research Station
Summerland, B.C. V0H 1Z0

Pherocon 1C traps baited with laboratory-made septums containing synthetic female peachtree borer sex pheromone were much more attractive to male moths than 3 other combinations of traps and attractants in a 1 ha nursery block of seedling peaches. Pherocon 1C traps baited with laboratory septums caught an average of 36.0 moths/trap, 1C traps baited with Conrel hollow-fiber dispensers or septums impregnated with pheromone extracted from Conrel hollow-fiber dispensers caught 23.0 moths/trap and Kitterman traps baited with laboratory septums caught an average of 11.5 moths/trap.

## Peach Twig Borer - Peaches and Apricots

Fred L. Banham, Agriculture Canada, Research Station
Summerland, B.C. V0H 1Z0

Economic threshold moth capture levels averaging 2 first brood and/or 5 second brood peach twig borer male moths/trap/week in sex pheromone traps were highly effective for timing summer pesticide sprays against this pest in 23 ha of peaches and apricots at Osoyoos, B.C. Azinphos-methyl 50 WP at 1.4 kg ai/ha was applied to individual blocks 10-14 days after the critical

levels were attained or exceeded in the Pherocon PTB baited 1C traps deployed at 1/ha. At harvest, there was no fruit damaged by twig borer in 5 orchards and 0.04% in 1 orchard in the 7 ha core area. In the 16 ha border area, 8 orchards comprising 10 ha were sampled; 5 had no damage, 2 had 0-2% and 1 had 1.3-4% damage.

## Codling Moth - Apples

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Male Removal for Codling Moth Control: Work was continued for the 2nd year to determine whether removal of male moths by sex pheromone traps would prevent this pest from increasing to injurious numbers in areas where a previous program of sterile moth release had almost eliminated the insect.

In a nonisolated area, 4 male moths were captured (17 traps/ha) in each of 2 apple orchards (2.5 and 4 ha) compared with 19 males in a neighboring 12-ha monitored orchard (1 trap/ha). Codling moth damaged fruit at harvest was less than 0.02% in each of the 3 orchards, i.e. well below the economic threshold level (ca. 0.5%). However, the codling moth is evidently becoming re-established; 1980 is the 1st year in which codling moth damage was observed in the 2 male removal orchards following cessation of sterile moth release in 1978.

In a semi-isolated area, 2 apple and pear orchards (17 ha each) were subjected to the male removal rechnique (17 traps/ha), and 2 neighboring orchards (3.5 and 12 ha) were monitored (1-2 traps/ha). Two male moths were captured in 1 of the male removal orchards, but no codling moth damaged fruit was found in any of the 4 orchards. Orchard isolation plus the suppressant effect of a mid-July spray of azinphos-methyl or Diazinon for leafroller control may be responsible for the virtual absence of codling moth in these orchards.

## Phaneta latens (Heinrich)-host unknown Another Olethreutine, Phaneta latens (Tortricidae), Attracted to the Sex Pheromone of the Codling Moth

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The attraction of extract from female codling moths, Cydia pomonella (L.), for male codling moths was first demonstrated at Yakima, Wash., in July 1963 (Butt and Hathaway 1966). Later, Roeloefs et al. (1971) identified the sex attractant of codling moth to be (E,E)-8,10-dodecadien-1-01. We found another olethreutine, Phaneta latens (Heinrich), to be attracted to this pheromone.

Adults of P. Latens were first captured in Yakima County on May 12, 1978 in Sectar 1R insect traps baited with commercially prepared pheromones (Zoecon Corp., Palto Alto, CA) for codling moth. Peak catches occurred in mid-May; then declined rapidly therafter. A second activity period occurred

from June 1 to 21. Although the traps were left in the field until Oct. 15, no additional P. latens were caught. A somewhat similar pattern occurred in 1979, with the first moth being captured on May 14 and the first peak of activity in mid-May. Unlike 1978, however, more moths were caught from the end of May to mid-June than earlier in May. No additional moths were caught from July 2 to Oct. 15, 1979.

When different concentrations of codling moth pheromone were compared in the field, the low concentration of 0.25 mg/trap caught significantly fewer moths than concentrations of 1.0 and 2.0 mg/trap. The number of moths caught at 0.5 mg/trap was not significantly different from the lower or hight concentrations.

In 1980, 67 P. latens were caught in the pheromone traps in apricot trees from May 20 to June 12. In Ellensburg 45 P. latens were caught in pheromone traps in pear trees from June 10 to July 7.

In summary, this study showed that another olethreutine moth species was attracted to (E,E)-8,10-dodecadien-1-ol, a known sex attractant of the codling moth. Furthermore, since all captured moths identified were males, we assume that the pheromone was also an important component of the sex attractant of P. latens.

## Tentiform leafminer - Apples

Donald W. Davis, Utah State University, Logan Utah

The tentiform leafminer problem subsided somewhat in Utah during 1980, but was still serious in some orchards. We received a tentative identification of Phyllonorycter sp. near propinquinella (Braun) in April, then a probable identification of P. elmaelia Doganlar in November. The Threshold developmental temperature is quite close to 5°C. Adults are readily attracted by the pheromone produced by Conrel for P. blancardella. There are 4 seasonal flights (assumed to represent generations) in the Provo area: Late April, late June, early August and mid September.

## Winter Moth - Filberts

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The European winter moth, Operophtera brumata, now well established in the northern Willamette Valley of Oregon has become a serious pest of filberts causing moderate to heavy defoliation when not controlled. During spring 1980, field studies on larval development were initiated in Washington County. First instar larvae were encountered for over a month period beginning on March 18 with peak populations occurring on March 31. The remaining four stadia constituted ca. 70% of the larval population at consecutive one week intervals beginning with the second instar on April 14. An estimated 86% of the population had completed development by May 12. Larval numbers exhibited a constant increase until March 31, when populations peaked at 2.4 larvae/leaf cluster. Density decreased to .5 larvae/leaf cluster just prior to the onset of pupation.

## Navel Orangeworm - Almonds

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The invasive stage of the insect parasitic nematode Neoaplectana carpocapsae Weiser which reportedly dies at temperatures above 32°C, remained viable and infective to naval orangeworm larvae in newly split almonds for the duration of a four day test. The average daily maximum temperatures in the almonds ranged from 42.0°C (morning sun) to 49.2°C (afternoon sun) (Table 1). All monitored almonds reached a maximum of at least 44°C over the four day period.

TABLE 1

Four day average maximum and minimum temperatures recorded from newly split almonds[1]/ exposed to morning or afternoon sun.

| | MAXIMUM TEMPERATURES (°C) | | | MINIMUM TEMPERATURES (°C) | | |
|---|---|---|---|---|---|---|
| Date | Morning sun | Afternoon sun | Air | Morning sun | Afternoon sun | Air |
| 7-19-80 | 42.4 | 48.4 | 44.0 | 19.6 | 19.0 | 22.0 |
| 7-20-80 | 43.4 | 49.2 | 48.6 | 19.0 | 18.6 | 22.0 |
| 7-21-80 | 43.2 | 48.4 | 45.6 | 20.0 | 20.0 | 23.6 |
| 7-22-80 | 42.0 | 46.6 | 43.0 | 20.2 | 20.6 | 23.6 |

1/ Temperatures recorded from 5 almonds/slide, 10 almonds total.
2/ Air temperatures recorded inside shaded weather station.

## Western Peach Tree Borer - Apricot

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Peach Tree Borer, Synanthedon exitiosa (Say) attacks the crown area of almond, apricot, cherry and peach. Damage is observed above or below the soil line, depending upon the height of the bud union and the rootstock used. The cryptic habit of this insect necessitates repeated application of insecticides. The Mexican strain of the insect parasitic nematode Neoaplectana carpocapsae Weiser has been shown to be effective in controlling such well-hidden borers. In 1980, tests were performed to determine if Peach Tree Borer larvae were susceptible to this nematode and, if so, to determine a suitable application technique.

Parasitized borer larvae were collected following application of namatodes by hand sprayer and soil-drench methods. Nematodes were found to persist in clay soils for one month during summer 1980. It appears that low soil moisture was limiting rather than high temperatures.

Volck[R] supreme oil (2E) has been used to minimize dessication and improve nematode distribution in almond orchard applications for navel orangeworm control, Lindegren, J. E., Dibble, J. E. Curtis, C. E., Yamashita, T. T. and Tomero, E., Compatibility of Entomogenous Nematode with Some Commercial Sprayers, California Agriculture (in press). Recent tests indicate that his undeluted oil, originally used as a carrier for nematode tests for American plum borer larvae control on almond trees, may by itself offer an effective control for this insect, Lindegren, J. E., Yamashita, T. T. and Hendricks, L. C., Insecticide and Acaricide Tests (in press). Volck[R] oil applications to Peach Tree Borer larval galleries, however, did not consistently kill the borer larvae; larvae that were killed by the oil were those apparently in direct contact with the frass plugging the active gallery openings. The frass apparently acts like a wick carrying the oil to the borer larva.

Further work needs to be completed to verify a best application technique which would maximize nematode survival and contact the greatest number of borer larvae. Preliminary indications suggest a 1/2 - 1 gallon spray per tree trunk consisting of approximately 3 million nematodes with oil applied in the spring when soil temperatures exceed 60°C and before initial pupation and moth flight.

## Comparative Efficacy of Various Trapping Techniques and Effects of Within Tree Trap Placement on Catches of Filbert Moth in Pheromone Traps

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Seven different types of traps were compared for trapping the filbertworm, Melissopus latiferreanus adults using a pheromone source. Zoeconi pherocon 1 cp trap and a one gallon icecream carton trap with top half of the lides removed and inside surface painted with Tanglefoot[R], were highly effective. Further studies indicated that these two traps were most effective when placed at a height of 4.8 meter, just above the tree canopy, and least effective at the ground level. As the trap height was increased, a corresponding increase in trap catches was recorded. Moths were caught in traps placed at a distance of up to 30 meters from the orchard. No traps were found in traps placed at 50 meters. The south and west quadrant of the tree trapped more moths than north and east.

## Leafroller Control Using Synthetic Pyrethroids and Effects on Beneficial and Harmful Mites

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Ambush, Pounce, and Pydrin were tested and their efficacy compared with Guthion and Larvin for the control of the obliquebanded and the filbert (European) leafroller on apples. All 3 synthetic pyrethroids were highly effective. Guthion was moderately effective and Larvin was poor. Effects of these treatments on a predatory mite, Typhlodromus arboreus and spider mites was also checked.

## Codling Moth - Apples

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Determine Temperature Thresholds for Development and Activity of Codling Moth: Codling moths did not oviposit at 5° or 10° C but did at 15° C. Mating was observed at 13° and 15°C but the number mating was low. At 17° and 18°C from 32 to 60% mated. At 21°C the heat sum for egg hatch was 1436 to 2243 degree hr C. At 26° it was 1789 to 2179 degree hr and at 27° it was 1863 to 2226 degree hr. The average larvae needed 9234 degree hr C for development and from hatch until emergence averaged 13,260 degree hr.C. Overwintering larvae is diapause needed between 5,000 and 13,000 degree hr C of heat to terminate diapause and emerge.

Determining the Potential of Control of Codling Moth Via Male Removal Using an Integrated Pheromone-insecticide Technique: Trees baited with pheromone and sprayed with azinphosmethyl were used to attract and kill male moths and annihilate them before mates were found. It was assumed that this approach would work only at low population densities. Trials were made in 1979 and 1980. Both years there was no infestation by first generation larvae. In 1979 there were 60 fruit infested by second generation larvae and in 1980, 102. Both years the infestation was in border trees and in trees that were not sprayed. All data indicate that the infestations were the result of gravid females migrating into the orchard from the outside. Significant findings from these tests were: (1) rapid kill required weekly treatments, (2) migration of moths from overwintering larvae is not as extensive as second flight moths based on recorded infestation, (3) that 3 or 4 border sprays would control codling moth and cover sprays could be eliminated, and (4) that the critical catch level is probably different for each generation and that the "critical catch" level has not yet been isolated. Further testing is not anticipated.

Temperature Summation (Degree Hours): Our objective was to develop a field model of a temperature integrator to measure directly degree hour summation. With the cooperation of Pro El Company, a temperature integrator was designed and tested. Production models are now available. This represents a significant advance in the collection and utility of heat summation for measuring rates of growth and development of insects and plants.

## Codling Moth - Apples

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Effect of Volcanic Ash on Codling Moth: Our objective was to determine the effect of volcanic ash on the codling moth and on azinphosmethyl. The ash was on the trees between the first and second generation or flights, and therefore caused minimal damage to codling moth populations. The ash did shorten the adult life span and was very toxic to neonate larvae. It had no effect on eggs or oviposition. The ash resulted in the degradation of 5-20% of the azinphosmethyl applied for codling moth control.

## Navel Orangeworm - almonds

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Improved reliability and performance of navel orangeworm egg traps was achieved by replacing wheat bran bait with almond press cake meal. Field trials throughout the 1980 season in almond orchards located in three locations in the state consistently showed increased oviposition on traps baited with 15 grams of press cake compared to 15 grams of the standard wheat bran bait. In addition to greater ovipostion levels, trap maintenance and servicing time was decreased.

## Codling Moth - Pears

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Environmental control of oviposition: The oviposition rhythm in Laspeyresia pomonella (L) is entrained by light-dark cycles and free-runs in continuous light and in continuous darkness. In the laboratory as well as in the field, the median of oviposition occurs on average 2.5 h before the onset of darkness. The codling moth can adapt quickly to a new light regime. Oviposition was resynchronized with a normal light-dark cycle within 48 h after free-running for several days in continuous light. The cue for entrainment of the oviposition rhythm in a light-dark (LD) regime appears to fall between the onset and mid-point of the night. In a regime with abrupt LD and DL changes (no twilight) the codling moth can display a bimodal oviposition rhythm. The expression of bimodality appears to be sensitive to temperature. In constant light, a 24-hour thermoperiod (square wave) can also entrain oviposition. The peak of oviposition occurred regularly at the transition of the high (25$^{o}$C) to the low (20$^{o}$) temperature.

## Codling Moth - Pears

J. E. DeTar, H. Riedl, and L. A. Hanson
University of California, Berkeley, CA 94720

Monitoring with pheromone traps: Two slow-release substrates, one a plastic laminate (Hercon Co.) the other consisting of capillary plastic fibres (Conrel Co.) were compared in replicated field tests to the red rubber stopper (Zoecon Co.) to determine longevity, optimum lure content, and rate of pheromone release. For the plastic laminate 10 mg appeared to be close to the optimum lure content. Field life of this dispenser was at least 10 weeks. Only preliminary data are available for the plastic fibres due to insufficient catches.

Three traps, the Pherocon 1CP, the Delta trap (Contrel Co.) and a plastic trap similar in design to the Pherocon 1CP were evaluated. The Delta trap appears to have potential as a codling moth trap.

L. A. Hanson and H. Riedl
University of California, Berkeley, CA 94720

Chemical control: Fenvalerate (Pydrin) 2.4 EC at 0.2 lb ai/acre and the experimental compound SD57706 1.2 EC at 0.05 lb ai/acre provided satisfactory control when applied as two covers. Single application of SD57706 at 0.05 and 0.1 lb ai/acre as first cover sprays did not produce control significantly different from the check at harvest. Populations of spidermites tended to be higher in the fenvalerate and single cover SD57706 treatments. Rust mites were not effected by either material.

Susceptibility to azinphosmethyl: Populations from five pear orchards located in California's pear-growing districts are being screened to monitor resistance development to azinphosmethyl. Using the test procedures and baseline data of Barnes and Moffitt (1963) the populations tested so far appear to have maintained a high degree of susceptibility to this compound.

## Pandemis pyrusana and Orange Tortrix - Apples

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University of California, Berkeley, CA 94720

Chemical Control: Pydrin 2.4 EC and Pounce 3.2 EC at 0.1 and 0.2 lb ai/acre as well as Zolone 25 W at 3.0 lb ai/acre applied by speed sprayer twice during the season (Mar 10 and Jul 5) kept damage at levels significantly lower than in the check or in a Guthion treatment (25 W at 1.0 lb ai/acre). Counts of European red mite eggs after harvest indicated a significant build-up on Pydrin-treated trees but low numbers in the remaining treatments.

## Codling Moth - Pear

P. H. Westigard
Southern Oregon Experiment Station

Fenvalerate (0.05 lb ai/100) and SD 57706 (0.025 lb ai/100) used in a 2 cover spray program gave better control (1.0 and 2.0% infested fruit respectively) than the normal 3 coverspray program using phosmet (0.5 lb ai/100) which had ca. 6% infested fruit at harvest. Average post treatment two-spotted mite levels were 1.9, 6.4, 6.8, and 2.1 in the SD 57706, fenvalerate, phosmet and check plots respectively.

## Oriental Fruit Moth - Peaches

Jack Eves, AfReCon, Prosser, WA

Pydrin at .1, .2, and .4 lb ai/acre in two applications provided excellent protection to peach fruits from oriental fruit moth entries. All rates were slightly more effective than the Guthion standard.

# Naval Orangeworm - Almonds

J. E. Dibble
University of California, Parlier

Caged female and male moths were sprayed with Ambush, Pounce, Pydrin, Lorsban, Orthene, Diazinon, Imidan, and Guthion. All pyrethroids performed well in early knockdown and high kill rate in 1 to 3 days. Lorsban looked good and Orthene showed some activity. Diazinon, Imidan and Guthion performed poorly.

# S E C T I O N  I I

## ORCHARD MITES

Section Leader -- Donald W. Davis

## European Red Mite - Apples

Stan Hoyt, Washington State University, Tree Fruit Research
Wenatchee, WA 98801

NC21314 applied in the prepink period on apple gave good control of European red mite through early July. Summer applications of this material DPX3792, SLJ0312, and Encapsulated Omite were also effective although less so than Plictran. L676863 provided some initial knockdown but poor residual control.

## Pear Rust Mite - Pears

Stan Hoyt, Washington State University, Tree Fruit Research
Wenatchee, WA 98801

Fair protection from fruit russet by pear rust mite was given by Carzol and Plictran. Vydate and BAAM were less effective than the above, and oil plus ethion or oil plus flowable sulfur were ineffective.

## Two Spotted Spider Mite - Pears

Stan Hoyt, Washington State University, Tree Fruit Research
Wenatchee, WA 98801

Vydate, Plictran, Omite, and Encapsulated Omite provided good control of two spotted spider mite on pears. Carzol was somewhat less effective than the above treatments. The standard formulation of Omite was phytotoxic to pears but the encapsulated formulation caused no injury.

## Spider Mites - Apple and Pear

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

UC 55248 and UBI 1323 were the most effective experimental compounds tested with UC 55248 being destructive to Typlodromus predators. A seasonal amitraz program (4 sprays) on pear suppressed ERM, but resulted in a late resurgence of twospotted mites with foliage damage by late August. The highest mite densities were in the highest fenvalerate and azinphosmethyl plots.

## Citrus Flat Mite - pistachios

R. E. Rice, University of California, Parlier 93648

The citrus flat mite, Brevipalpus lewisi McGregor, is known primarily as a pest of citrus and pomegranites. It was discovered infestating bearing pistachio trees (new host record) in Kern County, California in 1979. This mite is smaller than most tetranychid mites, is flattened dorsally, and oblong in shape. The motile stages are slow moving and are colored reddish brown to bright pink. The mites overwinter in colonies in bark cracks or under bark or bud scales. They emerge in the spring when temperatures reach ca. 70°F and begin feeding on developing shoots and buds. Highest populations of B. lewisi are usually observed in mid-to late summer as they are not adversely affected by hot summer temperatures.

Sampling for citrus flat mite in nut clusters in 1980 showed extremely low populations from late May until early July. Average temperatures during this period were in the 70 + 5°F range. A sharp increase in mite populations occurred in late July and August, along with average temperatures significantly above 80°F. Mite numbers declined along with declining temperatures in late August and September.

The injury caused to pistachios by flat mite is similar to that seen on other host fruits. The mites feed on petioles, stems, and nuts, forming dark, roughened, scab-like blotches on the surface tissues. On nut hulls these injured areas may be slightly raised. Continued feeding on the petioles and stems causes them to wither and dry. Heavily damaged nuts also cracked and dried prematurely, which could possibly lead to increased oviposition by navel orangeworm, and impaired hulling at harvest. A predaceous phytoseiid mite, Metaseiulus mcgregori (Chant) was collected in association with citrus flat mite from nut clusters.

## Two-Spotted Spider Mite - Pears

P. H. Westigard
Southern Oregon Experiment Station

The experimental acaricides L-676863 (0.1 oz AI) with and without oil, Vydate (0.5 lb AI) with and without oil, DPX 3792 (.25 lb AI), all gave good control for over a 4-week period. Lower rates of the above compounds did not provide acceptable control. Vendex 4L (0.5 pt), Vendes 4L (0.5 pt) plus Buffer X, and Vendex 4L (0.5 pt) plus oil provided control equivalent to Plictran at 0.5 lb/100. The encapsulated formulation of Omite UBI 1294 used at 2.5 lbs/100 also provided control but lower rates of this compound and other formulations (UBI 1292) did not give acceptable mite suppression.

## Two-Spotted Spider Mite and *Metasiulus occidentalis* - Pears

P. H. Westigard, M. A. Hoy
Southern Oregon Experiment Station

Laboratory strains of *M. occidentalis* tolerant to the synthetic pyrethroid Pemethrin were released into a southern Oregon pear orchard. The trees received 2 applications of Permethrin (0.1 lb AI/acre), with the first applied 6 weeks prior to release, and the second ca. 5 weeks after release. Though predator densities were initially depressed following the 2nd treatment they subsequently increased and entered the fall period in relatively high numbers.

# S E C T I O N  I I I

## OTHER INSECT PESTS

Section Leader -- Richard L. Penrose

## San Jose Scale - stone and pome fruits

R. E. Rice
University of California, Parlier 93648

Evaluation of San Jose scale isomers and trap designs continued in 1980. Results confirmed previous data showing that the SJS-3 isomer was more attractive than either the SJS-1 or SJS-2 isomers. Pheromone dispenser longevity was optimally set at 6-8 weeks when using 300 µg cap loads. Comparisons of large (3 x 10 in.) tent trap surfaces to small (3 x 6 in.) trap surfaces showed no significant differences in trap collections of male scale. Evaluations of scale flights in several host crops showed good correlations of observed and predicted events using the SJS phenology model.

## San Jose Scale - Almonds

J. E. Dibble
University of California, Parlier

May worm treatment of Lorsban, Pydrin, Diazinon and Ambush all plus oil were evaluated approximately one month for live scale. All treatments were good with Lorsban WP and Diazinon the best.

## San Jose Scale - Almonds

J. E. Dibble
University of California, Parlier

Dormant applications of Diazinon and narrow range oil (dilute and concentrate) and Supracide + oil all did an excellent job of scale control. Diazinon and Volck performed poorly and probably due to old oil stock. New and old wood samples were taken and generally showed the same relative results. The value of oil was clearly shown as an OP additive.

## San Jose Scale - Pears

P. H. Westigard
Southern Oregon Experiment Station

Evaluation of insecticides commonly used in combination with oil for delayed dormant control of San Jose scale were tested for their efficiency in providing scale suppression when used alone. Diazinon, Supracide and parathion provided equivalent control used at 0.5 lb AI/100 rates (9.2 to 10.4% infested fruit at harvest). Flowable sulphur (THAT) at 1 qt/100 and polysulfide at 4 lbs/100 gave poor control (74 and 64% infested fruit respectively).

Summer control of San Jose scale crawlers was tested comparing Furadan, FMC 35001 and parathion. The best control was measured with FMC 35001 at 0.5 lb AI/100.

## San Jose Scale - Apples

Jack Eves, AgReCon, Prosser, WA

Three rates of FMC 35001 with and without oil, Supricide with and without oil, and Parathion with oil were applied in a dormant application to red delicious apple trees with extremely high scale populations. The results in order of effectiveness were: Supricide with oil > FMC 35001 - .375 + oil > Parathion + oil > Supricide > FMC 35001 - .250 + oil > FMC 35001 - .500 > FMC 35001 - .500 + oil > FMC 35001 - .375 > FMC 35001 - .250 > Check. All trees exceeded 60% infested fruit with the single dormant application.

Three rates of FMC 35001 and a single rate of Parathion were applied to different trees in the same highly infested scale block in a single summer application. The results in order of effectiveness were: FMC 35001 -.500 > FMC 35001 -.375 > FMC 35001 - .250 > Parathion > check. All trees exceeded 75% infested fruit with the single summer application.

## Apple Aphid - Apples

Jack Eves, AgReCon, Prosser, WA

Pirimor at .03 and .06 lb ai/100 gal was compared to the standard Systox in 2 applications for apple aphid control. The .03 Pirimor rate was equal to Systox and the .06 rate was superior to Systox. Both Pirimor rates worked faster than Systox and had less impact on lady beetles immediately after application. Pirimor did not have a detrimental effect on predator mites.

## Walnut Husk Fly - Persian Walnut

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University of California, Berkeley, CA 94720

Monitoring: Evaluations of spherical and rectangular traps of different colors revealed strong attraction of adult husk flies to green when combined with a spherical trap shape, and yellow when combined with a rectangular shape. In several season-long field tests with green spherical traps, standard fluorescent-yellow AM rectangles (Zoecon co., Palo Alto, CA) and AM rectangles baited with dry ammonium carbonate the latter were the most sensitive indicators of low husk fly populations. However, spherical traps were generally better indicators for the onset and time course of oviposition. Additional experiments are planned to determine the value of spherical traps for improved spray timing.

Chemical control: The combination of Pounce 3.2 EC at 0.4 lb ai/acre and Staley's bait No. 7 applied to ¼ or ½ of the tree canopy provided better control than a full-canopy treatment without bait. Walnut aphid was also controlled by this material, but spider mite build-up occurred on treated foliage.

## Pear Psylla - Pears

P. H. Westigard
Southern Oregon Experiment Station

In prebloom trials the pyrethroid AC 222705 used at 0.1 lb AI per acre gave equivalent control to that obtained with Pydrin at 0.2 lb AI/acre. In late summer tests, SN 72129 at 1 lb AI/100 gave control of psylla nearly equal to that achieved with amitraz (0.4 lb AI/100).

Failure of fenvalerate to provide summer control of pear psylla was reported from one southern Oregon pear orchard which had been treated experimentally with this compound in prebloom and summer programs for the past 4 years. Laboratory tests on adult psylla indicated the development of resistance to fenvalerate.

## Apple Maggot - Apples

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635 Capitol Street NE, Salem, Oregon 97310

The apple maggot, Rhagoletis pomonella, first detected at Portland in October 1979, was found to be widespread in western Oregon in 1980. The largest infested area is in the northern Willamette Valley and encompasses portions of Multnomah, Washington, Yamhill, Clackamas and Marion Counties. Smaller, isolated appearing populations were also located in Linn, Lane, Hood River, Lincoln, Josephine and Jackson Counties. First adult activity was noted in mid-July; the last fly was trapped between October 17-20. Seventy-five percent of all flies trapped in early maturing hosts were caught before August 15 (Portland area). Summer maturing varieties of apples were most frequently found harboring maggots. Larvae readily completed development in these apples as well as in ornamental hawthornes (Crataegus spp.) and certain selections of crabapples. No larvae infestations have been reported from commercial operations in the Valley, indicating that existing recommended sprays may be providing some control.

## Walnut Husk Fly Monitoring and Phenology

M. T. AliNiazee
Oregon State University
Corvallis, OR 97331

The population emergence and field activity of the walnut husk fly was monitored using Zoecon's AM standard traps. The phenology was studied by collecting walnuts at different time intervals and examining was eggs and maggots. Data indicate good synchromization with host fruit development.

## Pear Psylla - Pears

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

Results of laboratory tests on overwintering adult female psylla showed the wettable powder SN 72129 gave very good control alone and excellent control with oil. Fenvalerate was found to lose contact efficiency when combined with copper compounds or Na polysulfide; residual results were only slightly lower. HAG 107 0.2 FL gave very good control and BAY FCR 1272 EC gave excellent control with oil. Pear Clean, ACCO Highway Plant Spray, Safers Soap, acephate, and sulfur gave poor to very poor adult control.

AC 222,705 was as effective in the field as fenvalerate against adults. Neither flowable sulfur nor LI-9037 LC were effective in preventing psylla egg deposition.

The most effective materials used against immature psylla were SN 72129 50 WP, BAY FCR 1272 EC, and HAG 107 .3 EC. The least effective were Safers Soap, ACCO Highway Spray, LI-9037 (alone or with either Safers Soap or acephate), FMC 35001 EC, FMC 45801 EC, Systox 6E, Temik 15G, and Ziram.

Our 1980 work included monitoring a pear orchard sprayed by injecting pesticides into an overtree irrigation system. In one Bartlett block, sprays were supplemented with periodic two-hour washing periods during the cover season. Psylla populations became extremely high and honeydew was evident on the trees. The grower concluded he did not suffer economic loss on this Bartlett block.

Use of a 2.6 oz per acre rate of fenvalerate as a dormant spray in an integrated pear orchard gave some adult psylla knockdown but allowed for an early predator buildup and summer control without any psylla insecticide sprays.

Amitraz EC and SN 72129 WP were very easy on Deraeocoris brevis adults in laboratory tests. Fenvalerate, Guthion, and Imidan were very toxic to this predator.

## Pear Psylla - Pear

Everett Burts, Washington State University
Tree Fruit Research Center
1100 N. Western Avenue, Wenatchee, WA 98801

Ac 222-705 .1 lb ai/A, BAY FCR 1272 .05 lb ai/A and SN 72129 5 lb ai/A controlled overwintered adult pear psylla as well as Pydrin . 3 lb ai/A in airblast sprays containing 1% oil applied at late dormant stage, when first psylla eggs were found. The following experimental pesticides provided good control of pear psylla when applied as hand gun sprays to replicated plots in a Bartlett pear orchard: SD 57706 .025 and .05 lb ai/100 gal, HAG 107 .011 and .022 lb ai/100 gal, SN 72129 1.25 lb ai/100 gal, AC 222-705 .024 lb ai/100 gal and BAY FCR 1272 .013 lb ai/100 gal. All treatments were applied 3 times, May 12, June 17 and July 23, except SD 57706 .05 lb ai.100 which was applied May 12 and July 23 only.

Two fatty acid soaps, Acco Plant and Tree Wash and Safer's Soap, failed to provide economic control of dense nymph population when applied as drenching hand gun sprays. Both materials were applied at a rate of 1/2 gal/100 in 2 sprays 2 weekd apart. The same dosage of Safer's soap added to BAAM or Guthion sprays did not improve pear psylla nymph control with these pesticides.

## Pear Psylla - Pears

R.E. Fye, USDA SEA/AR
Yakima Agricultural Research Laboratory, Yakima, WA 98902

During 1980 a total of 96,986 ladybeetles were released including 12,805 Harmonia conformis, 28,512 H. axyridis, and 56,387 Menochilus quadriplagiatus with 33,119 released in Yakima, 1,250 at Tieton, 7,476 at Gleed, and 56,387 in Parker Heights, 1,777 at Wenatchee and 12,739 in Husum. The beetles were reared on greenbugs, Schizaphis graminum, on wheat seedlings grown in vermiculite in 1-gallon ice cream cartons. To date there is no evidence of establishment of any of the released species;however, adults, pupae and full grown larvae of H. axyridis and M. quadriplagiatus were detected in areas in which only young larvae were released in 1980.

The Laboratory pear orchard was not sprayed for pear psylla. Predation reduced high early season populations to low levels and maintained them at those levels for the remainder of the season. Less than 1% of the pears were culled due to psylla damage. In one grower orchard a single application of oil (7.5 gallons/acre) reduced populations of psylla eggs by one half. Predation by Deraeocoris followed and continued until volcanic ash decimated predator populations. The psylla population never recovered and the grower completed the season with a single application of Plictran$^{R}$ for mites. The data from the two blocks indicate that in the absence of disruptive sprays of hard pesticides for other pests the native predators may effectively reduce psylla populations.

Evaluation of cover crops in orchards indicated: (1) that if wheat is the cover crop, aphids on the wheat provide an alternate food source for predators in the absence of pear psylla populations in the trees; (2) that wheat varieties in use do not withstand repetitive mowing by the orchardist, and (3) that common cover crops of grass and weeds do not provide adequate sustenance for the common pear psylla predators.

## Pear Psylla - Pears

J. F. Howell, USDA, SEA/AR
Yakima Agricultural Research Laboratory
Yakima, WA 98902

Determine the Effects of Temperature on Development and Reproduction of Pear Psylla. Exposure in excess of 72 hr to 35$^{o}$C temperatures is fatal to psylla eggs. Nymphs die before molting to adults if exposed for 72 hr at 35$^{o}$C. Variable temperatures simulating a day late in June with maximum temperatures simulating a day late in June with maximum temperatures of 37$^{o}$C and minimum ones of 15$^{o}$C resulted in a 92% nymphal mortality. Psylla eggs require from 1750 to 2850 degree hours C for hatching. Psylla lay few eggs at 10$^{o}$C but have normal oviposition at 15$^{o}$C.

## Berta Armyworm - Apples

J. F. Howell, USDA, SEA/AR
Yakima Agrucultural Research Laboratory
Yakima, WA 98902

Develop pheromone traps for monitoring activity of bertha armyworm: Rubber septa loaded with 1 mg of Z11-16:Ac and .05 mg Z9-14:Ac were effective attractants for a full season. The addition of phenylacetaldehyde, n-buranol and acetaldehyde resulted in a 6X increase in catch. Pheromone trap catch during the first generation was 5.1 males/trap per day whereas BL trap catches were 0.4/trap per day. Second generation catches were as high as 105/trap per day in pheromone traps.

## Spotted Cutworm - Apples

J. F. Howell, USDA, SEA/AR
Yakima Agricultural Research Laboratory, Yakima, WA 98902

Isolate and identify the sex pheromone of the spotted cutworm: Virgin female baited traps caught 3.7 males/trap per day. This was a better catch than with the synthetic pheromone which was 0.06/trap per day in 1979. Since 1973 average BL trap catches have ranged from 5.6 to 154.6/trap per day. BL still seem more attractive than the virgin females.

Develop bait traps for moniotring activity of spotted cutowrm larvae: Apple pomace and soya meal laced with molasses and soya laced with propylene glycol were more attractive baits than the others tested. The baits were apple pomace, soya meal, and alfalfa pellets laced with molasses, propylene glycol, and phenylacetaldehyde.

## Pear Psylla - Pears

Douglas G. Pfeiffer WSU, Tree Fruit Research Center, Wenatchee, WA

The effect of differential nitrogen application on pear psylla was observed in a mature orchard as well as on Bartlett seedlings in a growth room. In the orchard, a 2X2 factorial wxperiment was carried out, employing two rates of application (1 lb and 1/3 lb actual N) and two dates of application (dormant and late summer). Trees with a high rate of fertilization had significantly more psylla eggs, predominantly in the early season. There was no significant effect due to date of application. Nymphs were also present in greater numbers on trees with high fertilization. In the middle of July, this difference disappeared and there were significantly more nymphs on trees fertilized in the dormant season. There were few significant differences in adult numbers, but adults collected from trees with the high fertilization rate, and also those from late summer-fertilized trees, had higher free amino acid levels. There was significantly more downgrading due to honeydew russet at harvest on trees with high fertilization. There was no effect on the size of fruit. A greater percentage of pear rust mite cullage was found on trees with low fertilization.

Preliminary analysis of data obtained in growth room studies showed no significant differences in psylla oviposition or developmental time on trees supplied with different rates on nitrogen. These rates did result in different nitrogen levels in the trees as shown by leaf color analysis and free amino acid assay of phloem/cortex tissue.

# S E C T I O N  I V

## CONCENTRATE SPRAYING RESIDUES & PHYTOTOXICITY

Section Leader -- Arthur H. Retan

## Honey Bee - Pears

D. F. Mayer
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IAREC, Prosser, WA 99350

Anise oil at one quart with 20 pounds of sugar in 400 gallons of water was applied to every other middle in an 8-acre block of Anjou pears. Twelve colonies of honey bees were established for pollination in two groups, one on each side of the orchard. Counts of honey bees per tree per minute were taken during full bloom and averaged. Pre-application counts were 12.4 bees per tree per minute. Post-application counts were 15.9 bees per tree per minute. This is statistically significant at the five percent level.

The minimum bee requirement to set a good pear crop is about 10 bees per tree per minute.

## Honey Bee

Carl Johansen and Chris Kious Department of Entomology
Washington State University, Pullman, WA 99164

Test exposures of honey bees to field-weathered residues of insecticides provided the following results (lb ai/acre):

(1) low hazard: Mv-770, 0.5; U-56295; U-57770; U-47319, 0.5; Larvin; Bromophos, 0.25; Sevin XLR, 1.0; Sevin bait.

(2) moderate hazard: Pirimor + Dylox; MV-770, 0.75; L-676,863, 4 ppm; U-47319, 1.0; Bromophos-ethyl, 0.5; Sevin XLR, 1.5.

(3) high hazard: MV-770, 1.0; L-676,863, 8 ppm or more; Thiodiazol; Bromophos-ethyl, 1.0; Sevin XLR, 2.0; Sevin SL; Sevin WP; Guthion.

A look at poisoning symptoms showed following: All honey bees died with tongues out when hit with direct spray of organophosphorus or carbamate materials, but all were dry. All bees killed by exposure to residues of organophosphorus insecticides were heavily soaked and black looking from regurgitation, most had tongues out. About half of bees exposed to carbamate residues had tongues out, but most were dry.

## Powdery Mildew - Apples

Jack Eves, AgReCon, Prosser, WA

Bayleton at 1 and 2 oz ai/100 gal applied in green tip, pink, and petal fall sprays provided good control of powdery mildew on Jonathan apples, Bayleton at ½ oz provided only moderate control. There was a 3-4 ton per acre increase in yield on the Bayleton treated trees.

Bayleton at 1 oz ai/100 gal applied in green tip, pink, and petal fall sprays increased yield by 7.7 tons per acre on Rome apples and 7.8 tons per acre on golden delicious apples.

## Coryneum Blight - Peaches

Jack Eves, AgReCon, Prosser, WA

Bravo at 2 and 4 pts per 100 gal applied in fall, pink, and shuck split provided good control of coryneum blight and was comparable to the standard fall copper and pink and shich split sprays of Captan.

# S E C T I O N V

## DECIDUOUS ORCHARD DISEASES

Section Leader -- William J. McPhee

## Brown rot blossom blight and fruit rot - Cherry (Black Republican)

Iain C. MacSwan and Bashir Gashaira
Oregon State University, Corvallis, Oregon

The following treatments (rate per 100 gallons of water) - bloom, preharvest sprays, or a Botran dip were applied. BAS 436F 50 WP 12 oz (bloom and preharvest) followed by Botran dip, Ronilan 50 WP 12 oz (bloom preharvest) followed by Botran dip, Bravo 500 1½ pt plus Benlate 50 WP 4 oz ( 3 bloom sprays) then Captan 50 WP 2 lb (preharvest), Quintar 5F 6.4 fl oz (3 bloom sprays), Baycor 50 WP 4 oz ( 3 bloom sprays), Benlate 50 WP 4 oz (popcorn only) then Quinatr 5F 3.2 fl oz (full bloom and petal fall), Benlate 50 WP 4 oz (popcorn and full bloom only), Baycor 50 WP 4 oz (3 bloom sprays), Captan 50 WP 4 oz (3 bloom sprays) then Ronilan 50 WP 12 oz (preharvest) followed by Botran dip, Bravo 500 2 pt (3 bloom sprays) then Captan 50 WP 2 lb (preharvest), Captan 50 WP 2 lb (3 bloom sprays), and Captan 50 WP 2 lb (3 bloom sprays) then BAS 436F 50 WP 12 oz (preharvest) followed by Botran dip. At harvest one hundred fruits from each replicate were combined in one sample, placed on brown paper on a plywood board, then covered with cheesecloth and clear poly sheeting. The fruit from four treatments were placed in a mesh sack, dipped in a five gallon solution of Botran 75 WP for one minute, and air dried before being placed on the plywood board. High humidity was maintained by regularly sprinkling the cheesecloth with water. After 7 days numbers of fruits showing brown rot or other rots were counted and recorded. Blossoms blight: good control was provided by all fungicides. Brown rot fruit rot: all fungicides provided good control with the exception of the Baycor treatments and the Captan bloom sprays followed by the BAS 436F preharvest sprays. Total fruit rot: significant reduction resulted from the Quintar 5F and the Bravo/Benlate mix followed by preharvest sprays of Captan. Brown rot fruit rot (Botran dip): good control was obtained after field treatments of Captan bloom sprays followed by preharvest (21 and 14 days) sprays of Ronilan or BAS 436F and bloom and preharvest (21 and 14 days) sprays of Ronilan. Total fruit rot (Botran dip): reduction of rot due principally to control of Rhizopus sp. and Mucor sp.

## Brown rot blossom blight and fruit rot - Cherry (Corum)

Iain C. MacSwan and Bashir Gashaira
Oregon State University, Corvallis, Oregon

The following treatments (rate per 100 gallons of water) - bloom, preharvest sprays, or a Botran dip were applied. Quintar 5F 6.4 fl oz, Benlate 50 WP 4 oz (popcorn and full bloom only), Benlate 50 WP 4 oz (popcorn) then Quintar 5F 3.2 fl oz (full bloom and petal fall), Bravo 500 1.5 pt plus Benlate 50 WP 4 oz (3 bloom sprays) then Captan 50 WP 2 lb (preharvest), and Captan 50 WP 2 lb (preharvest), and Captan 50 WP 2 lb. Four hundred blossoms per replicate were assessed as diseased or healthy on April 29. At harvest 100 fruits from each replicate tree were combined in a sample, placed on brown paper on a plywood board, then covered with cheesecloth and clear poly sheeting. A high humidity was maintained by regularly sprinkling the cheesecloth with water. After 7 days numbers of fruits showing brown rot or other rots were counted and recorded. Bloosom blight: all fungicides provided good control. Brown rot fruit rot: good control was proveded by Benlate 50 WP 4 oz applied at popcorn and full bloom only, Benlate 50 WP 4 oz applied at popcorn followed by Quintar 5F 6.4 fl oz at full bloom and petal fall, Bravo 500 1.5 pt plus

Benlate 50 WP 4 oz followed by Captan 50 WP 2 lb at 14 days before harvest, and Bravo 500 2 pt followed by Captan 50 WP 2 lb at 14 days before harvest. Total fruit rot: good control was provided by sprays of Benlate 50 WP 4 oz at popcorn followed by Quintar 5F 3.2 fl oz at full bloom and petal fall and Bravo 500 1½ pt plus Benlate 50 WP 4 oz followed by Captan 50 WP 2 lb at 14 days before harvest.

## Brown rot blossom blight - Peach (Improved Elberta)

Iain C. MacSwan
Oregon State University, Corvallis, Oregon

The following treatments (rate per 100 gallons of water) were applied Baycor 50 WP 2 oz and 4 oz, BAS 436F 50 WP 12 oz, Ronilan 50 WP 12 oz, Bravo 500 2 pt, Benlate 50 WP 4 oz (popcorn only) then Cyprex 65 WP 8 oz (full bloom and petal fall), Bayleton 50 QP 1 oz, 2 oz, and 4 oz, Benlate 50 WP 4 oz (popcorn and full bloom only), Bravo 500 2 pt plus Benlate 50 WP 4 oz, and Captan 50 WP 2 lb. One hundred blossoms per replicate were rated for disease on May 28. All treatments provided good control of blossoms blight.

## Scab - Apple (Red Delicious)

Iain C. MacSwan
Oregon State University, Corvallis, Oregon

The following sprays (rate per 100 gallons of water) were applied at pre-pink (April 17), pink (April 21), calyx (May 8), first cover (May 23), and second cover (June 12). Cyprex 65 WP 12 oz, Baycor 50 WP 2 oz and 4 oz, CGA 64251 10 WP 2.5 oz, GAF 865 15 EC 10 fl. oz, Bayleton 50 WP 1 oz. Leaf scab: 100 leaves per replicate were assessed as diseased or healthy on July 7. Fruit scab: two boxes of fruit per replicate were rated for scab shortly after harvest (October 9). Fruit scab and leaf scab: good control, under the conditions of the test, was provided by sprays of Cyprex 65 WP 12 oz, Baycor 50 WP 2 oz and 4 oz, and CGA 64251 10 WP 2.5 oz.

## Powdery mildew - Apple (Jonathan)

Iain C. MacSwan
Oregon State University, Corvallis, Oregon

The following sprays (rate per 100 gallons of water) were applied at pre-pink (April 17), pink (April 21), calyx (May 12), first cover (May 29) and second cover (June 12). Bayleton 50 WP 1 oz and 2 oz, CGA 64251 10 WP 2.5 oz and 3.5 oz, THAT 52F 4 pts, Karathane 25 WD 12 oz. One hundred terminals per replicate were assessed as diseased or healthy on July 7. Two boxes of fruit per replicate were assessed for russet shortly after harvest (October 6). Powdery mildew: significantly better control that provided by the standard Karathane sprays was obtained from sprays of Bayleton 50 WP 1 oz and 2 oz and CGA 64251 10 WP 2.5 and 3.5 oz. All of the test fungicides reduced fruit russet.

## Scab and Powdery Mildew - Apple (Rome)

Iain C. MacSwan
Oregon State University, Corvallis, Oregon

The follwing sprays (rate per 100 gallons of water) were applied at pre-pink (April 18 or 19), pink (April 23), calyx (May 12), early first cover (May 23), first cover (May 29), and second cover (June 18 or 19). CGA 64251 10 WP 2.5 oz and 3.5 oz, Baycor 50 WP 2 oz, 4 oz, and 8 oz, Cyprex 65 WP 12 oz plus Karathane 25 WD 12 oz, GAF 865 15 EC 10 fl oz, and Bayleton 50 WP 1 oz and 2 oz. Powdery mildew: 100 terminals per replicate were assessed as diseased or healthy on June 14. Leaf scab: 100 leaves per replicate were assesses as diseased or healthy on July 8. Fruit scab: two boxes of fruit per replicate were assessed for scab within a few days of harvest (October 13). Fruit scab: best control was provided by sprays of CGA 64251 10 WP 3.4 oz and 8 oz, Baycor 50 WP 2 oz, 4 oz, and 8 oz, and Cyprex 65 WP 12 oz in combination acceptable control of scab since all were equivalent to Cyprex, the standard fungicide commonly used in the Northwest. Powdery mildew: best control was provided by Bayleton 50 WP 1 oz and 2 oz, Baycor 50 WP 2 oz, 4 oz, and 8 oz, CGA 64251 10 WP 3.5 oz and Karathane 25 WD 12 oz in combination with Cyprex 65 WP 12 oz.

## Scab and Powdery Mildew - Apple (Rome)

Iain C. MacSwan
Oregon State University, Corvallis, Oregon

The following sprays (rate per 100 gallons of water) were applied at pre-pink (April 19), pink (April 23), calyx (May 22), first cover (May 29), and second cover (June 19). CGA 64251 10 WP 2.5 oz, Cyprex 65 WP 12 oz plus Karathane 25 WD 12 oz, Baycor 50 WP 2 oz, and Gaf 865 15 EC 10 fl oz. Powdery mildew: 100 terminals per replicate were assessed as diseased or healthy on July 18. Leaf scab: 100 leaves per replicate were assessed as diseased or healthy on July 10. Fruit scab: two boxes per replicate were assessed for scab within a few days of harvest (October 13). Fruit scab, leaf scab, and powdery mildew: under the conditions of the test - very frequent and heavy rains - best control was provided by sprays of CGA 64251 10 WP 2.5 oz and Cyprex 65 WP 12 oz in combination with Karathane 15 WD 12 oz.

## Brown rot blossom blight or fruit rot - Prune (Early Italian)

Iain C. MacSwan and Bashir Gashaira
Oregon State University, Corvallis, Oregon

The following treatmtnes (rate per 100 gallons of water) were applied for control of blossom blight (3 bloom sprays) or fruit rot (14 days previous to harvest) - Bayleton 50 WP 1 oz, 2 oz, and 4 oz, Bravo 500 1.5 pt and 2 pt, Zineb 75 WP .75 lb, Ferbam 76 WP . 75 lb, and Baycor 50 WP 1 oz. At harvest time 50 fruit from each replicate were combined in a sample, placed on brown paper on a plywood board, then covered with cheesecloth and clear poly sheeting. A high humidity was maintained by regularly sprinkling the cheesecloth with water. After 7 days number of fruits showing brown rot or other rots was counted and

recorded. Brown rot blossom blight: insufficient disease prevented assessment of fungicides. Brown rot fruit rot: good control was obtained from sprays of Bayleton 50 WP 1 oz, 2 oz, and 4 oz, Bravo 500 1½ pt, and Zineb 75 WP 12 oz. Fair control was obtained from sprays of Bravo 500 2 pt and Ferbam 76 WP 12 oz. Total rot: best control was obtained from sprays of Bayleton 50 WP 1 oz and 2 oz and Ferbam 76 WP 12 oz.

## Leaf Curl - Peach (Elberta)

Iain C. MacSwan
Oregon State University, Corvallis, Oregon

The following sprays were applied on December 10, 1979 and January 7, 1980 (rate per 100 gallons of water). Ziram 76 WP 3 lb, Ferbam 76 WP 2 lb, Bravo 500 1½ pt and 2 pt, Bordeaux 8-8-100, Kocide 101 4 lb and 4 lb + 1 pt oil, Zinc Coposit CC9829 7.3 lb, and Zinc Copocil CC9816 7.3 lb. Two hundred terminal tips per replicate were assessed as diseased or healthy on August 12, 1980. Best control was provided by sprays of Ziram 76 WP 3 lb and Ferbam 76 WP 2 lb. Braco 500 1½ pt and 2 pt provided control equal to that of the standard Bordeaux 8-8-100.

## Brown rot blossom blight and fruit rot - Cherry (Sour - Montmorency)

Iain C. MacSwan and Bashir Gashaira
Oregon State University, Corvallis, Oregon

The following treatments (rate per 100 gallons of water) - bloom, preharvest sprays, or a Botran dip were applied. BAS 436F 50 WP 12 oz (2 bloom sprays and preharvest) followed by Botran dip, Captan 50 WP 2 lb (2 bloom sprays) then BAS 436F 50 WP 12 oz (preharvest) followed by Botran dip, Ronilan 50 WP 12 oz (2 bloom sprays and preharvest), Baycor 50 WP 2 oz (2 bloom sprays), Benlate 50 WP 4 oz (2 bloom sprays), Captan 50 WP 2 lb (2 bloom sprays) then Ronilan 50 WP 12 oz (preharvest), Bravo 500 1½ pt plus Benlate 50 WP 4 oz (2 bloom sprays) then Captan 50 WP 2 lb (preharvest), Quintar 5F 6.4 fl oz (2 bloom sprays), Benlate 50 WP 4 oz (full bloom) then Quintar 5F 3.2 fl oz (oetal fall), Baycor 50 WP 4 oz (2 bloom sprays), Bravo 500 2 pt (2 bloom sprays), and Benlate 50 WP 4 oz (full bloom) then Cyprex 65 WP 8 oz (petal fall). At harvest 100 fruits from each replicate were combined in one sample, placed on brown paper on a plywood board, then covered with cheesecloth and clear poly sheeting. The fruit from two treatments were placed in a mesh sack, dipped in a five gallon solution of Botran 75 WP for one minute, and air dried before being placed on the plywood board. High humidity was maintained by regularly sprinkling the cheesecloth with water. After 7 days numbers of fruits showing brown rot or other rots were counted and recorded. Blossom blight: good control was provided by sprays of all test fungicides. Brwon rot fruit rot: all fungicides provided good control. Total fruit rot: good control was provided by BAS 436F applied at full bloom, petal fall, and preharvest (21 and 14 days), Benlate 50 WP applied at full bloom then Quintar 5F at petal fall, Captan 50 WP applied at full bloom and petal fall plus BAS 436F 50 WP at preharvest (21 and 14 days), Bravo 500/Benlate 50 WP mix applied at full bloom and petal fall then Captan 50 WP at preharvest (14 days) and Bravo 500 applied at full bloom and petal fall.

# Evaluation of experimental fungicides for control of benomyl-resistant Monilinia fructicola.

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

Fay Elberta peach fruit harvested from the Kearney Field Station in Parlier, California were used for the study. Fruit were washed, defuzzed, and rinsed with water using a Decco post-harvest treater. Fungicides were sprayed on the fruit with a De Vilbiss atomizer. Treated and untreated fruit were inoculated with conidial suspension of benomyl-resistant Monilinia fructicola. Disease development data summarized in Table 1.

TABLE 1

Brown Rot Development in Postharvest Treated Fay Elberta Peach Fruit Inoculated with Monilinia Fructicola[a]

| Treatment[b] | Conc/100 gal or ppm | No. diseased fruit/16 | Avg. lesion diam. (mm) |
|---|---|---|---|
| CGA 64251 10W | 6 oz. | 0 w[c] | 0 |
| CGA 64251 10W | 6 oz. | | |
| + | | | |
| Botran 75W | 1 1/3 lb. | 0 w | 0 |
| Prochloraz 50W | 250 ppm | 0 w | 0 |
| Prochloraz 50W | 250 ppm | | |
| + | | | |
| Botran 75W | 1 1/3 lb. | 0 w | 0 |
| Imazalil 69.3% E.C. | 500 ppm | 0 w | 0 |
| Imazalil 69.3% E.C. | 500 ppm | | |
| + | | | |
| Botran 75W | 1 1/3 lb. | 0 w | 0 |
| Ronilan 50W | 8 oz. | 0 w | 0 |
| Ronilan 50W | 8 oz. | | |
| + | | | |
| Botran 75W | 1 1/3 lb. | 0 w | 0 |
| Rovral 50W | 8 oz. | 0 w | 0 |
| Rovral 50W | 8 oz. | | |
| + | | | |
| Botran 75W | 1 1/3 lb. | 0 w | 0 |
| Botran 75W | 1 1/3 lb. | 5 x | 8 |
| Benlate 50W | 8 oz. | | |
| + | | | |
| Botran 75W | 1 1/3 lb. | | |
| Benlate 50W | 8 oz. | 14 z | 33 |
| Check | -- | 16 z | 45 |

a Fruit were inoculated with benomyl-resistant isolate (MF 78-4) by placing a drop of conidial suspension on injury made with 2 mm glass rod. Diseased fruit were counted and lesion diameter measured after 4 days at 20 C. RH 85%.

b A DeVilbiss atomizer 15 with air was used to spray on the fungicides.

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

## Powdery Mildew - Jonathan Apples

N. S. Luepschen, CSU Research Center, Grand Junction, CO 81503

Fungicides were applied to 15-yr-old Jonathan trees in 2 test blocks beginning at early bloom (April 28), early petal fall (May 6) for the speed-sprayer test and late petal fall (May 13) for the hand gun test, and during active leaf expansion and shoot growth (May 21 and June 6) for a total of 4 applications. Foliar mildew was measured in late June by examining 8 terminal shoots/tree. The hand-gun test had 5 tree reps/treatment, the speed-sprayer test had 8 reps. Fruit infections were determined at harvest, as web-like russeting, by taking a 10-fruit sample/tree.

Very good leaf mildew control was obtained by CGA 64251, by Benlate and CGA mixtures, and by Benlate-sulfur mixtures. All treatments substantially controlled fruit russet. There appeared to be some systemic suppression of primary infections but this was not significant when rated critically. Fruit yield and russet control was excellent with Karathane even though foliar mildew control has been poor using 14-day schedule. Speed-sprayer plots did not give as good control as hand-gun plots but were satisfactory for obtaining valid experimental data.

| | Hand-gun applied | | | Speed-Sprayer | |
|---|---|---|---|---|---|
| Treatment rate/100 gals | % Foliar Mildew | % Fruit Russet | Yield lbs/tree | % Foliar Mildew | % Fruit Russet |
| Unsprayed | 73 d | 37 b | 113 c | 66 c | 43 b |
| Benlate 6 oz | 38 b | 6 a | 185 ab | 44 b | 13 a |
| Benlate 2 ozs + oil | 30 ab | 6 a | 125 bc | 44 b | 6 a |
| Karathane 8 ozs | 53 c | 2 a | 187 a | --- | --- |
| Benlate 4 ozs + 2 pts flowable sulfur | 23 a | 8 a | 126 bc | --- | --- |
| CGA 64251 3.5 ozs | 23 a | 4 a | --- | 30 a | 12 a |
| Benlate 2 ozs + CGA 64251 1.5 ozs | --- | --- | --- | 44 b | 8 a |
| Flowable sulfur 2.5 pts | 29 ab | 4 a | --- | --- | --- |

Values in the data columns followed by the same letters are not significantly different. 5% DMRT.

## Apple Insect Pests and Natural Enemy Immigration Rates

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Four portable orchards composed of 22-3 year old apple trees (Malus pumila var. golden delicious) were established in different habitats; 1) commercial orchard (approximately 10 m from the nearest apple tree), 2) abandoned orchard (approximately 10 m from the nearest apple tree), 3) mowed grass and mixed annual weeds (185 m from the nearest apple tree), and 4) predominantly corn mixed with annual and perrenial weeds (480 m from the nearest apple tree). Orchards were intensively sampled with a 30 minute

visual sample at 14 day intervals from April to October. Species immigration rates and diversity were calculated from observations of species occurrence and density.

## Eastern Filbert Blight - Filberts

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

Eight treatments have been evaluated at a LaCenter, Wash. orchard to determine their effectiveness in controlling Eastern Filbert Blight. Trees of the most susceptible variety (Daviana) were used and the number of new cankers appearing in each tree was recorded. With all but two of the pesticide treatments, previous existing cankers were left in the tree to act as additional inoculum sources. All treatments except the Excised and the Pruning & MBC Injection treatments resulted in a signigicant reduction in the number of new cankers, with the Bordeaux, Baycor, and Bayleton sprays showing the most promise. With better timing of the Thiodan sprays a further reduction in the number of new cankers may be observed.

EASTERN FILBERT BLIGHT PESTICIDE TRIALS[d]

| Treatment | Avg. # of New[a] Cankers/Tree 1979[b] | 1980[c] |
|---|---|---|
| Pruned & Bordeaux | - | 4.56a |
| Bordeaux 12-12-100 | 9.00a | 4.78a |
| Baycor 50WP (8 oz a.i./100) | - | 6.00a |
| Bayleton 50WP (2oz a.i./100) | - | 10.00a |
| Thiodan 50WP (1-lb/100) | 17.57a | 15.78a |
| Kocide 101 (6-lbs/100) | 18.70a | - |
| Pruned & MBC Injection | 28.20ab | - |
| Excised | 34.30ab | |
| Check | 55.30b | 47.11b |

a numbers in vertical column followed by the same letter are not significantly different. P=0.05.
b Seven replicate trees per treatment.
c Nine replicate trees per treatment.
d Sprays were applied with a hand gun according to the following schedule.

| Spray Schedule for 1980 Results: | | | | For 1979 Results: | | |
|---|---|---|---|---|---|---|
| Bordeaux | Baycor | Bayleton | Thiodan | Bordeaux | Thiodan | Kocide |
| 10-10-78 | 4-5-79 | 4-5-79 | Late Feb'78 | 10-21-77 | 4-13-77 | 10-21-77 |
| 03-07-79 | 4-20-79 | 4-20-79 | 3-31-78 | 3-31-78 | 4-27-77 | Late Feb'78 |
| 04-05-79 | | | 5-17-78 | | 5-24-77 | |
| | | | | | 10-21-77 | |

Powdery Mildew and Scab - Golden Delicious and Rome Apples

| Treatment and rate/100 gallons | % leaf scab[1] | | % fruit scab[1] | | % powdery mildew[1] | |
|---|---|---|---|---|---|---|
| | G. Delicious | Rome | G. Delicious | Rome | G. Delicious | Rome |
| Baycor 0599 300EC 6.4 oz | 1 a | 0 a | 1 a | 0 a | 18 abc | 27 cd |
| Baycor 0599 300EC 12.8 oz | 1 a | 0 a | 0 a | 0 a | 12 ab | 8 ab |
| Baycor 0599 50W 4 oz | 2 ab | 0 a | 1 a | 1 a | 30 cde | 22 bcd |
| Baycor 0599 50W 8 oz | 0 a | 0 a | 1 a | 0 a | 25 bcd | 23 bcd |
| Bayleton 50W 1 oz + Cyprex 65W 6 oz | 0 a | 0 a | 1 a | 1 a | 7 a | 8 ab |
| Bayleton 50W 2 oz + Cyprex 65W 6 oz | 0 a | 0 a | 0 a | 0 a | 7 a | 4 a |
| CGA 64251 10W 2.5 oz | 0 a | 0 a | 0 a | 0 a | 14 ab | 3 a |
| Cyprex 65W 12 oz + Karathane 4LC 5 oz | 0 a | 0 a | 0 a | 0 a | 15 ab | 14 abcd |
| THAT flowable sulfur 52% 3 pt | 5 b | 1 ab | 4 a | 2 a | 33 de | 19 abcd |
| THAT flowable sulfur 52% 3 pt + Cyprex 65W 6 oz | 1 a | 1 ab | 2 a | 0 a | 19 abcd | 11 abc |
| Check (Insecticides only) | 17 c | 3 b | 21 b | 8 b | 41 e | 29 d |

1 numbers followed by the same letter within columns are not significantly different at $p=0.05$ according to Duncan's new multiple range test.

## Powdery Mildew and Scab - Golden Delicious and Rome Apples

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

Treatments were applied to randomized single-tree plots (2-4 replications) of mature 'Golden Delicious' and 'Rome Beauty' on MM 106 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 8 (half-inch green), 22 (pink); May 7 (petal fall), and 30 (cover spray). Several insecticides, including Thiodan, Plictran, Imidan, Cygon, and Diazinon were tank mixed with fungicides as needed. Leaf scab and mildew counts were made on the 10 terminal leaves of 10 shoots per tree on July 1 and fruit scab counts on 50 fruits per tree on September 17. Eight primary scab infection periods were recorded during April, May and June.

Under the moderate disease pressure in this test, all fungicides significantly controlled fruit and leaf scab. However, THAT flowable sulfur was less effective for scab control than other fungicides. Significant mildew control was obtained with Baycor EC, Bayleton, CGA 64251, Karathane, and THAT flowable sulfur + Cyprex. Baycor EC appeared more effective than the WP formulation. Mildew control with THAT flowable sulfur at 3 pt/100 gal was not significant. No phytotoxicity was observed with any fungicide tested.

## Brown rot blossom blight and fruit rot - Cherry (Royal Anne)

Iain C. MacSwan and Bashir Gashaira
Oregon State University, Corvallis, Oregon

The following treatments (rate per 100 gallons of water) - bloom, preharvest, or a Botran dip were applied. Baycor 50 WP 2 oz and 4 oz (popcorn and full bloom only), Captan 50 WP 2 lb (popcorn and full bloom only) then BAS 436F 50 WP 12 oz (preharvest) followed by Botran dip, Ronilan 50 WP 12 oz (popcorn, full bloom, and preharvest) followed by Botran dip, BAS 436F 50 WP 12 oz(popforn, full bloom, and preharvest) followed by Botran dip, Benlate 50 WP 4 oz (popcorn and full bloom only), Difolatan 4F 2 pt (popcorn then every four days until petal fall and then every 10 days until 14 days before harvest), and Difolatan 4F 2 pt (popcorn then 4 day intervals then 6 pt per 100 gallons was applied at petal fall). At harvest 100 fruits from each replicate were combined in one sample, placed on brown paper on a plywood board, then covered with cheesecloth and clear poly sheeting. The fruit from four treatments were placed in a mesh sack, dipped in a five gallon solution of Botran 75 WP for one minute, and air dried before being placed on the plywood board. A high humidity was maintained by regularly sprinkling the cheesecloth with water. After 7 days numbers of fruits showing brown rot or other rots were counted and recorded. Blossom blight: good control was provided by sprays of all test fungicides. Brown rot of fruit (field sprays only): all test fungicides provided good control. Total fruit rot (field sprays only): good control was provided by nine sprays of Difolatan 4F 2 pt, BAS 436F 50 WP 12 oz applied at popcorn and full bloom and 21 and 14 days before harvest, Captan 50 WP 2 lb at popcorn and full bloom followed by BAS 436F 50 WP 12 oz at 21 and 14 days before harvest. Fair control was provided by Ronilan 50 WP 12 oz applied at popcorn, full bloom, and 21 and 13 days before harvest and Difolatan 4F 2 pt during bloom then 6 pt at petal fall. Brown rot fruit rot (Botran dip): the relative low incidence of brown rot fruit rot as a result of all fungicide sprays prevented the assessment of rot control by the Botran dip. Total fruit rot (Botran dip): significant reduction of post harvest rots especially Rhizopus and Mucor rots was obtained from the Botran dip.

## Brown rot blossom blight and fruit rot (field and post harvest) - Peach (Improved Elberta)

Iain C. MacSwan and Bashir Gashaira
Oregon State University, Corvallis, Oregon

The following treatments were applied as bloom, preharvest sprays, or a Botran dip. Ronilar 50 WP 12 oz (3 bloom sprays and preharvest) followed by Botran dip, Bayleton 50 WP 1 oz (3 bloom sprays), Benlate 50 WP 4 oz (popcorn only) then Cyprex 65 WP 8 oz (full bloom and petal fall), Captan 50 WP 2 lb (3 bloom sprays) then Ronilan 50 WP 12 oz (preharvest) followed by Botran dip, BAS 436F 50 WP 12 oz (3 bloom sprays and preharvest) followed by Botran dip, Baycor 50 WP 2 oz and 4 oz (3 bloom sprays and preharvest) followed by Botran dip, Baycor 50 WP 2 oz and 4 oz (3 bloom sprays), Bayleton 50 WP 2 oz (3 bloom sprays), Bravo 500 1.5 pt plus Benlate 50 WP 4 oz (3 bloom sprays) then Captan 50 WP 2 lb (preharvest), Captan 50 WP 2 lb (3 bloom sprays) then Captan 50 WP 2 lb (preharvest) followed by Botran dip, Benlate 50 WP 4 oz (popcorn and full bloom only), Captan 50 WP 2 lb (3 bloom sprays), Bravo 500 2 pt (3 bloom sprays) then Captan 50 WP 2 lb (preharvest), and Bayleton

50 WP 4 oz (3 bloom sprays). One hundred blossoms per replicate were rated for disease on May 27. At harvest 70 fruits were picked randomly from each treatment, placed on brown paper on a plywood board, then covered with cheesecloth and clear poly sheeting. The fruit from four treatments were placed in a mesh sack, dipped in a five gallon solution of Botran 75 WP for one minute, and air dried before being placed on the plywood board. High humidity was maintained by regularly sprinkling the cheesecloth with water. After 7 days number of fruit showing brown rot or other rots were counted and recorded. Blossom blight: all treatments provided good control. Brown rot fruit rot and total fruit rot: good control was provided by bloom sprays of Captan followed by preharvest (21 and 14 days) of BAS 436F and bloom and preharvest sprays (21 and 14 days) of Ronilan and BAS 436F. Brown rot fruit rot (Botran dip): excellent control was obtained in all dip treatments. Total fruit rot (Botran dip): reduction of rot due principally to control of Rhizopus sp. and Mucor sp.

## Isolation of Rovral-Resistant Alternaria alternata

W. J. McPhee
Agriculture Canada Research Station, Summerland, B.C.

Strains of Alternaria alternata were readily isolated during plate assays to determine the efficacy of this fungicide against local isolates. These isolates are stable and capable of causing postharvest rots in cherries in postharvest packs.

## Alternaria alternata + Alternaria spp. on cherries

W. J. McPhee
Agriculture Canada Research Station, Summerland, B.C.

Alternaria species have caused postharvest problems in B.C. cherries for a number of years. Alternaria rot was the major cause of postharvest rots in cherries in 1980 and has been identified as an orchard problem on this crop and other stone fruit crops in the Okanagan valley in 1979 and 1980. New government policy in Canada makes it impossible to recommend orchard controls for this disorder.

## Powdery Mildew - Jonathan Apples

N. S. Luepschen
CSU Research Center, Grand Junction, CO 81503

Fungicides were applied to 15-yr-old Jonathan trees in 2 test blocks beginning at early bloom (April 28), early petal fall (May 6) for the speed-sprayer test and late petal fall (May 13) for the hand gun test, and during active leaf expansion and shoot growth (May 21 and June 6) for a total of 4 applications. Foliar mildew was measured in late June by examining 8 terminal shoots/tree.

Very good leaf mildew control was obtained by CGA 64251, by Benlate and CGA mixtures, and by Benlate-sulfur mixtures. All treatments substantially controlled fruit russet. There appeared to be some systemic suppression of primary infections but this was not significant when rated critically. Fruit yield and russet control was excellent with Karathane even though foliar mildew control has been poor using a 14-day schedule. Speed-sprayer plots did not give as good control as hand-gun plots but were satisfactory for obtaining valid experimental data.

## Powdery Mildew -- Apple

Sherman V. Thomson, Utah State University, Logan, UT

Fungicides were applied to 15-year-old Jonathan apple trees in a commercial orchard in Willard, Utah. Fungicides were applied after infection to determine their eradicative ability. Treatments were applied with a Kinkelder concentrate sprayer at the rate of 60 gal/acre at 100 trees/acre. The sprayer was adjusted to 340 gal/hr, 21 pounds pressure, 200 mph air blast and 2.4 mph tracter speed. Approximately 75% of the terminals were infected with mildew at bud break. Four applications were made beginning on May 2 (full bloom), May 21 (petal fall), June 4 and June 18. Applications were discontinued when terminal growth had ceased. A randomized block design was used with paired trees and five replications per treatment. Guthion was applied separately for insect control on May 31, June 24, July 18 and August 5.

The spring growing season had record-breaking amounts of rainfall and unseasonably cool temperatures. Ten terminals were examined from each tree on July 2 and the percentage of infected leaves on each was determined. Terminals were also given a visual severity rating of 1 = healthy to 4 = necrotic leaves. The data were analyzed using a standard analysis of variance and the least significant difference for mean separation.

Mildew incidence was severe at the time of initiation of the trial and infection rate was high. Bayleton at 4 oz gave outstanding control of established powdery mildew infections. CGA 64251 at 5 oz and Benlate at 3 oz were both fairly effective. Benlate at 1.5 oz and Benlate at 3 oz were both fairly effective. Benlate at 1.5 oz combined with oil provided control almost equal to Benlate at 3.0 oz. Karathane at 2-week intervals and with an established mildew infection was not better than the check. Bayleton provided excellent control of mildew on terminal leaves.

| Treatment and rate/100 gallons | Powdery mildew infection | | |
|---|---|---|---|
| | severity rating* | % infected leaves | % infected twigs** |
| Control | 3.2 a*** | 88.9 a | 100 a |
| Bayleton 50W 2.0 oz | 2.4 b | 66.2 b | 94 ab |
| That flowable sulfur 6EC 52% 2.0 qt | 2.3 bc | 62.3 b | 98 a |
| Bayleton 50W 4.0 oz | 2.3 bc | 59.9 b | 98 a |
| CGA 64251 10W 5.0 oz | 2.2 bc | 49.0 bc | 96 a |
| Benlate 50W 6.0 oz | 2.0 bc | 37.7 cd | 100 a |
| CGA 64251 10W 3.5 oz | 1.9 c | 26.1 d | 88 bc |
| Benlate 50W 3.0 oz + summer oil 2 qt | 1.9 c | 23.8 d | 84 c |
| LSD .05 | 0.42 | 19.7 | 7.7 |

*Severity rating: 1 = healthy, 4 = heavy sporulation and severe distortion.
**Any infected leaves on an examined terminal constitutes an infected twig.
***Means within columns followed by the same letter are not significantly different at the 5% level according to Least Significant Difference test.

## Powdery Mildew -- Sour Cherry

Sherman V. Thomson, Utah State University, Logan, UT

Two experimental fungicides were compared to two standard fungicides for control of powdery mildew, the most significant foliar disease of sour cherry in Utah. The test was conducted in Willard, Utah on a commercial block of 4-year-old Montmorency cherries. Treatments were applied as dilute sprays to run-off with a single nozzle handgun at 300 lb/sq inch in a five-replicate randomized block design on the following dates: May 27 (fruit set), June 18, July 15, August 6 and 21. Three trees were treated in each replication. No other pesticides were applied in the orchard. The spring growing season had record breaking amounts of rainfall and unseasonably cool temperatures. The summer weather was hot and dry. The incidence of mildew was very light in this orchard and wasn't evident until August 29. Ten terminals were examined from the center tree of the three treated trees on September 9 and the percentage of infected leaves on each was determined. Terminals were also given a visual severity rating of 1 = healthy to 4 = heavy sporulation and severe distortion.

All fungicides gave good control of powdery mildew although under light infection pressure. Benlate + oil provided the best protection but CGA 64251 at 3.5 oz and 5.0 oz were not much less effective. There was no significant difference between the Benlate + oil applications. Bayleton at 2.0 oz and 4.0 oz and That flowable sulfur were significantly less effective than the Benlate-oil combination but were still satisfactory.

| Treatment and rate/100 gallons[1] | Powdery mildew infection | | | |
|---|---|---|---|---|
| | severity rating[2] | % infected leaves | % infected[3] twigs | % infected[3] terminals |
| Check | 2.58 a[4] | 52.6 a | 95 a | 62 a |
| Karathane 37.4 LC 6.0 oz | 2.46 a | 48.5 a | 94 a | 63 a |
| Benlate 50W 1.5 oz + summer oil 2.0 qt | 2.04 b | 33.0 b | 74 b | 26 b |
| Benlate 50W 3.0 oz | 1.92 bc | 26.7 bc | 72 b | 28 bc |
| CGA 64251 10W 5.0 oz | 1.62 c | 18.1 c | 51 c | 20 bc |
| Bayleton 50W 4.0 oz | 1.21 d | 5.8 d | 17 d | 7 c |
| LSD 0.05 | 0.369 | 11.2 | 17.6 | 19.2 |

[1]Application was at 60 gallons/acre with concentrate sprayer.

[2]Severity rating: 1 = healthy, 4 = necrotic leaves.

[3]Percent infected twigs are those twigs with mildew infections on any leaves of the twig whereas the percent infected terminals are those twigs with terminal leaves infected.

[4]Means within columns followed by the same letter are not significantly different at the 5% level according to Least Significant Difference test.

Western Orchard Pest and Disease Management Conference

MINUTES OF THE 55th ANNUAL MEETING

Imperial Hotel, Portland, Oregon - January 14-16, 1981

The 55th Annual Meeting of the Western Orchard Pest and Disease Management Conference was called to order at 0830, January 14, 1981, by Chairman Don Berry. Introduction of guests and members preceded the announcement of the committee assignments and section leaders.

Don Davis gave what should be a final report on the common name, as well as generic name, of the Western predatory mite, Typhlodromus occidentalis. The common name as stated has been accepted and agreement has been made as to the priority use of Typhlodromus as the proper generic name. Now we can all talk about the same mite again!

Don Berry introduced Dr. Henry J. Korp, Senior Science Advisor - EPA Minor Use Pesticides Coordinator, who spoke on EPA. His talk covered organization - now and in the future, APAR, registration, and the IR-4 program. He also fielded questions put to him by the membership.

The business meeting was adjourned until 0920, January 16, 1981, when it was again called to order by Chairman Don Berry. Minutes of the 1980 meeting were approved as mailed. The treasurer's report was read showing a balance of $195.31. The audit committee found the books in order and the audit was accepted by the membership.

Resolutions Committee Chairman, Bob Lauderdale, read the proposed resolutions as follows:

Be it resolved that:

1. We express our sincere appreciation to the management and staff of the Imperial Hotel for the excellent accommodations and courteous services during the 55th Annual Meeting of the Western Orchard Pest and Disease Management Conference.
2. We express our appreciation to Chairman Don Berry and to all the section chairman for their effective service in organizing and conducting this conference in a successful manner and that we withhold our thanks to Gary Fields to insure that he continues to strive to provide us with his excellent services for another year.
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 and Glenn Fisher for providing and operating the visual aids equipment which is so important to the success of this conference.
5. The secretary be requested to write letters to those members of this conference that have retired in the past year offering our congratulations and expressing our appreciation for their contributions to this conference over the years.

6. The secretary be requested to write letters of condolence to the families of those former members of this conference that have passed away during the past year.

These resolutions were unanimously adopted by the membership in attendance.

A list of proposed officers for next year's conference was presented by Everett Burts, Acting Chairman of the Nominating Committee, as follows:

| | |
|---|---|
| Chairman | - Norman Waters |
| Chairman Elect | - Johanne Joos |
| Secretary/Treasurer | - Gary Fields |

Nominations were opened to the floor and were promptly closed! A motion to elect by unanimous ballot was approved again railroading the officers into office.

A report was given by Bill McPhee, Disease Section leader, with a request that all section leaders be informed of and attend joint sessions or special programs to promote inter-conference communication between sections.

Historian Harry O'Reilly spoke to the future as an "is-er", not a "was-er" and predicted good times ahead for WOPDMC, the United States, and Canada.

Chicken-of-the-Year Award Chairman, Everett Burts, presented the award to himself in-perpetua to prevent "the thing from every again rearing its ugly head." A voice from the floor was heard to express the need for a Turkey-of-the-Year Award - so who knows?

A special awards committee awarded Bob Zwick a Thrifty Award for his alertness and perseverance in finding the cheapest restaurants in all of Portland, The award was a book on the cheapest restaurants in all of Portland.

A motion was approved to add the title "Pesticide Development" to Section IV, the Concentrate Spraying, Residues, and Phytotoxicity Section. The addition of this title will provide the Research and Development representatives of the Ag Chemistry industry a forum to present data that might not otherwise fit well in the other sections. All companies will be informed of this addition.

The Imperial Hotel owner granted free use of the meeting rooms for the next two years. After this time, the conference may be required to rent the meeting rooms.

A suggestion was brought to the chair as adjournment was declared to have a glossary of chemical names added at the end of the abstracts to include trade, common generic, or other names for all chemicals reported on in abstracts submitted for 1982. Instructions to that effect will be included in the meeting notice mailed this fall.

The gavel (pointer) was turned over to Chairman Elect Norm Waters who assumed command and read the committee and section discussion leader assignments as follows:

A. Section Leaders - 1982

1. Lepidopterous Pests - Fred Banham
2. Orchard Mites - Dick Rice
3. Other Orchard Pests - Jack Eves
4. Concentrate Spraying, Residues, Phytotoxicity, and Pesticide Development - Dan Mayer
5. Decidious Orchard Diseases - Robert Spotts

B. Resolutions Committee

1. Dick Penrose
2. Frank Howell
3. Don Joy

C. Auditing Committee

1. Glenn Fisher
2. Bill Batiste
3. Sue Haley

D. Nominating Committee

1. Don Davis
2. Helmut Riedl
3. Kurt Volker

E. Chicken (or Turkey) Committee

1. Jack Dibble
2. Bob Fye
3. Jack Warren

With business completed, the meeting was adjourned at 1005, January 16, 1981.

Respectfully submitted,

Gary J. Fields
Secretary/Treasurer