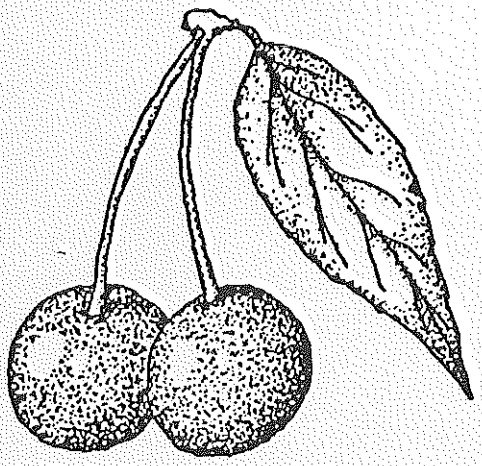
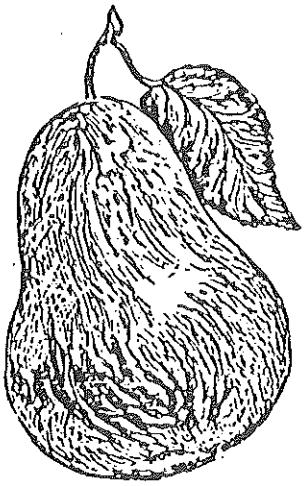
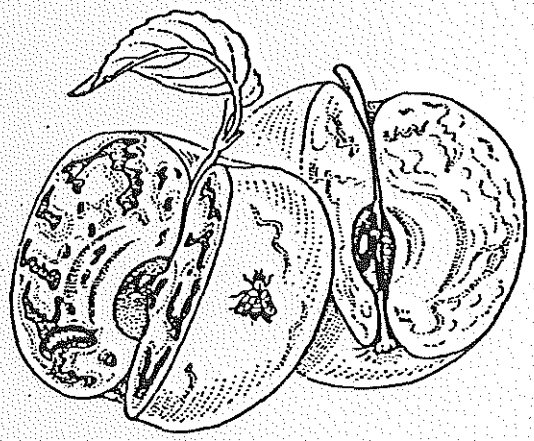
CRAIG COLLINS





ABSTRACTS OF REPORTS FROM THE 59TH ANNUAL WESTERN ORCHARD PEST AND DISEASE MANAGEMENT CONFERENCE

Imperial Hotel, Portland, Oregon
January 16,17,18, 1985



These abstracts of progress reports on research conducted on the principle 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 by the conference. Official recommendations can only be made by public service entomologists and plant pathologists from their respective areas.

OREGON STATE UNIVERSITY EXTENSION SERVICE

Agriculture, Home Economics, 4-H Youth, Forestry, Community Development, Energy, and Marine Advisory Programs. Oregon State University, United State Department of Agriculture, and Oregon Counties cooperating

ABSTRACTS OF REPORTS FROM THE 59TH ANNUAL
WESTERN ORCHARD PEST AND DISEASE MANAGEMENT CONFERENCE

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S E C T I O N I

DECIDUOUS ORCHARD DISEASES

Section Leader -- Doug Gubler

I. Deciduous Orchard Diseases

BROWN ROT BLOSSOM ROT and FRUIT ROT

CHERRY - CORUM

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Best control of brown rot blossom blight was provided by RO 15-1297 4 E 2.67 fl. oz and Benlate 50 WP 4 oz. Fair control was provided by A815 50 AP 5 oz, DPX-H6573 40 EC 1.67 fl. oz and Trimidal .75 EC 3.75 fl. oz at popcorn and full bloom, then 6 fl. oz at petal fall. Poor control was found in plots sprayed with Prochloraz 50 WP 8 oz and Rubigan A EC 2.75 fl. oz. Good control of brown rot fruit rot was provided by Prochloraz 50 WP 8 oz and A815 50 WP 5 oz.

All fungicides were applied at late popcorn, late full bloom and petal fall in the equivalent of 100 gals water.

BROWN ROT BLOSSOM BLIGHT, FRUIT ROT - ROYAL ANNE CHERRY

IAIN C. MACSWAN
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Sprays at popcorn, full bloom and petal fall of the following fungicides, in the equivalent of 100 gals water provided good control of blossom blight but insignificant control of fruit rot: RO 15-1297 4 E 2.67 fl. oz, Trimidal .75 EC 3.75 fl. oz (popcorn & full bloom) then 6 fl. oz at petal fall, Benlate 50 WP 4 oz, A 815 50 WP 5 oz, Prochloraz 50 WP 8 oz, DPX-H6473 40 EC 1.67 fl. oz and Rubigan 1 EC 2.75 fl oz.

I. Deciduous Orchard Diseases

BROWN ROT BLOSSOM BLIGHT - CHERRY - SOUR

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Sprays of the following fungicides in the equivalent of 100 gal/water at popcorn, full bloom and petal fall provided good control of brown rot blossom blight: A 815 50 WP 5 oz, Rovral 50 WP 6 oz, Benlate 50 WP 4 oz, (popcorn & full bloom only), RO 15-1297 4 E 1.67 fl. oz, Bravo 500 2 pt, Rubigan A EC 2.25 fl. oz and 3.75 fl. oz, Prochloras 50 WP 4 oz and 8 oz, DPX-H6573 40 EC 1.67 fl. oz, Trimidal .75 EC 1.875 fl. oz and 3.75 fl. oz and DPX-H6573 .83 oz and 3.33 oz.

BROWN ROT BLOSSOM BLIGHT, FRUIT ROT - ROYAL ANNE CHERRY

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Post-harvest sprays of the following fungicides in the equivalent of 100 gal. water provided good control of brown rot fruit rot. Fungaflor 50 EC 378 and 756 ml and Benlate 50 WP 4 oz. After spraying, the fruit was allowed to dry, laid on brown paper on plywood, then covered with cheesecloth and polysheeting to keep fruit moist. Disease assessment was made after seven days.

I. Deciduous Orchard Diseases

BROWN ROT BLOSSOM BLIGHT & FRUIT ROT

CHERRY - BLACK REPUBLICAN

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To test a once-only bloom spray applied at full bloom only, the following fungicides did not provide acceptable control of blossom blight: Funginex 18.2 EC 16 fl oz, Baycor 50 WP 4 oz, Bayleton 50 WP 4 oz, Rubigan 1 EC 3.75 fl. oz, Benlate 50 WP 4 oz and Aliette 80 WP 1.5 lb.

Three of the fungicides, however, provided good control of fruit rot: Baycor 50 WP 4 oz, Benlate 50 WP 4 oz and Funginex 18.2 EC 16 fl. oz.

1. Deciduous Orchard Diseases

BROWN ROT BLOSSOM BLIGHT

PEACH - ELBERTA #2

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Under the conditions of the test almost continuous and heavy rainfall and high humidity, 17 fungicide treatments did not provide significant control of blossom blight. Sprays were applied at popcorn (Mar 15), full bloom (Mar 22), and petal full (Mar 27), except the Benlate and Benlate Plus Superior oil sprays which were applied at popcorn only and the funginex sprays applied at popcorn and full bloom only. Other fungicides tested were Bravo 500 18 fl oz and 24 fl oz and BPX-H6573 at .83 fl oz, 1.67 fl oz, and 3133 fl oz. Sprays were applied in the equivalent of 100 gal/water.

BROWN ROT BLOSSOM BLIGHT

ELBERTA PEACH #3

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Under the conditions of the test - almost continuous and heavy rainfall and high humidity 11 fungicide treatments did not provide significant control of brown rot blossom blight. Sprays were applied by handgun at popcorn (Mar 15), full bloom (Mar 22), and petal fall (Mar 27), except Prochloraz 4 oz and 8 oz which was not applied at popcorn and Benlate 4 oz applied at popcorn only followed by Funginex 9 oz at full bloom. Other fungicides tested were Rovral 50 WP 6 oz, RH 3866 40 WP at 1.25 oz, 2.5 oz, and 5 oz, RO 15-1297 4E 2.67 fl. oz, UBI A815 50 WP 5oz and Trimidal 75 EC 1.875 fl oz and 3.75 fl oz. Sprays were applied in the equivalent of 100 gal/water.

I. Deciduous Orchard Pests

Efficacy of Postharvest Imazalil Treatment in Reducing Brown Rot (*Monilinia fructicola*).

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Department of Plant Pathology
University of California, Davis

A sterol inhibitor fungicide, imazalil is registered on citrus for postharvest decay control. Peach, nectarine, and plum fruit were treated postharvest with imazalil in wax to determine efficacy. Results are compiled in Table 1.

Table 1

Efficacy of Postharvest Fungicide Treatments in Reducing Brown Rot (*Monilinia fructicola*) of Stone Fruit.

TREATMENT[a]	CONC (ppm)	% Brown Rot		
		Peach	Nectarine	Plum
IMAZALIL	1200	1.6 x[b]	41.3 ns	8.4 y
IMAZALIL	600	7.9 x	56.0 ns	7.5 y
IMAZALIL	300	23.8 y	65.3 ns	8.4 y
BENLATE 50W BOTRAN 75W	300 900	33.3 y	72.0 ns	---
BENLATE 50W BOTRAN 75W	600 1800	----	----	2.7 y
CHECK	---	79.4 z	89.3 ns	21.0 z

[a] Postharvest treatment applied with Decco peach treater. All fungicides applied in wax.

[b] Numbers in vertical column followed by the same letter(s) are not significantly different, P = 0.05. ns = not significant.

I. Deciduous Orchard Diseases

Cytospora or Cytospora-like Canker-Peach, Apricot, Cherry

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Oliver, B.C. V0H 1T0

Cytospora canker has been recognized in Okanagan orchards for many years but was never considered a significant problem. A survey of local orchards in the south Okanagan valley in 1984 indicated that Cytospora or Cytospora-like canker is causing serious loss of limbs in Okanagan peach orchards and is present, although to a lesser extent, in Okanagan apricot and cherry orchards. Removal of infected limbs and cleaning of cankers is recommended. It is recommended that all infected bark and limbs removed should be burned and cleaned wounds should be treated with ziram or captan in boiled linseed oil.

CORYNEUM

ELBERTA PEACH

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EXTENSION PLANT PATHOLOGIST
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Corvallis, OR 97331

Sprays were applied at approximately 400 gal water per acre (one treatment was applied in 200 gal water per acre) by hydraulic handgun sprayer to single-tree plots replicated four times. Sprays were applied in several sequences in the fall, winter, and for the bloom period. The full spray was applied October 24, the winter sprays on Dec 15 and Jan 15 and the bloom and following sprays at popcorn (Mar 15), full bloom (Mar 22), petal fall (Mar 27), and shuck split (April 25).

Significant control of Coryneum blight of fruit was provided by Bravo 500 6 pt/400 gal/acre applied October, shuck split and 10 days later Bravo 500 6 pt/400 gal/acre applied in October popcorn, full bloom, petal fall, 10 days later, and 10 days later.

I. Deciduous Orchard Diseases

Mycoplasma Disorders Cherry, Apricot, Apple

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Okanagan Similkameen
Cooperative Growers Association
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Oliver, B.C. V0H 1T0

Several stone fruit disorders which were previously unidentified or identified as virus infections have tested positive for mycoplasma by the Dienes staining technique and the Dapi fluorescence technique. The symptoms are variable with at least 3 different symptoms on cherries and one each on apricot, nectarine and apple.

The apricot disorder has fruit symptoms resembling the symptoms of apricot ring pox virus ARPV) and has apparently been misdiagnosed as ARPV for several years in our area.

Some of the infected trees have been treated with tetracyline·HCl but results of these tests will not be available until the summer of 1985.

These disorders appear to spread within the orchards in a pattern indicative of an inefficient insect vector and there is also evidence that the disorder is being spread from orchard to orchard by the exchange of bud wood.

PEACH LEAF CURL

PEACH - ELBERTA

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Oregon State University
Corvallis, OR 97331

Sprays were applied at approximately 400 gal per acre (one treatment was applied in 200 gal/acre) by hydraulic handgun sprayer to single tree plots replicated four times of mature trees. Sprays were applied Dec 5 and Jan 5, 1984. Some plots had received an Oct 24 spray for control of Coryneaum blight. Disease assessment was made on May 23 on 200 leaves per treatment.

Significant control of leaf curl was provided by Ziram 76 WP 3 lb/100 applied in Oct, Dec, and Jan, and Ziram 76 WP 3 lb/100 applied in Dec and Jan. Other fungicides were Bravo 500 6 pt/400 gal per acre applied in Oct, Dec, Jan. Bravo 500 4.5 pt/400 gal per acre applied Oct, Dec, Jan, Bravo 500 3 pt/200 gal per acre applied Oct, Dec, Jan, Bravo 4.5 pt/400 gal per acre applied Oct, Dec, Jan, Bravo 500 4.5 pt/400 gal/acre applied Oct, Dec, Jan, Bravo 500 6 pt/400 gal per acre applied Dec and Jan, DPX-H6573 45 EC 31.5 ml and 63 ml per 100 gal water applied Dec and Jan.

1. Deciduous Orchard Diseases

POWDERY MILDEW - JONATHAN APPLE

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Corvallis, OR 97331

Acceptable control of powdery mildew equal to that of the standard Bayleton 50 WP was provided by RH3866 40 WP, KWG 0519 25 DF 4 oz/100 and Rubigan 1EC.

Above fungicide plots and those of RH 3866 40 WP 1.5 oz/100, and KWG 0519 25 DF 1 oz and 2 oz/100 had very low incidence of scab compared to check plot. It is not common to have enough scab present on Jonathan fruit to assess efficiency of fungicides applied primarily for control of powdery mildew.

All fungicides reduced fruit russet.

Sprays were applied at prepink, pink, calyx and 1st and 2nd covers.

POWDERY MILDEW,SCAB - JONATHAN APPLE

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Oregon State University
Corvallis, Oregon 97331

Acceptable control of mildew equal to that of the standard Bayleton 50 WP was provided by RH3866 40WP, KWG 0519 25DF 4 oz/100 and Rubigan 1EC.

Under the infection period pressure of the above-average wet weather in the spring all fungicides provided good control of scab. It is not common to have enough scab present on Jonathan fruit to assess efficacy of fungicides applied primarily for control of powdery mildew.

All fungicides reduced fruit russet.

I. Deciduous Orchard Diseases

Powdery Mildew - Apple

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Trees were sprayed by handgun to runoff Apr 2, Apr 9, Apr 16 (pink), May 7 (petal fall) and May 22. Treatments were applied to five single-tree replicates in a randomized block design Terminal mildew was evaluated May 18 and Jun 1. Ratings for terminal mildew were determined by multiplying percent mildew-infected terminals by a severity factor based on a scale of 0.1 to 1.0. Mildew russet was determined on 100 fruit per tree at harvest. Data on terminal mildew and fruit russet data were subjected to analysis of variance and means were separated by Duncan's Multiple Range Test.

Cold winter weather reduced the level of carry-over mildew. All fungicides reduced both the amount of terminal mildew and mildew russeted fruit. A 815, DPX H6573 at the higher rates, as well as RH 3866 and Ro 15-1297 gave significantly better control of terminal mildew than the Karathane standard treatment. Lack of separation between fungicide treatments for mildew russet control was probably due to the lack of inoculum during the blossom period. The combination of Ro 15-1297 + X77 produced some spray type russet. This may be reflected in a higher mildew russet recorded for this combination.

Treatment and rate per 100 gal	Date of evaluation and disease rating May 18*	Jun 1*	% mildew russet
Check	48.0	63.3 a	14.2 a
Karathane 18.25 WP 12.00 oz + B 1956 6.00 oz	11.0	13.2 b	1.6 c
Ortho XE 779 25 WP 4.00 oz	5.3	7.3 bc	2.8 c
DPX H6573 40 WP 0.31 oz	8.5	6.1 bc	1.2 c
UniRoyal A 815 50 WP 3.00 oz	3.7	3.7 bc	1.6 c
DPX H6573 40 WP 0.62 oz	3.8	3.5 bc	2.0 c
UniRoyal A 815 50 WP 2.00 oz	4.8	3.3 bc	1.8 c
UniRoyal A 815 50 WP 4.00 oz	3.2	3.1 c	0.6 c
DPX H6573 40 WP 1.24 oz	1.9	1.8 c	2.0 c
RH 3866 40 WP 3.75 oz	0.7	1.1 c	0.8 c
RH 3866 2 EC 8.00 oz	0.2	0.6 c	1.2 c
Maag Ro 15-1297 4.00 oz + X77 8.00 oz	0.2	0.5 c	3.4 c
RH 3866 40 WP 8.00 oz	0.2	0.2 c	0.4 c
Maag Ro 15-1297 4EC 2.00 oz + X77 8.00 oz	0.1	0.2 c	7.0 b

Numbers followed by the same letter are not significantly different (P=0.01).

* Percent infected terminals X severity index factor.

I. Deciduous Orchard Diseases

SCAB - RED DELICIOUS

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Best control of scab was produced by Bravo 500 ½ gal/100 at ¼ inch green followed by six sprays of D557654 and by Cyprex 65 WP 12 oz/100 applied at prepink, pink, calyx and 1st cover. Fruit russet in the Bravo 500-D557654 plots was severe. Three rates of BAS06F and one rate of Baycor 50 WP applied on same schedule as Cyprex 65 WP gave inadequate scab control.

SCAB, POWDERY MILDEW - ROME I

IAIN C. MACSWAN
EXTENSION PLANT PATHOLOGIST
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Corvallis, OR 97331

Good control of scab was provided by RH 3866 40 WP plus Dithane M 45, DPX-H6573 40 EC 1.25 oz and 2.5 oz/100 gal and Cyprex 65 WP. Fair control of scab was provided by RH 3866 40 WP 2.5 oz. plus Bayleton 50 WP 2 oz, Funginex 18.2 EC 6 oz applied at prepink, pink, calyx, followed by Cyprex 65 WP 12 oz applied in two cover sprays and Funginex 18.2 EC 10 applied at prepink, pink, calyx, followed by Cyprex 65 WP 12 oz in two cover sprays.

All treatments provided good control of powdery mildew. All fungicides reduced fruit russet.

Basic spray schedule was prepink, pink, calyx, 1st and 2nd covers.

1. Deciduous Orchard Diseases

SCAB

ANJOU PEAR

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EXTENSION PLANT PATHOLOGIST
Oregon State University
Corvallis, OR 97331

Best control of scab was provided by Cyprex 65 WP 12 oz/100 and RO 15-1297 4E 125 ml/100 gal. Poor control was provided by sprays of Baycor 50 WP 2 oz and 4 oz, Funginex 18.2 EC at 6 oz and 10 oz in the early sprays followed by Cyprex 65 WP 12 oz in 1st and 2nd covers, Vangard 10 WP 2.5 oz. Check trees had 100% fruit infection. Sprays were applied at pink, full bloom, calyx and 1st and 2nd covers. Persistent and heavy rain prevented the application of a prepink spray and delayed the calyx spray.

SCAB

BARTLETT PEAR

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Corvallis, OR 97331

Best control of scab was provided by Cyprex 65 WP 12 oz/100, Funginex 18 2EC 6oz and 10 oz applied at prepink, pink, calyx followed by Cyprex 65 WP 12 oz at 1st and 2nd covers, Baycor 50 WP 2 oz and RO15-1297 4E 127 ml. Baycor 50 WP 4 oz provided fair control. All fungicides were applied in the equivalent of 100 gal. water spray schedule - prepink, pink, calyx, 1st and 2nd covers.

I. Deciduous Orchard Diseases

Scab - Pear (Bartlett)

David Sugar
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Southern Oregon Experiment Station

Four Bartlett pear trees as single-tree replicates in a random block design were sprayed with solutions of registered and experimental fungicides. Trees were sprayed by handgun to runoff, on March 28 (pink) and April 23 (petal-fall). Four trees were left unsprayed as a check. Fruit scab was evaluated on 50 fruit per tree on June 11. Prolonged wet weather between fungicide applications keyed to bloom stage provided a long infection period. Under these conditions, protectant fungicides gave better control than most eradicant fungicides tested. Untreated trees had an average 45% fruit scab. The least scab occurred on trees treated with Cyprex 65W, Bravo 500, and Rubigan 1E.

S E C T I O N II

ORCHARD MITES

Section Leader -- Sid Sakamoto

II. Orchard Mites

Clofentezine (Apollo) - A New Acaricide

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Pendleton, Oregon 97801

Clofentezine, or NC 21314 (trade named Apollo) is a new acaricide of novel structure which has shown good control of mites on tree crops and vines.

Apollo is primarily an ovicide but also has shown some activity on larvae and protonymphs. Also it appears to have little effect on the predator mite Typhlodromus occidentalis.

Rates of application range from 2.0 to 4.0 oz Ai/acre.

European Red Mite (Panonychus ulmi Koch)

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Chemical Combination Trials for Control of European Red Mite (Panonychus ulmi Koch) On Apples

M. Mochizuki, J.L. Joos

Combinations of four miticides were tested for control of European Red Mite (Panonychus ulmi Koch) on Rome Beauty apples. These miticides: Cyhexatin (Plictran), Fenbutatin-oxide (Vendex), Formetanate (Carzol), and an experimental ovicide NC-21314, were applied by handgun sprayer on four single tree replications in a random complete block design.

Results showed the NC-21314 and Formetanate combination gave the best control, and adequate control was obtained with the Cyhexatin and Formetanate combination as well as the Fenbutatin-oxide and Formetanate combination.

II. Orchard Mites

Twospotted and European Red Mites - Almond

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Various rates of Omite, Plictran and Vendex were applied to Thompson or Mission almonds. All test trees were treated with Carbaryl 12 days prior to acaracide applications to kill mite predators.

All rates of Omite tested brought about an immediate reduction in the twospotted mite population. Although no statistical differences were noted, counts were generally higher in the .3 lb. AI/A Omite, than the other treatments 21 days following application.

Plictran provided an immediate knockdown of the mite populations for two weeks, but by day 21, counts had begun to increase in the two lowest rates. Predators provided control as mite populations increased.

Vendex, at all rates, was effective on twospotted mites with only the 1/16th lb. AI/A rate showing any sign of population resurgence. Predators started moving back into all rates where prey existed by 21 days after treatment.

All treatment provided an immediate reduction in European Red Mite numbers. However, by 21 days following treatment, only the highest rates of Omite and Plictran were significantly better than the check. The 1/16th lb. rate of Vendex was significantly better than the check for 28 days. Higher rates of Vendex controlled mites during the duration of the experiment.

II. Orchard Mites

Twospotted Spider Mites - Strawberry

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Near Watsonville, California, twospotted spider mites (Tetranychus urticae Koch) on new strawberry plantings were surveyed to detect the influence of immigrants from nursery plants or surrounding vegetation on resistance development to cyhexatin and formetanate. Susceptible mites (cyhexatin LC_{50}=).0039% a.i.; formetanate LC_{50}=0.0018% a.i.) from nurseries initially colonized new strawberry fields, having survived in diapause in cold storage (average 0.068 mites/plant) and on plants thereafter transplanted (average 0.0051 mites/plant) in fields. Often these mites were subsequently outnumbered by resistant mites (average cyhexatin LC_{50}=0.064% a.i.; average formetanate LC_{50}=0.086% a.i.) immigrating from surrounding vegetation, while occasionally, susceptible mites predominated until acaricides were applied. At three field sites resistance was influenced by immigration of resistant mites from surrounding vegetation which resulted in moderate resistance levels to cyhexatin and formetanate by mid-March. At one isolated site without significant immigration of resistant mites, LC_{50}'s of only 0.0035 and 0.0074% a.i. occurred for cyhexatin and formetanate, respectively by the same time period. Alternative crop production practices to improve management of immigrant T. urticae and subsequent acaricide resistance in this species are discussed.

II. Orchard Mites

Two-spotted Spider Mite
Tetranychus urticae koch

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Reversion of Plictan resistance in the two-spotted spider mite under relaxed selection:

Plictran (cyhexatin) is a relatively selective acaracide used in integrated pest management of spider mites since the early 1970's on a wide variety of crops. In the western United States cyhexatin resistance was first documented on California strawberries in the late 1970's and on Oregon pear in the early 1980's. We have studied rates of reversion or increase in resistance of cyhexatin by *T. urticae* in the laboratory and from Oregon Pear orchards maintained under conditions of: 1) no cyhexatin use, 2) continued cyhexatin selection, 3) selection with reduced rates of cyhexatin combined with a mixture of formetanate and, 4) use of an alternate chemical, Avermectin. Results indicate that a resistant strain of *T. urticae* held under isolation to prevent gene flow in the laboratory for approximately two years (48 generations) showed a 16 fold decrease in its LC50 values when assayed every four months using a leaf disc technique. The LC50 decreased from twice the field rate to 1/7 of the field rate over the two year period. In field experiments plots treated with three applications of Plictran and Plictran plus Carzol showed a twenty fold and thirty-six fold increase in their respective LC50's for cyhexatin over one growing season; whereas, a similar plot treated with Avermectin showed a two fold decrease in its LC50 for cyhexatin over the same period.

S E C T I O N III

OTHER INSECT PESTS

Section Leader -- Glenn Fisher

III. Other Insect Pests

General Insect Control - Commercial Apples

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Lorsban 50W was evaluated against standard treatments for control of various apple insects in over 78 commercial apple orchard blocks during the 1983 and 1984 seasons. A total of 3,125 acres was treated with Lorsban 50W in block sizes ranging from 1 to 400 acres with an average size of about 60 acres. Among these, 62 blocks accounting for over 2,250 acres and averaging about 65 acres had sufficient insect infestations to monitor control. Numbers and timings of Lorsban 50W treatments varied among blocks: from single cover sprays within normal 3-4 cover spray programs to three full-season sprays in place of standard programs. Adjacent to all Lorsban 50W blocks were blocks of equal or greater size which received standard program treatments. Standard treatment programs varied depending on pest infestations, orchard history, and individual fieldmen. Evaluations of insect control were made by post-treatment visual inspection comparing observations in both Lorsban 50W-treated and standard blocks. Lorsban 50W provided good to excellent control of lygus, cutworms, woolly apple aphids, and apple pandemis under commercial pressures. Codling moth control ranged from fair to excellent. An evaluation of "fair" normally required retreatment at about 14 days. Scale control ranged from poor to excellent. Poor control was nearly always associated with orchards receiving poor spray coverage or not having delayed-dormant treatments. Rosy apple aphid control was fair to good in the limited number of evaluations obtained. Control of white apple leafhoppers and apple aphids was inconsistant. White apple leafhopper control improved substantially with early sprays at about 2 weeks post-bloom before fourth instars were present. Apple aphid control improved substantially with the addition of reduced amounts of Systox 6EC or Thiodan 50W to Lorsban 50W sprays. Lorsban 50W performed as well as or better than standard treatments in nearly all comparisons. No adverse affects on predator populations or IPM programs were noted.

III. Other Insect Pests

Ambrosia Beetle - Apples

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The emergence of ambrosia beetles (Xyleborus dispar) was monitered during the 1983 and 1984 springs. The emergence period during 1984 lasted much longer than previously anticipated, extending from the end of March through the first week of June. Flights generally occurred during warm, calm days vs. windy and either warm or cool days.

A 50:50 ethanol and water mixture was far superior to a 50:50 mixture of molasses and water plus yeast in attracting the beetles. The attractants were placed in open glass funnels and suspended from limbs inside tree canopies.

Normally, these mycophagous beetles enter sick and dying trees which exhibit a sour-sap condition. They have been observed boring into healthy limbs surrounding the bait pots but failed to establish. The resulting tunnels were very shallow empty holes about 1/8"-1/4" inch deep. The beetles and the symbiotic fungus associated with them did not become established in these healthy trees suggesting that they are a secondary pest which enter trees that were already stressed.

III. Other Insect Pests

Apple Aphid - Apples

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A simulated commercial, full-season cover spray program of Lorsban 50W was evaluated against standard treatments for the control of various insect pests in apples. Four cover sprays were applied according to codling moth timing: 5/18, 6/10, 7/29, and 8/20. Treatments were made to four, 2-tree replicates at an equivalent rate of 400 gal spray volume per acre. Aphid control was evaluated following the 2nd and 3rd cover sprays by counting the number of aphids per 50 leaves per treatment replicate at 7 and 14 days post-treatment. Lorsban 50W (1.5 lbs a.i./A) was evaluated against a tank mix of Guthion 50W (1.0 lb a.i./A) and Systox 6EC (0.3lb a.i./A). Parathion 25W (1.5 lb a.i./A) was included in the standard 2nd cover spray for scale control. Lorsban 50W provided 75.2% and 80.9% control following the 2nd and 3rd cover sprays, respectively, compared to 91.3% and 91.9% for the standard 2nd and 3rd cover treatments, respectively. Overall, Lorsban 50W provided 79.0% control with a total of 670 aphids per 50 leaves compared to 91.7% control with 265 aphids per 50 leaves for the standard treatment. These results suggest that Lorsban 50W alone can provide suppression of moderate apple aphid populations. The standard tank mix of Guthion 50W plus Systox 6EC provided better control under these conditions tested.

Seasonal Development of the Apple Maggot in Oregon

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Adult emergence, oviposition and larval development of the apple maggot, Rhagoletis Pomonella was studied at three different sites in Oregon. The first fly was caught near Portland on July 19, 1984. Peak egg deposit occured during the middle of August. Adult flies from hawthorn fruit emerged about two weeks after the first flies were trapped in apple trees.

III. Other Insect Pests

APPLE MAGGOT

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1. Seasonal Activity of Adult Flies

This is a subject we have discussed several times in previous years but because we get many questions on when to begin and end adult trapping programs, we will share our trap catch data from southwest Washington during 1982, 83, 84. Generally adult activity begins around July 1 and extends into mid/late October. Trap catch peaks on apple about two weeks earlier than on hawthorn. We feel maintaining fresh traps throughout September and October is very important to accurately be able to assess apple maggot population levels, especially in areas where hawthorns are important hosts.

2. Fruit Hardness as it Relates to Larval Infestation

Research in 1984 yielded a great deal of new information on this subject; unfortunately none of it is particularly good news for fruit growers. Our data show that female R. pomonella will readily oviposit in very hard, young fruit (> 27 lbs. pressure) under natural field conditions. Larvae from these eggs also completed development in these fruit with only a slightly higher mortality than those deposited in softer fruit. These findings end the hope that non-commercial growers may have been able to delay applying insecticides until fruit had reached a certain susceptible level of hardness.

3. Rearing of Rhagoletis Larvae From Various Host Fruit in Southwestern Washington

During the course of this three-year apple maggot research program we have reared more than 37,000 Rhagoletis larvae from 13 different host plants. Because tree removal programs are interested in which plants represent a worthwhile investment of effort, we will share our data from 1982, 83 and 84 and make recommendations on where we feel the bulk of the host removal effort should be.

III. Other Insect Pests

Rhagoletis pomonella (Walsh)
(Apple Maggot)

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Containment of apple maggot from commercial orchards or eradication from California (which is a threat to a $350,000,000-$500,000,000 industry) is possible. After working on this pest problem in California and Brookings, Oregon during the 1983-1984 season, I feel that eradication is feasible. An extensive survey by my staff and myself shows, with little reservation, that the apple maggot is not widespread and presently limited in its range. This then makes eradication feasible.

In 1984 research solutions to some of the most important problems that would lead to possible eradication or containment of apple maggot from California apples, cherries, plums, prunes, and pears was accomplished. This included:

1. Wild and Feral Host Preference - Present study in Del Norte, Humboldt, Siskiyou, Mendocino Counties, Oregon and Washington.
2. Aerial Survey - 3,000 - 4,000 2¼" color aerial photographs evaluated for location of apple trees in bloom. Infrared photograph information is also included in this research.
3. Commercial Fruit Host Preference - Current evaluation in California Utah, Oregon, and Washington.
4. Field Biology and Dispersal - 1984 study in Brookings, Oregon and Smith River California.
5. Integration of Chemical Control into Existing IPM Systems - A successful bait spray used on apple maggot in Del Norte County (Infested area).
6. Trap Research - Intensive replicated trap trials were done on red, black, yellow and white croquet spheres and plastic balls; DBJ trap (black and white); Helmut Riedl rectangle trap, plastic ribbon on red, black, yellow, and white croquet spheres and plastic balls; toilet ball (black) trap with and without plastic ribbon. Lures on all designs included: ammonium acetate blends, ammonium carbonate, and Dr. Reissig's volatile extract. The Zoecon AM trap was used as a standard in all trials. The black croquet sphere showed 9-12 times better results as compared to other trap systems The research was done in infested areas of Brookings, Oregon and Del Norte County, California.

III. Other Insect Pests

San Jose Scale Crawler - Apples

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A simulated commercial, full-season cover spray program of Lorsban 50W was evaluated against standard treatments for the control of various insect pests in apples. Four cover sprays were applied according to codling moth timing: 5/18, 6/10, 7/29, and 8/20. Treatments were made to four, 2-tree replicates at an equivalent rate of 400 gal spray volume per acre. All trees received a delayed-dormant treatment on 3/29. Lorsban 50W blocks were treated with Lorsban 4E plus oil and standard blocks were treated with Supracide 2E plus oil. Scale control was evaluated at mid-season (6/18) by counting numbers of live scale per 20 shoots per treatment, and at harvest (9/27) by determining percent infested fruit from 400 fruits sampled per treatment. Lorsban 50W (1.5 lbs a.i./A) was evaluated against a tank mix of Guthion 50W (1.0 lb a.i./A) and Parathion 25W (1.5 lbs a.i./A). Systox 6EC (0.3 lb a.i./A) was also included in the standard tank mix for aphid control. Both treatments provided comparable control at both evaluation dates (85% control with 6.5 live scale/20 shoots mid-season and 96% control with 1.5% infested fruit at harvest). These results suggest that Lorsban 50W can provide excellent control of moderate San Jose scale crawler populations.

III. Other Insect Pests

San Jose Scale - Apple

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Male emergence as detected by either pheromone traps or sticky barrier traps, was not well correlated with tree phenology (Red Delicous) in two different growing areas of the Okanagan Valley. Degree day accumulations past March 1st related to 1st and 50% male emergence were equally variable between areas and would not be reliable indicators of male emergence. Crawler emergence was better synchronized in terms of degree days but not in terms of calendar dates.

San Jose Scale - Apple

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Accumulated degree days past March 1 (using temperature thresholds of 10.5 and 32.5 degrees C) were used to time the application of diazinon sprays for control of San Jose crawlers. Sprays were applied at 400, 500, 600 and 700 degrees past the detection of the first male by pheromone-baited traps. These sprays were compared against standard dormant oil, dormant oil plus methidathion, and a petal fall spray for male control. The 400 DD spray produced the lightest scale infestation of apples at harvest, followed by the 500 DD spray and the dormant methidathion spray (all <1%).

III. Other Insect Pests

White Apple Leafhopper - Apples

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A simulated commercial, full-season cover spray program of Lorsban 50W was evaluated against standard treatments for the control of various insect pests in apples. Four cover sprays were applied according to codling moth timing: 5/18, 6/10, 7/29, and 8/20. Treatments were made to four, 2-tree replicates at an equivalent rate of 400 gal spray volume per acre. Leafhopper control was evaluated following the 1st cover spray by counting the number of mines per 100 leaves per treatment replicate at 7, 14, and 21 days post-treatment. Lorsban 50W (1.5 lbs a.i./A) was evaluated against a tank mix of Guthion 50W (1.0 lb a.i./A) and Systox 6EC (0.3 lb a.i.\A). Pre-treatment counts indicated mean infestation levels of 59 or more mines per 100 leaves per treatment. Lorsban 50W provided 72.3% control with a total of 27 mines per 100 leaves compared to 79.8% control with a total of 20 mines per 100 leaves for the standard treatment. These results suggest that Lorsban 50W alone can provide control of low white apple leafhopper populations comparable to standard treatments.

Western Cherry Fruit Fly - Cherries

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Six sour cherry sites a few miles south of Logan, Utah were used for intensive trapping and model validation. The first catches were observed on June 18 at 510.24 DD above 5°C, representing a 3-day catch period. The peak flight was about June 25 at 610.85 DD.

Trapping by other agencies showed the western cherry fruit fly to be concentrated from Salt Lake City northward. South of Provo, the fruit flies infesting cherries were nearly 100% apple maggots.

The few apple maggot adults collected north of Salt Lake City, in traps set out for cherry fruit flies, were caught about mid-August. The cherry infesting apple maggot flies from the Provo area occurred about a month earlier, indicating the probability of two apple maggot biotypes in Utah. There has been no verification of Utah apple maggots completing their development in apples under field conditions.

III. Other Insect Pests

Contarinia psendotsungae Condrashoff - Christmas Trees (Douglas-Fir Midge)

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In 1984 a major project (research) was conducted in a Christmas tree planting in 1983 and 1984 on trap systems (color, phase, height, population levels, thermograph, and native range, life history, and controls).

The Douglas-fir midge (Contarina pseudotsungae) is the species of most concern to the Christmas tree industry because:

1. It may occur in great numbers and is most injurious to the foliage on Contarinia sp.

2. The infestations recur periodically in dry-belt areas which are the best Christmas tree growing sites.

3. Its effect on trees may be long term and hence delay harvest indefinitely.

Contarina pseudotsungae infests Douglas-fir from British Columbia along the Pacific Coast of Oregon and California. This pest has also been collected in the Sierra Nevadas. Specific locations in California coastal zone include Humboldt, Mendocino and Sonoma Counties. Materials in control trials included Endosulfan 50WP (Thiodan), Acephate 75%SP (Orthene, Diazinon 50%WP, Pydrin 2.4EC), Dimethoate (Cygon), Carbaryl 43% (Sevin XLR), Larvin 80DF, Lorsban 50WP, CGA-72662, and Orthene 75SP.

III. Other Insect Pests

San Jose Scale - Almonds

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Dormant applications and May evaluations of crawlers showed a trend, but nonsignificantly better control, as oil "heaviness" increased. Volck Supreme and Superior oils at 6 gpa performed better than dormant oil emulsion. Performance increased along with oil rate increase from 2, 4, and 6 gpa. The addition of Penetrator 3 (2 quarts) to 4 gallons of oil gave equal performance to 6 gallons of oil. Two gallons plus 2 quarts was less effective than 4 gallons of narrow range (Superior) oil alone.

III. Other Insect Pests

Filbert aphids, Myzocallis coryli - Filberts

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During the spring of 1984, filbert (hazelnut) orchards in Italy, Spain, and France were searched for parasites of the filbert aphid. An aphidiid wasp, tentatively identified as Trioxys pallidus, was found to attack the aphid in all three countries, and was subsequently imported into Oregon.

After quarantine, the wasps were mass-reared in the greenhouse and approximately 5,000 adults have been released in commercial orchards. The parasites have successfully completed development in the field on the Oregon strain of the filbert aphid, and have established in at least three locations.

III. Other Insect Pests

Hemiptera

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Several species of Hemiptera in the families Coreidae, Miridae and Pentatomidae have been shown to induce symptoms of "epicarp lesion" on pistachio nuts. Included are species of Leptoglossus, Lygus, Calocoris, Thyanta, Chlorochroa, and Acrosternum. Nuts attacked between bloom and shell hardening by all species drop from the tree; nuts attacked by the coreids and pentatomids after shell hardening often do not abort, but do suffer kernel necrosis. Lesion symptoms vary depending on the bug involved.

Rhagoletis completa Cresson
Walnut Husk Fly

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The Effect of Reduced Bait Sprays on Walnut Husk Fly

J.L. Joos, D. Dicke, H. Riedl

Field trials were performed in a mature walnut orchard in Napa County to evaluate baited Staley's #7 Bait treatments with synthetic pyrethroid Fenvalerate (Pydrin) 2.4EC at reduced coverage for walnut husk fly control.

Seven treatments, each replicated three times with .5 acres per replication, were arranged in a randomized block design. Treatments included: full tree coverage, alternate rows, every third row, one side every row with bait; full tree coverage without bait; Malathion with bait; and, untreated checks. The chemicals were applied with a speed sprayer on 8/3/84 and 9/7/84. 100 nuts per replication were sampled on 10/9/84. Best control was obtained with full coverage, alternate rows, every third row, and one side every row - with bait. Infested nuts on the untreated check showed 90% damage. Fenvalerate showed 22-25% infested nuts. A higher walnut aphid population developed due to using Fenvalerate - full coverage, because of the elimination of Trioxys pallidus Halliday.

III. Other Insect Pests

Pear psylla - Pear

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Several synthetic pyrethroids, including those registered for use on pear and some new ones being developed, were screened in the laboratory for activity against overwintered pear psylla adults using the slide-dip technique of Follett and Croft. Psylla were collected in 11 orchards in the Yakima and Wenatchee areas where control with Pydrin had not been good in the past in order to compare susceptibility of different populations. Psylla from the Research Center were tested for susceptibility to Pydrin on several dates from beginning of their emergence from hibernation until about petal fall on pear. All pyrethroids tested were highly toxic to overwintered adults. Although some newer ones required lower dosages to kill psylla than those now registered there seems to be no advantage of one compound over the others. Overwintered adults were most susceptible to pyrethroids about the time of their peak egg-laying and become harder to kill near the end of their life. Populations from the 11 orchards did not differ in susceptibility to Pydrin, indicating that resistance had not developed at any location. One type of pyrethroid resistance is overcome by addition of piperonyl butoxide to sprays, but addition of pbo to Pydrin dips did not increase activity against these psylla.

Field tests of new compounds as foliage sprays for control of pear psylla produced no promising new candidates for use against this pest, but SN 72129 and MK-936 continued to provide good control. Comparisons of psylla russet damage to fruit with psylla density in the screening plots indicated that peak density is better correlated with fruit damage than accumulated nymph feeding days. Nymph density of about .75/leaf produced some fruit russet but .45/leaf did not. Fruit heavily russeted by psylla honeydew was smaller and firmer at harvest.

III. Other Insect Pests

Pear Psylla - Pears

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Soft-pesticide programs centering around diflubenzuron gave good control of pear psylla and codling moth. Fruit harvested from both standard and soft programs had comparable low levels of insect and honeydew damage.

Bartlett pear trees sprayed with Acco Plant and Tree Wash plus San 406 produced fruit with pear psylla honeydew russetting that was inversely related to the rate of the soap sprays. The higher the rate of the sprays, the lower the amount of damage. Additionally, treated trees had less codling moth damage than did the untreated check trees.

Orange Tortrix

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Synthetic sex pheromone baited traps caught 16, 32, and 49% fewer marked ♂ Argyrotaenia citrana (Fernald) when in the presence of 5, 10, and 20 virgin ♀ moths caged in Pherocon^{R} I-C sticky traps in a semi-enclosed courtyard respectively, than did controls with synthetic pheromone traps only. Capture efficiencies ranged from 28-52% of all marked males released at constant rates in test treatments including controls without virgin traps. The estimated competition coefficients for individual ♀ moths at the three different virgin ♀ trap densities indicated reductions from 2.56-3.27% in pheromone trap catch per trap per night. Data suggest that calling virgin female A. citrana can significantly affect captures of male moths in synthetic pheromone baited traps and therefore may influence moth phenology and density interpretations made from these types of monitoring data in the field.

S E C T I O N IV

LEPIDOPTEROUS PESTS

Section Leader -- Tim Smith

IV. Lepidopterous Pests

AMERICAN PLUM BORER AND PLUM LIMB BORER - ALMONDS

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CONTROL OF BORER COMPLEX ON ALMONDS. Studies were conducted during 1983 and 1984 in Merced County on the control of borer complex on almonds. The complex consisted primarily of American plum borer and plum limb borer. A few peach twig borer larvae also were found feeding in the limbs. Various insecticides and concentrations of white interior latex paint were tested during the two-year period. All insecticides tested (Sevin, Diazinon, Lorsban, Pounce, Thiodan and Supracide) in combination with white latex paint gave good control of the borer complex. The insecticides controlled the borers within the cambium, thus preventive treatments do not appear to be necessary.

IV. Lepidopterous Insects

Peach Twig Borer - Almonds

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In 1984, diazinon was applied at 100± 10 D° intervals to control 1st generation larvae of the peach twig borer (PTB), Anarsia lineatella (Zeller). Test plots were established in 3rd leaf nonpareil almonds near Kerman, Fresno County, using a randomized complete block design with seven 3-tree replications per treatment. Diazinon 50 W was applied by handgun to runoff at rates of 0.25 lb. and 0.5 lbs. a.i. per 100 gals. of water. Treatment timings, at 300, 400, 500, and 600 day-degrees (D°) after first moth collections in pheromone traps, were based on the PTB phenology model using thresholds of 50° and 88°F. Temperatures were monitored with a standard hygrothermograph sheltered within ¼ mile of the test area. Pheromone traps (4) in the test plot were serviced twice weekly; pheromone caps were changed every 2 weeks and trap bottoms as needed.

Pheromone traps were placed in the orchard on March 14; the first PTB moths were trapped on March 30. D° accumulations were initiated on March 30, respective treatments were applied on the following dates: 300° - April 29; 400° - May 6; 500° - May 10; and 600° - May 17. Treatments were evaluated on the basis of fresh twig strikes in each replicate, counted on May 24, 1984.

Results and Discussion. Pheromone trap collections of PTB moths in untreated checks showed a long, erratic flight pattern, with the optimum treatment timing generally falling at about the middle of the flight, but between the two flight peaks.

The results of this test show the best control of first generation PTB larvae at 400 D° after first moth collections. In this particular test the 0.25 lb. a.i. rate and the 300 D° timing were not statistically different from the full rate, 400 D° treatment. These data confirm the results of previous test which indicated that treatments applied at 400 D° for PTB gave the highest level of control.

IV. LEPIDOPTEROUS INSECTS

Peach Twig Borer - Peaches

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A phenologically timed pink spray and a pheromone trap timed summer spray of cyfluthrin 240 EC at 75 g, WL85871 10 EC at 25 g, deltamethrin 2.5 EC at 10 G or methidathion 250 EC at 1400 g ai/ha effectively controlled overwintered and first summer brood peach twig borer larval feeding injury in terminal twigs and fruit on Redhaven and Valiant peach trees. No fruit injury resulted from second summer brood larvae because of abnormally slow development which resulted in postharvest moth emergence. Sprays were applied to replicated 0.1 ha plots by hand gun sprayer in 3370 L/ha when about 80% of the flower buds were at the pink stage of development and again, 11 days after catches of first summer brood moths in the pheromone traps exceeded the weekly economic threshold level of 2 male moths/trap. The traps were deployed at a density of 10/ha. At harvest, larval feeding injury in the fruit from each treatment and the checks averaged 0.3, 0.8 0.3 1.0 and 23.5%, respectively. In 1983, one pheromone trap timed spray of deltamethrin 2.5 EC at 10 g, WL85871 10 EC at 25 g or azinphos-methyl 50 WP at 1.4 kg ai/ha applied against first summer brood peach twig borer moths and larvae gave equivalent control.

Tentiform Leafminer - Apples

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Oxamyl (Vydate) was applied on July 18 at 0.25 and 0.5 lbs. AI/100 gallons. This timing followed the peak of the second moth flight. There was a slight, but non-significantly, better control with the higher rate. Both rates prevented new mine formation through August. There was a sharp increase in number of mines in the controls between August 15 and 18, soon after the peak of the third adult flight. On September 1, the mean numbers of mines per leaf were: controls 4.43, 0.25 oxamyl 2.30, and 0.50 oxamyl 1.76.

IV. Lepidopterous Pests

Western Spotted Tentiform Leafminer

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We evaluated six insecticides at two foliar application dates and one systemic pesticide for their control on Western Spotted Tentiform Leafminer and effects on mite populations. Also, three different rates of Dimilin were evaluated. Each plot consisted of 16 trees and each plot was replicated twice in a randomized complete block design. Materials, rates, timing, and results follow.

Table 2. Effect of Insecticides on Western Spotted Tentiform Leafminer, Moxee, WA. 1984.

Material	lb AI/A	Application(s)	Mean No. WSTLM mines/leaf on 9/13/84
Check	--	--	2.2 A
Dimilin 25W	0.5	4/19	2.0 A B
Dimilin 25W	0.25	4/19	2.0 A B
Dimilin 25W	0.19	4/19	1.8 A B
FMC 54800 2E	0.08	4/19	1.6 A B D
Larvin 80DF	0.75	7/7	1.3 A B D E
Larvin 80DF	0.75	4/19	1.1 A B D E
Larvin 80DF	0.75	4/19 & 7/7	0.9 A B D E
Dimilin 25W	0.25	7/7	0.8 B D E
Dimilin 25W	0.5	4/19 & 7/7	0.7 B D E
Pounce 3.2EC	0.2	4/19	0.7 B D E
Lorsban 50W	1.5	7/7	0.6 B D E
Dimilin 25W	0.19	4/19 & 7/7	0.4 D E
Dimilin 25W	0.25	4/19 & 7/7	0.3 D E
Dimilin 25W	0.19	7/7	0.3 D E
Dimilin 25W	0.5	7/7	0.2 D E
FMC 54800 2EC	0.08	7/7	0.08 E
FMC 54800 2EC	0.08	4/19 & 7/7	0.05 E
Temik 15G	4	5/18	0.03 E

Duncan's Multiple Range Test; means with the same letter are not significantly different, (P=0.10).

In September, plots receiving summer applications of Lorsban and/or FMC 54800 had significantly higher populations of European red mites and McDaniel mites than other plots.

IV. Lepidopterous Insects

Western Spotted Tentiform Leafminer - Pome Fruits

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A serious infestation of western spotted tentiform leafminer (WSTLM) Phyllonorycter elmaella Doganlar and Mutuura was first reported in Washington in a commercial apple orchard in the Southwestern part of the state in 1980. The insect population spread during 1981 and the insect was found infesting foliage of apple, cherry, pear, and prune trees in many orchards of Washington, Oregon, and parts of Idaho in 1982, 1983 and 1984.

In 1984, we found that a eulophid parasite deposited it's egg in the mine of the leafminer. M. E. Schauff, Research Entomologist at the Systematic Entomology Laboratory, USDA, Beltsville, Maryland, identified the parasite species found in Washington as Pnigalio maculipes Crawford. The data indicates that P. maculipes was the principal parasite of WSTLM collected in the commercial fruit growing areas at Kennewick, Roosevelt, Prosser, Wapato and Moxee, Washington during 1984. Parasites may have had a role in reducing WSTLM populations, but a virus that infected many of the larvae during the growing season has also shown potential as a biological control agent. Donald W. Davis, Utah State University, and Clive Jorgensen, Brigham Young University, reported at the Portland conference in 1981 that a polyhedral virus pathogen killed WSTLM larvae, and that the virus became epidemic killing most of the larvae during August. The flat desiccated, dead leafminer larvae we observed in Washington orchards appeared to be very similar to the virus-infected larvae described by Davis and Jorgensen from Utah orchards.

A potent attractant in the field for spotted leafminer, Phyllonorcycter Lithocolletis blancardella (F.), a common pest in apple orchards of the Eastern United States, was found to be very attractive to the WSTLM. Attractant traps baited with the P. blancardella (F.) sex pheromone, (E)-dodecenyl acetate, were placed in commercial apple and cherry orchards in southeastern Washington. The flight of the adult WSTLM moth was monitored from late March to mid November 1984.

IV. Lepidopterous Insects

Obliquebanded Leafroller

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Seasonal flight activity of obliquebanded leafroller was monitored with pheromone traps in a Madera Co. Pistachio orchard, and in plums and wild hosts in Fresno County. Two distinct flight peaks were observed in both locations; the first in mid-May and the second in August. Damage to pistachio foliage was readily apparent but nut damage was insignificant. OBLR injury to the plums was undetectable in 1984. Moths responded better to the commercial orange tortrix pheromone than to obliquebanded pheromone caps.

Pandemis and OBLR Leafrollers - Apple

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Pheromone traps indicated Pandemis and OBLR flights lasted all summer with OBLR catches the highest this year. Applications of several insecticide-oil combinations at delayed dormant and insecticides alone at pre-pink gave good control of early damage in commercial orchards and heavily infested test plots. Good early control plus summer covers prevented late summer damage even though adults were present in late summer.

IV. LEPIDOPTEROUS PESTS

Modality of Diapause Induction and Termination in the Obliquebanded Leafroller

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The diapause in obliquebanded leafroller is induced both in the first and second generation under Willamette Valley, Oregon, conditions. The first generation diapause is generally caused by the high temperatures (90° and above), while the diapause in the second generation is primarily caused by declining photoperiod. Only a small proportion (15-20%) of the first generation enters diapause while almost the entire second generation goes through it. The diapause is terminated under field conditions primarily in response to increasing temperatures in the spring months with almost no effect from the photoperiod. The diapause in the OBLR is terminated in a bimodal fashion.

Carob moth - dates (almonds, pistachios, pomegranates)

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First noted in California in 1982, the carob moth appears to be an ecological homolog of the navel orangeworm in many respects, a related pyralid derived from the Old World. It is a pest of Deglet Noor variety dates in Algeria and in the Coachella Valley of California, a major pest of soft-shelled almonds in Israel and a pest of pistachios and pomegranates in Morocco. Its potential as a pest in California will be discussed, along with current biological studies. Control experiments with insecticides in date gardens are limited to dust formulations. Results with OP dusts and carbaryl will be reported.

IV. Lepidopterous Insects

Codling Moth - Apple

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Forecasting - Observations on air temperature and codling moth density and development (adult emergence, egg hatch and larval instar) were made at seven sites in the Okanagan Valley. Heat accumulation was correlated with insect development at each site. The accumulation of 450°D (3% egg hatch), according to the Washington State phenology model, agreed closely with the actual time of first fruit entry at almost every site. Therefore the model appears to forecast accurately the time to apply the first larvicidal spray.

Chemical Control - Two insect growth regulators, Alsystin (BAY SIR 8514) and Dimilin (diflubenzuron), were sprayed on moderately infested apple trees at various times and doses. Fresh residues of Alsystin caused 100% egg mortality, but mortality from older residues declined with time. Dimilin caused somewhat lower mortality rates. Variable results were obtained due to the presence on trees of both old and new leaves. All treatments kept the level of fruit damage low in the first generation.

The efficacy of the carbamates Oncol, Larvin and CGA73102 was evaluated; initial results showed that these chemicals controlled the codling moth as well as the organophosphates Guthion, Zolone and Orthene.

Six applications of the codling moth granulosis virus to a 0.3-acre apple orchard kept the fruit damage level down to 3%.

Cold Storage and Fumigation - Treatment of all insect stages with cold storage, methyl bromide fumigation or various combinations has shown what treatment levels are required to kill 100% of the test insects in each stage.

IV. Lepidopterous Pests

Cydia Pomenella (L.) - Apples (Codling Moth)

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The entomogenous nematode, Steinernema feltiae Filipjev, was applied to overwintering codling moth pre-pupae that occurred in corrugated paper bands placed around apple tree trunks. Nematode applications made in October resulted in a total codling moth mortality of 80% (62% infected with nematodes) whereas July applications resulted in a total mortality of 32% (23% infected with nematodes). February applications provided the best results with 95% total mortality (58%-73% infected with nematode survival). A comparison of nematode survival in corrugated cardboard bands: burlap lined with Pellon fleece, and nylon pack cloth lined with Pellon fleece showed the survival in corrugated cardboard bands was less than 4 days; in nylon pack cloth lined with Pellon fleece - 23 days; and, burlap lined with Pellon fleece - 21 days.

Codling moth being the key pest on apples and pears with low mortality from beneficial preditors. This research shows promise for the control of this pest. When used on apples in three years of trials, shows outstanding control of codling moth overwintering larvae (Re: Journal of Entomology article in 1984.

IV. Lepidopterous Pests

Codling Moth - Apples

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and

J.D. Eves
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A simulated commercial, full-season cover spray program of Lorsban 50W was evaluated against standard treatments for the control of various insect pests in apples. Four cover sprays were applied according to codling moth timing: two treatments against first generation with a 21-day spray interval (5/18 and 6/10); and two treatments against second generation with a 22-day spray interval (7/29 and 8/20). Treatments were made to four, 2-tree replicates at an equivalent rate of 400 gal spray volume per acre. Codling moth control was evaluated mid-season (7/15) and at harvest (9/27) by determining the percent infested fruit from 400 fruits sampled per treatment. Lorsban 50W (1.5 lbs a.i./A) was evaluated against Guthion 50W (1.0 lb a.i./A). Both treatments provided comparable control at both evaluation dates (89% control with 1.5% infested fruit mid-season and 85% control with 3.2% infested fruit at harvest). These results suggest that 21-day spray intervals of Lorsban 50W can provide commercially acceptable control of moderate codling moth populations exemplified by these test conditions.

IV Lepidopterous Insects

Codling moth - Apples, Pears

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Non-replicated, one acre field trials were conducted in two commercial pear orchards and one commercial apple orchard using Dimilin 25W. At .75 lb. and 1.0 lb. formulated rates, Dimilin gave economic control of heavy codling moth populations (100-300 moths per trap). Elevated levels of mealy bug were seen in both pear blocks.

Codling moth - Pear

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A single spray of Dimilin, timed for first eggs of second generation provided codling moth control equal to three covers of Guthion. More than 50% of check fruit was infested. The single Dimilin spray probably works on pear in Washington because fruit is not very susceptible to larval entry by first generation. Dimilin residues persist for a long time and since there is little new growth after late June the crop is protected for the remainder of the season. In commercial orchards where codling moth densities are low a single spray for second generation should be adequate.

IV Lepidopterous Insects

Codling moth - Pears

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A major codling moth control failure occurred in the Suisun Valley fruit district near Fairfield California in 1984. Due to the economics of the Bartlett pear industry in this predominantly cannery district, growers have cut back on their chemical controls aimed at codling moth. This coupled with an increase in orchard abandonment plus weather conditions exceptionally favorable for moth development, contributed to very heavy moth pressure in most district orchards. Damage levels at harvest time ranged from 5-50%. Those few orchards following modern pest management practices and using a systematic moth trapping program maintained codling moth damage below the 5% rejection level. Growers in this district have been slow to adopt the pest management technology appropriate for preventing such control failures.

IV. Lepidopterous Insects

Codling Moth

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Three applications (May 3, 31, July 19) of Dimilin 25W at 3/4 or 1 lb/acre controlled codling moth in both pear and apple. There was no reduction in the populations of Deraeocoris, Anthrocoris, Nabis, Orius, Stethorus, or coccinellids. It appeared these beneficials were immigrants. There was no affect on rust mites. In both apples and pears, aphids were more abundant in the treated plots than in the check plots. This was especially true for wooly apple aphid in apples. Pear psylla populations were reduced in the treated pears compared to the checks (5.2 per tray vs. 3.0 per tray).

IV. Lepidopterous Insects

Codling Moth

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We found, as suggested by Taylor (1982), that decreased growth rates at high temperature (T_m) was primarily an artifact of growing insects at constant temperatures. Variable temperatures, as in the orchard, tended to accelerate the growth rate compared to the maximum rate at the optimum constant temperature. Therefore, upper temperature threshold cut-off was unnecessary for modeling codling moth development.

Constant high temperatures (86°F or above) retards growth rate of summer form codling moths, but high temperatures intermittently, as occurs in the field in summer, does not retard the growth rate. The rate of growth per degree hour was similar at all temperatures between 60 and 86°F and in the field for summer forms. But in overwintering forms, the rate of growth per degree hour was different for every degree change in temperature. Growth rate was retarded as the temperature decreased.

Intermittent temperatures up to 107°F did not increase or decrease the number of eggs oviposited, percentage hatched, or larval entries into the fruit. Mating increased as the mean daily temperature increased.

Temperature integrators accurately measured codling moth developmental rates that permitted timely control measures in 12 orchards scattered throughout the Yakima Valley.

Codling moths need to be controlled at densities (catch per acre) above 0.026 males per acre per week. At this moth density there were 5.7 wormy fruit per 10,000 fruit. Higher infestations would not result in serious economic damage in the current year, but would lead to problems in subsequent years.

Trapping results illustrated that timing sprays must be tailored to individual ranches. The biofix was May 4 at the Plath and Pence ranches, but May 18 at the Brandt ranch located in the same general area; May 2 at Green's, but May 17 at Leach's.

IV. Lepidopterous Insects

Oriental Fruit Moth - Almonds

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During the 1983 crop season, oriental fruit moth (OFM), Grapholitha molesta (Busck) (Lepidoptera: Tortricidae) was observed infesting almond nuts at a significant economic level in some Central Valley orchards. During the 10 years prior to 1983, OFM had been collected in high numbers in pheromone traps in almond orchards, but had not been a factor in nut meat infestations.

As a result of the 1983 infestation, research was conducted in 1984 on the timing of spray applications for control of OFM in a mature almond orchard near Caruthers, Fresno County. Guthion 50 W was applied at 1.0 lb.a.i./acre on three separate dates by helicopter at 30 mph, using 40 gpa. Treatments were applied on the following dates: May 6 - corresponding to the recommended timing for a standard navel orangeworm May spray; May 30 - optimum timing for 2nd flight OFM treatments as determined by pheromone trapping and the OFM phenology model; July 5 (two treatments) a). optimum timing for the 3rd OFM flight; and b). recommended timing for the navel orangeworm/hullsplit treatment. These last two treatments had been anticipated on separate dates, but fell on the same date in 1984 in this orchard.

Each treatment was comprised of four 20-acre replications, randomized within the 500 acre orchard. Untreated checks were included in the plot design. A 1.0 lb. a.i./acre rate of Guthion was used instead of the more common 2.0 lb. a.i. rate, in an attempt to avoid post-treatment increases of the European red mite, Panonychus ulmi (Koch).

Nut samples comprised of 250 nuts per replicate were knocked by machine on August 29, and were picked up on Aug. 30, 1984 and stored for later examination. Pherocon I-C pheromone traps were serviced twice weekly from Jan. 1 - Oct. 19, 1984 for collections of OFM adults in each replicate block. Pheromone caps were changed at 4-wk. intervals.

Results. Pheromone trap data for 1984 at Caruthers showed typically high OFM collections throughout the year. Examinations of nuts during the Spring, however, failed to show any notable level of OFM infestations as had occurred in 1983.

Examinations of mature nuts at harvest showed no significant differences in OFM infestation levels between any of the treatments and the check, nor were any differences in infestation levels noted for the peach twig borer (PTB) or for navel orangeworm (NOW).

IV. Lepidopterous Pests

Filbertworm Monitoring and Control Two Orchard Anomalies-Revisited

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A 5 moths/trap/cumulative threshold used in the 1983 and 1984 filbert IPM program has proven to be effective in preventing serious filbertworm infestations in most orchards.

However, in the last two seasons, nuts from two orchards have been seriously infested with filbertworm in spite of adult trap catches below the established threshold. Woeful results have occurred both with and without insecticide applications being made.

This season pheromone traps placed in abandoned trees adjacent (100-300 yds.) to the orchards recorded a large flight activity. Insecticides were applied based on these trap catches and although infestation rates at harvest time were reduced, the percentage of wormy nuts was still excessive.

What leads us amiss is what happens to the over-wintering population in the orchard and why we are not trapping it. It appears that traps within these two orchards are not effectively capturing the adults of the filbertworm populations overwintering within these orchards.

Cydia pomonella (L.) - Walnuts

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The relationship between male moth catches, sunset temperatures, walnut development and numbers of infested nuts was investigated during 1982-84. The highest coefficient of multiple determination was attained when the number of infested nuts was regressed on all three independent variables--moth catch, sunset temperature, and walnut development.

IV. Lepidopterous Pests

NAVEL ORANGEWORM - ALMONDS

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NAVEL ORANGEWORM EGG TRAP IMPROVEMENT -- A COMPARISON OF STANDARD AND IMPROVED EGG TRAPS. The improved traps were painted black, had extended ridges above the window, were baited with ground almond press cake plus 10% crude almond oil, and were filled with bait to the top of the window. Ten improved traps and ten standard traps were placed in each of six almond orchards in early April and monitored twice a week until harvest (Oct.). The bait was replaced once a month. Two orchards were in Kern County, two in Fresno County, one in San Joaquin County, and one in Butte County. The percent infested nuts was determined at commercial harvest by inspecting 1000 nuts per orchard. Egg deposition on the improved traps was from 1.3 to 2.6 times greater than that on the standard traps.

Navel Orangeworm - Almonds

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Continued evaluations of materials and timing show no advantage in two treatments (May and July) over a single treatment. Zolone gave 61-72% control, Imidan plus a pH modifier 77-80% control and Guthion 54% control.

IV. Lepidopterous Insects

Fruitworms--Apple

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A survey of 40 commercial apple orchards in the North Okanogan Valley found green fruitworm larvae in 29 orchards and brown fruitworm larvae in 24 orchards in low numbers. The most common species of green fruitworms were Orthosia hibisci Guenée and Lithophane georgii Girton, with a third species, Amphipyra pyramidoides Guenée, present in much lower numbers. The only brown species was Eupsilia tristigmata Grote.

Samples at harvest showed 1.4-3.8% fruit injury in 4 commercial orchards where fruitworm larvae were found to survive applications of azinphosmethyl or diazinon at petal fall. Experiments are planned for 1985 to develop means of distinguishing between fruit damage caused by larvae of fruitworms and of leafrollers and spanworms and to investigate relationships among larval density, fruit set, and subsequent fruit damage.

NAVEL ORANGEWORM - WALNUTS

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NAVEL ORANGEWORM CONTROL ON WALNUTS, 1984. Tests were conducted at the Westside Field Station at Five Points, CA. Six treatments were replicated eight times using a randomized complete block design. The treatments were: Supracide, 2.0 lb Ai/Ac; FMC 54800, 0.08 lb Ai/Ac; Guthion, 2.0 lb Ai/Ac; Zolone, 3.0 lb Ai/Ac; Sevin 5.0 lb Ai/Ac; and untreated. Each replicate consisted of an individual tree. Materials were applied to run-off (600 gal spray mixture per acre) with a hand-held orchard sprayer operating at 270 PSI. Applications were made on Sept. 5 when the walnut husks had just begun to split. Control was evaluated by inspecting 100 nuts per replicate (tree) for navel orangeworm on Sept. 19.

All materials tested gave some degree of control of navel orangeworm. Supracide and FMC 54800 gave significantly better control than Sevin and untreated.

IV. Lepidopterous Insects

PHEROMONE COMPARISON STUDY IN WALNUTS AND APPLES - 1984

Carolyn Pickel, W.W. Coates, and R. Van Steenwyk

To test commercially available pheromone release systems for efficiency and longevity. The 3 pheromones tested were Zoecon, Hercon, and Pest-Select (formerly Albany). There were 6 treatments and 4 replications. The treatments were Zoecon, Hercon, and Pest-Select with lures not changed for the entire test; then Zoecon, Hercon, and Pest-Select changed every two weeks. The test was conducted in 1 apple orchard in Watsonville and 1 walnut orchard in Hollister. The first test was conducted during the flight of the overwintered generation. The test was repeated during the first generation flight. The first test started in walnuts on April 29 and apples on May 1 and continued for 8 weeks. The second test started in walnuts on June 29 and apples on July 2 and continued for 5 weeks. Both Hercon and Pest-Select were considerably better than Zoecon. It appears from this data it is not necessary to change Hercon or Pest-Select every two weeks. A one-way ANOV was done for each date to find out when the significance occurred. The significance occurred at 4 weeks for Hercon and Pest-Select so the pheromone should be changed every 4 weeks. Even when Zoecon was changed every other week it did not perform as well as the other pheromones.

Walnuts - Hollister

Treatment	Overwintered Generation $\bar{x}$	s	Treatment	First Generation $\bar{x}$	s
Hercon	9.8 a**	14.9	Albany	13.7 e**	10.5
Albany	9.3 a	21.1	Albany *	9.9 d	7.5
Hercon *	8.4 a	13.4	Hercon *	6.7 cd	5.7
Albany *	7.7 ab	12.7	Zoecon	5.1 bc	3.5
Zoecon *	5.1 ab	12.6	Hercon	1.8 ab	2.3
Zoecon	2.7 b	7.1	Zoecon *	1.5 a	2.1

Apples - Watsonville

Treatment	Overwintered Genration $\bar{x}$	s	Treatment	First Generation $\bar{x}$	s
Albany *	5.3 c**	5.9	Hercon *	9.8 c**	8.3
Hercon *	5.0 bc	5.6	Albany *	8.5 bc	6.7
Hercon	4.1 bc	4.1	Hercon	6.9 abc	5.3
Albany	4.0 bc	5.4	Zoecon *	5.3 ab	4.1
Zoecon *	3.1 ab	3.5	Albany	4.2 a	6.4
Zoecon	1.3 a	1.4	Zoecon	3.8 a	3.8

* Pheromone changed every two weeks.
** ANOV at the 5% level using Duncan's multiple range test.

IV. Lepidopterous Pests

The Regional Dynamics of a Highly Mobile Tortricid Pest in Western Oregon

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Factors affecting the regional population distribution and movement of Argyrotaenia citrana were studied within a grid of 103 pheromone traps spaced 200 meters apart. Spring male flight was mediated by cool temperatures and localized around overwintering loci within caneberry fields. Male dispersal from caneberry to surrounding sites greatly increased following mating of calling females. Trap catches during the summer generation were distributed broadly and influenced by several factors affecting moth dispersal and trap apparency.

S E C T I O N V

TOPICS NOT COVERED UNDER ONE OF THE ABOVE

Section Leader -- Irwin Rammer

Section V.
Pesticide Registration, Spraying, Residues and Phytotoxicity

BENOMYL RESIDUES IN RED DELICIOUS APPLES DURING STORAGE

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MATERIALS AND METHODS

This project was designed to determine if the commercial use of the fungicide Benlate® (benomyl) when used as a post harvest treatment, would leave residues higher than the residue tolerance limit of foreign countries. Residue tests were conducted on samples taken over a period of time from the cold room storage, controlled atomosphere storage, and after a waxing/benomyl treatment, then the cold room storage. Residues are reported as the benomyl equivalents, or as the benomyl metabolite, MBC. The residue method used converts benomyl to its metabolite, MBC. Foreign tolerances are listed as benomyl or combined benomyl plus metabolites.

All residues were below the listed tolerances, except for the countries of East Germany (0.3 ppm) and Italy (1.0 ppm). There was no noticeable decline in residues during storage.

The benomyl equivalent residues for regular cold room storage sampled at 0-hour and then at monthly intervals through 180 days, ranged from 0.67 ppm to 0.86 ppm. For the controlled atmosphere storage, the residues were in the range of 0.93 ppm from 60 to 180 days. The wax plus benomyl treatment gave residues over 1.0 ppm when sampled at 0-hour and then at 15 day intervals through 60 days.

V. PESTICIDE REGISTRATION, SPRAYING, RESIDUES AND PHOTOTOXICITY

Efficacy and residue levels of current dimethoate formulations for cherry fruit fly control - Cherries

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At 5 sites a single timed spray of 4 dimethoate formulations, Sys-Tem 2 EC, Sys-Tem 480 EC, Cygon 480 EC or FMC 2.67 EC, applied to sweet cherries at rates of 1.1, 1.4 or 1.6 kg ai/ha gave 100% control of black and western cherry fruit fly larval feeding injury for 21 days. The same formulations applied at 0.8 kg/ha had 0.0 - 15.7% damage in harvested cherry samples at 21 days while those from the most heavily infested site had 10.6, 15.7 and 20.5% damage in the fruit at 14, 21 and 28 days, respectively. The treatments were applied by airblast sprayer to replicated 0.04 - 0.08 ha plots of cherry trees about 6 days after the first black or western cherry fruit flies were trapped on yellow sticky boards. The minimal efficacy rate of 1.1 kg/ha is the same as the current recommendation for controlling these pests that was established in 1970 - 1973 for Rogor (dimethoate) 4 EC which is no longer available. The FMC 2.67 EC formulation while equivalent in control efficacy to the others was less phytotoxic at the same application rates. For all formulations the severity of phytotoxicity increased with higher application rates.

Total omethoate and dimethoate residue levels in cherry samples from plots treated with one spray of Cygon 480, Sys-Tem 480, Sys-Tem 2 (240) or FMC 2.67 EC applied at 0.8 or 1.1 kg ai/ha were below the 2.0 ppm tolerance at 21 days after harvest. At 14 days, this limit was exceeded at 2 of the 4 test locations. Similarly, cherries treated at the 1.4 kg ai/ha rate exceeded the 2.0 ppm tolerance at 21 days at 2 of 3 locations.

RESIDUES OF DIMETHOATE ON SWEET CHERRIES

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Dimethoate (Cygon, O,O-dimethyl S-(N-methylcarbamoylmethyl)phosphorodithioate) is registered for the use on cherries for western fruit fly control with a 28 day application to harvest interval and a 2 ppm tolerance. However, in practice it became apparent that a 14 day application to harvest interval would give better protection and therefore a study was initiated to determine the residues of dimethoate applied to cherries 14 or 21 days before harvest with a concentrate sprayer. The material was applied at the rate of 1.5 kg/ha ai.

The following table summarizes some of the results obtained:

Location	Total dimethoate residue, ppm		
	0 day	14 days	21 days
Salem	7.05	1.61	0.67
Salem	10.63	1.98	1.08
Corvallis	4.06	0.71	0.44
Hood River	3.32	0.49	0.44

V. Other Topics

Peach Twig Borer
Codling Moth
Omnivorous Leafroller

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Rubber septum pheromone caps for peach twig borer, Anarsia lineatella Zeller, manufactured by Zoecon Corp. and by Albany International, were evaluated for comparative efficacy and longevity in 1984. The test was established in a 5 yr. old almond orchard near Clovis, Fresno Co., using 6 single-trap replications per treatment in a randomized complete block design. One treatment each of the Zoecon and Albany caps was changed at 2-wk intervals; the 2nd treatment from each manufacturer was not changed during the 6-wk test. Traps were serviced and moths removed twice weekly between June 18 and July 30, 1984. Moth collections were totaled on a weekly basis and analyzed by ANOVA and DMRT at $p = .05$.

The results of this test showed that the Zoecon caps generally collected more PTB moths than the Albany dispensers. This may be due to different initial load rates of pheromone in the caps.

More importantly, these data again show that the longevity of commercial PTB pheromone caps in the field is only two weeks, which confirms the test data obtained in similar tests in 1982-83. Thus, it is recommended that PTB caps routinely be changed at 2-wk intervals under California conditions.

Similar tests were conducted with Zoecon and Albany pheromone dispensers for omnivorous leafroller in nectarines and codling moth in plums and oriental pears. Results of the OLR tests indicated that dispensers from both sources lasted for ca. 8 wks. before replacement was needed. The codling moth test data was quite different from that seen in 1983; the 1984 CM cap longevity showed no differences between fresh and unchanged caps through at least 8 weeks.

V. TOPICS NOT COVERED

STONE FRUIT PEST MANAGEMENT ALTERNATIVES DIRECTORY - Pesticide Cultural and Biological (A New Publication)

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The Stone Fruit Pest Management Alternatives Directory was written to provide pest control advisors, growers, students and others with information to better understand pest management for apricot, cherry, nectarine, peach, plum, and prune orchards. The information is arranged so that once the pest(s) is correctly identified, the control alternatives available can be determined by first using the summary chapter at the beginning of the book. Once you have the alternatives identified, refer to the pesticide, cultural or biological control chapters where more detailed control information is found. The book also attempts to identify noninfectious disorders which may complicate proper diagnosis and treatment of orchard problems and other conditions which influence pest populations.

The individual chapters in the directory may also be used as a reference for information on pesticides, cultural controls and biological controls. When used in this way, each chapter acts as a unique section on the topic it covers. The contents page at the front of each chapter provides a more detailed subject index to allow quick access to the information within.

The Stone Fruit Pest Management Alternatives Directory, which is Part II of the stone fruit pest management series, emphasizes alternative controls for stone fruit pests by crop. Part I, a separate publication, titled "Stone Fruit Orchard Pests: Identification, Biology, Control", Publication No. 518, stresses the identification and biology of stone fruit pests problems regardless of crop together with some corrective measures. It also contains scientific names of pests and beneficials discussed in this directory. Both CDFA publications are designed to be used together or independently of each other.

V. Other Topics

Honey Bees and Fungicides

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Two fungicides, Fungine (triforine) and UBI-A815 were tested for their effects on honey bee foraging behavior and pollen germination at Prosser, WA. A total of nine trees (three triforine treated, three UBI-A815 treated, three untreated) were evaluated. Fungicides were applied to individual trees using a handgun sprayer and spraying to runoff during full-bloom when honey bees were foraging. Foraging behavior was assessed by counting number of honey bees observed in one minute per tree. At one-hour post-treatment flowers were picked and pollen placed on agar medium for germination tests. No differences in number of honey bees per tree per minute and no differences in pollen germination were observed.

Table 1. Honey bee visitation rates on blooming Golden Delicious apple trees sprayed with fungicides and percent pollen germination of pollen collected 1 hr post-application. Prosser, WA. 1984.

		Mean No. HB/tree/minute		
Material	Rate (lb AI/a)	Pre-application	30 min. post application	Mean % pollen germination
Funginex 1.6 EC	0.5	21.6	20.6	85
UBI-A815 50	0.4	22.6	21	83.3
Check	---	21	20.3	88.3

V. Pesticide Registration, Spraying, Residues and Phytotoxicity

Filbert Aphid and Obliquebanded Leafroller - Filberts

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Six insecticides were evaluated for the control of two major pests of filberts, the filbert aphid and the obliquebanded leafroller. Treatments were applied on May 6 in a randomized complete block design with four single tree replications. Tree age was ca. seven years and spacing was 14 x 18 ft. Barcellona, the predominant variety, was interspersed with Daviana pollinizers. To minimize the effect of drift, alternate trees in alternate rows received the individual insecticide treatments. No adjuvants were used: pH of water used to make the spray solutions was 6.5. Treatments were applied using an Amerind McKissick Sprayer with a handgun attachment capable of ca. 100 psi pressure. Each tree (rep) received 1.5 gallons of spray solution (258 gpa water equivalent). Total aphids on each of 6, 5, and 10 terminal leaves per replication were recorded prior to treatment, 3 and 13 days post treatment respectively and are expressed as $\bar{x}$ aphids per leaf per treatment. Total numbers of live obliquebanded leafroller larvae observed on ten randomly selected branches (last three terminal leaf clusters per branch) per treatment (tree) replication were recorded 13 days post treatment.

Table 1. Efficacy Against Filbert Aphid and Obliquebanded Leafroller.

Treatment	# ai/A	Aphids/Leaf/Treatment			Leafrollers/120 Leaf Clusters
		Pre	Post		
			3	13	
Lorsban 50W	1.5	21.0	.5 a[1/]	4.3 ab	0 a
Ambush 2E	0.1	16.3	10.6 ab	22.1 cd	5 b
Ambush 25W	0.1	18.5	21.4 bc	21.3 dc	1 ab
Pounce 3.2 EL	0.2	31.8	35.6 bc	14.8 c	2 ab
FMC 54800 10W	.06	20.0	0.9 a	0.9 a	1 ab
Metasystox-R 2E	0.5	16.3	31.8 d	35.5 d	21 c
Pydrin 2.4 EC	0.2	13.3	23.4 bc	12.3 bc	2 ab
Check		18.5	60.4 d	63.0 e	19 c

1/ Numbers followed by same letters are not significantly different from one another (P=0.05) DMRT

V. Pesticide Registration, Spraying, Residues and Phytotoxicity

Obliquebanded Leafroller and Brown Stain Damage in Filberts

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Brown stain has been described as a physiological disorder of the filbert nut. Theories have been developed as to the cause of this disorder, but none have been proven. Filbert growers have suggested the OBLR is the principal cause of brown stain. OBLR damage does look similar to brown stain, but upon close examination of the nut distinct differences have been found. The results of a three year survey conducted in IPM orchards indicate that OBLR is not a cause, if even a contributing factor, of brown stain. The survey data are summarized in Table 1.

Table 1. Brown Stain and Obliquebanded Leafroller Data Recorded in Filbert IPM Orchards.

Year	Total filberts checked	% Brown Stain		%OBLR Damage	
		Range	Average	Range	Average
1982[A]	17,400	4.0-40.0	13.4	0.0- 4.0	0.3
1983[A]	17,400	19.9-84.1	50.7	0.2- 7.0	1.3
1984[B]	17,900	0.0-25.0	6.5	0.0-60.0	2.7

A - Sixteen orchards surveyed
B- Sixty-five orchards surveyed

V. Concentrate Spraying, Residues, Phytotoxicity and Pesticide Development

Filbertworm Control on Filberts

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Seven insecticides were screened for efficacy against filbertworm on filberts. The experimental design was a randomized complete block design consisting of four single tree replications. Tree spacing was 20 x 20 feet with tree age being 40 years. The main variety was Barcelona with Daviana pollinizers. All insecticides were applied to Barcelona trees. Adjuvants were not included. Treatments were applied with an Amerind McKissick sprayer by handgun using 2 gallons of water per tree (ca. 218 gallons per acre). Pretreatment monitoring of filbert nut development, weather, and adult flight activity of filbertworm were used to time insecticide applications. Pheromone traps were used to monitor adult flight activity.

An insecticide application was made on July 17, 1984. Continuous trap catches required the trial to be resprayed on August 8, 1984. Samples consisting of 80 nuts per tree were collected on September 14, 1984. Nuts from both untreated and treated trees contained economically damaging infestations of filbertworms. Commercial filbert processors would reject the nuts from the untreated and Lorsban treated trees. The nuts from trees to which Ambush, Pounce, and FMC 54800 were applied would be accepted, but a sorting charge to remove worm infested nuts would be levied. An extremely low crop yield and an unusually high moth population not normally found in commercial orchards was experienced during this trial.

Treatment and # a.i./A		% Infestation
Pydrin 2.4 EC	0.2	0.9^{a} *
FMC 54800 10W	0.04	1.9^{a}
FMC 54800 2E	0.04	2.2^{a}
Ambush 2E	0.1	2.2^{a}
Pounce 3.2 EC	0.2	2.5^{a}
Ambush 25W	0.1	5.3^{ab}
Lorsban 50W	1.5	10.0^{b} 1/
Untreated		24.7^{c}

* Numbers followed by the same letter are not significantly different (P=.05) DMRT. Analysis completed using arc sine transformation.

1/Fifty-three percent of the wormy filberts were recovered from a single replication, perhaps indicating that the high population of worms found in this treatment was an artifact of the experiment rather than poor performance by the insecticide.

V. Other Topics

Three Years of Filbert IPM

Jim Calkin and Glenn Fisher
Oregon State University
Corvallis, OR 97331

Oregon State University has developed and operated a filbert IPM program for three years. Grower participation has increased from fourteen original growers to forty-five this last season with an acreage increase from 261 to 1559 acres. Growers were not assessed a scouting fee in 1982, but did pay trap cost in 1983 and $4.00 and $9.00 per acre for a partial and full season program in 1984.

Foliar pests including filbert aphid and larval stages of filbert leafroller, obliquebanded leafroller, winter moth, and omnivorous leaftier were monitored every other week. Pheromone traps were placed in orchards from May through September and inspected twice weekly to monitor the adult flight activity of filbertworm and OBLR. Insecticide applications were recommended when specific insect populations reached their respective action thresholds. Nuts from each orchard were collected at harvest time and inspected for insect damage.

The season's events in each orchard were summarized and given to the participating growers. A survey of our grower participants indicated an average decrease in their annual insecticide use that amounted to a savings of approximately $15.00/acre. Fewer insecticide sprays to control filbertworm and leafrollers largely accounted for the reduced insecticide use.

SPUR (Fluvalinate) Insecticide

Jack D. Root
Zoecon Corporation
3260 North Hayden Road # 209
Scottsdale, AZ 85251

SPUR, Fluvalinate, insecticide has recently been granted an experimental use permit and temporary tolerances for large scale testing of various insect and mite pests in the United States. SPUR has exhibited some unique characteristics in giving a wide range of lepidopterous insect control and either giving suppression or no detrimental effects to populations of phytophagous mites in apple orchards. Good control of several species of aphids attacking apples has also been achieved in multiple application trials in the northwestern United States.

Western Orchard Pest

Chairman - Bill Barnett
Chairman Elect - Harold Moffitt
Sec/Tres - Gary Fields

Disease Management Conference

Minutes of the 59th Annual Meeting. Imperial Hotel, OR
January 16, 17, & 18, 1985

The 59th Annual Meeting was called to order by Chairman Ron Covey at 0915, Wednesday 16 January 1985.

Introductions were made around the room with just under 100 members is attendance. Anouncements included a comment by Chairman Covey that the $3.00 charge ($2.00 for the abstracts and 1.00 for registration) finally went over the very first fee of 2.00 charged in 1958. It was announced that there would be no special interest meetings on Wednesday afternoon and regular reporting would continue until 5 PM. The Sec/tres asked all students to identify themselves so minutes and meeting notices would not be mailed to them unless they requested them.

The minutes of the 58th Annual meeting were approved as mailed.

Committee asignments were announced with the chairmen being: Nominating -Martin Barnes, Audit - Mike Willet, and Resolutions - Stan Hoytt.

Section leaders were announced with Tim Smith heading up Lepidopterous Pests, Orchard mites by Sid Sakamoto, Other Insect Pests by Glenn Fisher and the All Others by Irwin Rammer.

The meeting was adjourned until 0830, 18 January when chairman Covey again called the meeting to order. The Treasurer read his report showing a begining balance of $159.21. Expenditures were 103.21 and 1985 registration recipts were 130.00 for a balance of 186.01. The report was confirmed by the Audit committee and accepted by the membership.

There was no old business. Under new business the format and content of the abstracts were discussed. The Abstracts will become a Research Report. Each member will submit up to 2 full pages (2 sheets filled on one side only) to Joe Capazzi by Dec. 31. The report can have tables and figures as the maker sees fit. However, ALL reports sent to Joe's office will conform to the guidelines sent out with the meeting notice. No hand written reports, reports on colored paper or therafax copies will be printed in the WOP&DMC report. If your report is not finished enough to be copied on a Zerox or similar copier and collated with all the others it will not be included. A written schedule will appear in the Report and the meeting notice to facilitate the giving of reports at the meetings.

The nominations committee gave its report nominating Bill Barnet, chairman; Harold Moffitt, chairman elect and Gary Fields sec/tres. No additional nominations were made from the floor. It was moved and seconded for the Secratary to cast a unanimous ballot for the slate of officers.

The Resolutions committee gave its report with the following being accepted:

Be it resolved.....

1. that we extend our thanks in writing to the management and staff of the Imperial Hotel for their courteous service and excellent accomodations at the 59th annual meetings of the Western Orchard Pest and Disease Management Conference.

2. that we express our appreciation to Chairman Ron Covey, sec/tres Gary Fields and to all the section leaders for their effectivness in conducting the meetings in an excellent manner.

3. that we express our appreciation and tanaks to Joe Capizzi for the preparation of the abstracts and to Jim Calkin and Glenn Fisher for the operation of the projection equipment.

4. that we write letters of appreciation to the retired active members (Harold Madsen, Art Retan, Reed Roberts and Bob Zwick) and due to their particularly long and active participation encourage Harold Madsen and Art Retan to attend next year so that we can honor them in person.

The resolutions were approved by the members in attendance.

The meeting was adjourned by past chairman Ron Covey in the absence of Chairman Bill Barnett at 0906, January 18, 1985.

The meeting dates for 1986 are January 15, 16 & 17.

Respectfully submitted,

Gary J. Fields
Secretary/Treasure