ABSTRACTS OF REPORTS FROM THE
40th ANNUAL WESTERN COOPERATIVE SPRAY PROJECT

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NOT FOR PUBLICATION OR FURTHER REPRODUCTION

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

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Abstracts of Reports from the
40th Annual Western Cooperative Spray Project

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INSECT AND MITE PESTS OF POME FRUITS

APPLE INSECTS AND MITES

Codling Moth

M. D. Proverbs and H. F. Madsen:

The release of sexually sterile males and females, irradiated in the adult stage, was continued for the second year in an abandoned orchard. The fruit in this orchard was 60% wormy in 1963. At the end of the second year of release, the percentage wormy fruit was reduced to 0.31. Over the season, 266,000 male moths and 212,000 female moths were released for a total of 478,000. The use of sterile males and females eliminates the hand labor involved in sorting pupae and permits mechanization of some of the rearing procedures.

H. F. Madsen and M. D. Proverbs:

Sex traps containing live female moths were compared to a black light trap for efficiency in attracting codling moths. During the early season, the sex traps capture more moths than the light trap but this pattern is reversed during June, July and August. When male moths alone were considered, the total catch from four sex traps was equal to a single black light trap. When twilight temperatures drop below 60°F., neither trap captures a significant number of moths.

H. F. Madsen:

Five insecticides were compared for the control of codling moth in four cover sprays. Ryania and Thuricide 90TS failed to give adequate control. Imidan, NIA-10242, and Phosphamidon all gave good control. None of the materials gave any reduction of European red mite or McDaniel mite, and all but Ryania and Thuricide were toxic to mite predators. Phosphamidon caused fruit injury to Red Delicious apples.

Darrell O. Hathaway:

During the summer of 1965 an average of 10,000 codling moths per day were reared for evaluation of the sterile-male technique for population suppression and for the extraction of female sex-attractant. Larval rearing in the laboratory was facilitated by using blowers to distribute eggs on half inch squares of wax-paper over the rearing trays. Storage of apples in bulk bins that hold from 30-35 thousand apples per bin has reduced the handling and bruising of fruit. The use of a disposable cardboard rearing tray appears promising.

J. Franklin Howell:

Six-watt fluorescent blacklight traps and virgin female (sex-attractant) traps were used in 1965 to survey codling moth populations in an orchard where the feasibility of eradication by the sterile male technique was under evaluation. Sexually sterile moths released in the orchard were attracted to both types of traps in larger numbers than were native moths. The two types of traps yielded conflicting data as to the ratios of sterile to native male moths. However, the light trap data appeared most representative of the actual ratios.

Combining virgin females (sexual attraction) with light traps increased catches early in the season but showed no advantage after mid-July.

S. C. Jones:

GS-13005 40% W.P. and GS-13005 EC., was compared with SD-9129 EC., in the control of the codling moth. GS-13005 W.P., was tested at concentrations of 10 oz., and 20 oz.,/100 and GS-13005 E.C. (2#/1 gallon) 1 pt./100. SD-9129 EC., (2#/1 gallon) 1 pt.,/100. The sprays were applied with a power sprayer using hand guns. The plots were treated on June 2, June 28, and August 18. Each material and concentration was replicated three times on single tree plots. The average number of worms for the three replicates of each concentration was as follows: GS-13005 10 oz./100, 1.5%; GS-13005 20 oz./100, 2.3%; GS-13005 EC., 1 pt./100, 3.3% and SD-9129 EC., 1 pt./100, .066%. The average worms for the three check plots was 34.9%.

Donald W. Davis:

Codling moth work was limited to one orchard at North Ogden, Utah. A late severe freeze interfered with proper evaluation of the work, and resulted in lower than normal codling moth populations. Untreated checks were not used, but nearby unsprayed trees ranged from 50% to 75% injured fruit. Geigy 13005 (at two dosages), B37344, NIA 10242 and Guthion were all successful in reducing the wormy fruit to less than 1%. There were significantly more stings in the G 13005 treatments than in the NIA 10242 and Guthion plots. The lower rate (½# actual per 100 gal.) of G 13005 had 5.33% combined stings and wormy fruit.

John A. Quist:

Laboratory colonization of the codling moth was initiated in July 1965. Codling moth attractant traps were evaluated in a three-acre abandoned orchard near Paonia, Colo. One hundred traps were serviced daily during the second brood emergence period. Attractant traps produced no effect upon the percent wormy fruit at harvest. The average trap efficiency in traps containing five live females fell off rapidly with age. 43% of the total collection was obtained the first day, 21% the second day, 12% the third day, 13% the fourth day, and 2% the fifth day.

Field collections of wormy fruit showed the primary parasite of the codling moth is Ascogaster quadridentata of which 515 adults were recovered. This species accounts for 7% parasitism in western Colorado. Two additional parasite species have been recovered, Perilampus chrysopae and a species possibly Macrocentrus delicatus.

Orchard Mites

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

Several oils applied alone at delayed dormant controlled European red mite for slightly over two months and were better than several WP acaricides (Micasin, Milbex, and CPAS) at the pink stage. Petal-fall applications of Karathane, Morocide, Kelthane, and Chlorobenzilate were ineffective, while Morestan gave excellent and long-lasting residual control at this stage. Kelthane and Chloropropylate control varied depending upon the orchard area where used while petroleum oils plus ethion WP combinations gave consistently excellent ERM Control for 4 - 6 weeks. Oils alone were effective for only 2 - 3 weeks. TEPP, Tedion, and Guthion were ineffective. Promising experimental acaricides were: RP 11974, Omite, SD 9129, UC 19786, Nissol, and the systemic UC 21149.

Stan Hoyt:

Union Carbide 20047A provided outstanding control of the McDaniel spider mite and gave good control of the European red mite although in two tests the eggs were not killed. Shell Development 9129 and UC 19786 gave good control of both species although the residual action was shorter than with UC 20047A. The initial reduction of the populations of mites was slow with Omite, but good control was provided. Two new materials, C 8514 and Nissol, gave excellent control of European red and McDaniel spider mites. G 13005 provided a good knockdown of McDaniel spider mite but relatively short residual control. Micasin, Milbex and CPAS gave poor control of the McDaniel spider mite and were inconsistent against the European red mite. Neocide provided good control of the European red mite when applied at the prebloom stage of bud development.

Typhlodromus occidentalis virtually eliminates McDaniel spider mite populations from apple orchards within two years if the predator population is not reduced too extensively by chemicals. T. occidentalis will, in most cases prevent summer outbreaks of European red mite if a delayed dormant or prepink spray is applied for this pest. While T. occidentalis does feed on the apple rust mite, it will not maintain adequate control of the rust mite.

Several materials which control codling moth, aphids, apple rust mites or plant diseases have been shown to allow some survival of the predators. Programs using several of these materials have allowed sufficient predator survival to control McDaniel spider mite and European red mite.

John A. Quist:

Substantial outbreaks of the European Red Mite occurred throughout Delta County during the 1965 season. Spray tests established in Hotchkiss, Colorado, for control of the European Red Mite were applied on July 21. About 30 days later test results showed UC 20047A, Systox, Ethion, Morestan, and Meta-systox R provided the best control in that order.

Donald W. Davis:

One orchard at Orem, Utah, was used in a replicated experiment for the control of two-spotted mite. At the time the work was started, this was intended to be work with the McDaniel mite, but a population shift had taken place between the 1964 and 1965 seasons. Much of the experimental work in this orchard was directed toward obtaining residue samples and evaluation of mite control was imcomplete on some chemicals. Without question, the outstanding material was SD 9129 (Azodrin). Chloropropylate and Milbex showed excellent results. Micasin, 37344, and Morocide were less effective and resulted in only fair seasonal control from a single application. There was no phytotoxicity from any material.

Donald W. Davis:

The mite problem in Utah orchards was less severe than in any recent season. The problem that did arise came late. Several orchards normally infested with McDaniel mites were attacked primarily by the two-spotted mite in 1965. One orchard, located at Bountiful, Utah, was used in a replicated experiment for McDaniel mite control. Five materials: Omite and C940 (Naugatuck), 20047A and 19786 (Union Carbide), and a special formulation of Kelthane, resulted in excellent seasonal control from one application. Two applications of Karathane plus B1956 resulted in good control. Thiocron and Meta-Systox R were unsatisfactory. A non-43plicated treatment with granular UC 21149 was ineffective.

R. S. Downing:

Summer Sprays for Orchard Mite Control

Excellent control of European red mite was obtained by summer applications of: CIBA 8514 50% E.C. 1 pint, Morestan 25% W.P. 1/2 lb., Pennsalt Superior oil 1 gal., Micasin 50% W.P. 1 lb., Milbex 25% W.P. 1 lb., or C.P.A.S. 20% W.P. 1 1/4 lb. Chloropropylate 50% W.P. 0.6 lb., Omite 85% E. 7.2 fl. oz. and C940 85% E. 7.2 fl. oz. were somewhat inferior to those above.

Of the above miticides, CIBA 8514 and binapacryl gave excellent control of the McDaniel spider mite. Morestan, Milbex, Micasin, C.P.A.S. Chloropropylate and Omite gave good control whereas Pennsalt Superior oil and C940 85% E. 4 fl. oz. per gal. gave poor control.

R. S. Downing:

Effect of Early Season Sprays on Predaceous and Phytophagous Mites

Dormant or late delayed dormant sprays of ethion plus oil were extremely toxic to the predaceous mite, Neoseiulus caudiglans (Schuster). Sprays of oil alone applied at the same times were only slightly toxic to the mite.

Late delayed dormant application of either ethion plus oil or oil alone was much more effective against European red mite than a dormant application of these two sprays.

R. S. Downing:

Pink Bud Sprays for European Red Mite Control

C.P.A.S., Milbex, and Micasin, applied at 1 lb. or 1 1/2 lb. per acre based on active C.P.A.S. content, gave good control of European red mite, equivalent to that of Morestan 25% W.P. 3 lb. per acre.

R. S. Downing:

Effect of Miticides on a Predaceous Mite

Summer applications of Morestan 25% W.P. 1/2 lb., Chloropropylate 50% W.P. 0.6 lb., Omite 85% E. 1/2 lb., Karathane 25% W.P. 1 lb., and especially CIBA 8514 50% E. 1. pint, almost eliminated the predaceous phytoseiid mite, Neoseiulus caudiglans (Schuster). Micasin 50% W.P. 1 lb., Milbex 50% W.P. 1 lb., and C.P.A.S. 20% W.P. 1 1/4 lb. per 100 gal. were moderately toxic whereas Pennsalt Superior oil 1 gal. was the least toxic.

San Jose Scale

C. V. G Morgan and A. D. McMechan:

Control of the San Jose and European Fruit Scales by Air-Blast Sprayers

Because of the San Jose scale, Aspidiotus perniciosus Comstock and the European fruit scale A. ostreaeformis Curtis, lodge underneath the rough bark they are very hard to reach with low-volume air-blast sprays. To be effective the spray material must run down behind the bark scales. With air-blast sprayers, this requires at least 200 gallons of spray mixture per acre applied in the usual manner of spraying trees from two sides only.

C. V. G. Morgan:

Insecticidal Control of the San Jose Scale

Field and laboratory experiments upon the control of San Jose scale demonstrated there was little difference in control from dormant oil alone, oil-lime sulphur, or oil-organic phosphate combinations. The data indicate that oil alone at 2% is sufficient to give San Jose Scale control.

Lime sulphur at 8% in the pink stage selectively killed off many males and a number of female scales did not bear young due to lack of fertilization. A similar but more pronounced action was obtained from parathion and diazinon applied at the time of the first codling moth spray.

Rain Beetles (Pleocoma)

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

Laboratory evaluation of an ethylene dibromide emulsion indicated poor control of grubs at soil depths over about five inches even at high rates of fumigant application. Field tests with high rates of dieldrin, heptachlor, VC-13, Baygon, Zinophos emulsions, and UC 21149 granular all had live grubs in the treated plots six months after the fall applications.

PEAR INSECTS AND MITES

Pear Psylla

H. F. Madsen:

Supreme oil (vis. 142) was more effective than Shell oil (vis. 60) or Orchex oil (vis. 58.5) as dormant or delayed dormant sprays for control of over-wintered adults of the pear psylla. At a dosage of six gallons per acre, there was no difference in control when the materials were applied at the rate of 60 gallons per acre or at 400 gallons per acre. A combination of Supreme oil at 2 gallons per acre plus Dilan at 3 pounds 50% per acre gave excellent control as a dormant spray.

Morestan and Dilan gave good control of the pear psylla when applied as either a dormant or a delayed dormant spray. Imidan did not provide acceptable control.

H. F. Madsen and K. Williams:

Supreme oil (vis. 142) gave a better kill of pear psylla adults and nymphs than either Shell oil (vis. 60) or Orchex oil (vis. 58.5) when compared as foliage sprays on Bartlett pears. Analysis showed that Shell oil and Orchex oil dissipated rapidly while Supreme oil was persistent upon foliage. Shell oil and Orchex oil caused leaf spotting and light fruit russet, but Supreme oil was not phytotoxic to either foliage or fruit.

P. H. Westigard:

A definite resistance to Guthion by the pear psylla was noted in many Rogue Valley pear orchards during 1965. The most pronounced difficulties occurred in orchards where the pre-bloom sprays had been omitted. Generally, hardshells were not killed and less than 50% of the adults were affected when Guthion at 4 - 6 lbs. per acre was applied. However, early instar psylla were still controlled at these rates. Growers with high populations of psylla obtained control with either Guthion or Perthane in two applications spaced about 10 days apart. Other growers had success with a variety of combinations, rates and timings. Included in these was economic control obtained with Guthion at 1 lb. per acre plus oil at 2 gallons per acre applied at 100 gpa. Applications were spaced about 10 - 14 days apart through the entire season.

E. C. Burts:

Dormant sprays or dusts of Perthane applied either by ground equipment or aircraft were found to be very effective against overwintered psylla adults. When these sprays were applied just before the psylla began laying eggs, seasonal control was accomplished with one to three less summer sprays than was necessary under the conventional spray program. Of the several pesticides evaluated this season for control of pear psylla, only Nissol, a compound from Japan being developed in this area by Pennsalt Chemical Corp. and TDE were found to be effective against populations resistant to organophosphorous and cyclodiene compounds.

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

With one exception pre-bloom sprays of Dilan, Morestan and Perthane applied at the pink stage of development gave better psylla control than the earlier delayed dormant treatments of oil, lime sulphur, or combinations of the two. Volck Supreme oil applied at the 2.0 gal./100 rate was the only delayed dormant treatment providing control comparable to the better pink treatments.

Although four speedsprayer applications of Morestan WP applied between March 29 and July 14 at 6 oz./100 gal. gave adequate psylla control, considerable leaf and fruit marking resulted.

Of the registered materials available for summer use the following treatments looked the most promising. Morestan WP, Guthion WP + Volck Supreme, Guthion WP + ethion WP, Guthion WP + Perthane WP, Humble 60 vis oil, Volck Supreme, Perthane EC, Perthane WP, Perthane WP + ethion WP and nicotine sulphate + Volck Supreme. The only new materials showing promise as psyllicides were RP 11974 EC and Nissol EC.

R. D. McMullen:

Effect of Cover Crop of Pear Psylla Predators

Cover crops consisting mainly of herbaceous annual weeds supported a much higher density of predatory insects that prey on psylla in pear trees than did grass sod cover crops. In pear orchards with grass cover crops Anthocoris spp. and Chrysopa spp. comprise 80 - 90 percent of the predator population in trees. In orchards with weedy cover crops these species represented only 40 - 50 percent of the predators. The balance of the predator population consisted mainly of Dereaocoris sp. and Diaphnidia sp. Of six experimental blocks, three with grass cover crops required insecticide applications to control psylla in early July, whereas three with weedy cover crops did not require sprays for psylla control at any time during the season.

R. D. McMullen:

Effects of Insecticides on Pear Psylla Predators

Perthane and Guthion practically eliminated pear psylla predators from test blocks. Anthocoris spp. and Chrysopa spp. were highly resistant to DDT and actually increased in numbers in test blocks, probably due to removal of competing species. Malathion completely eradicated Campylomma sp. but allowed the survival of moderate to high populations of Anthocoris spp., Chrysopa spp., and Dereaocoris sp. Thiodan was highly toxic to Campylomma sp., moderatley toxic to Anthocoris spp., and slightly toxic to Chrysopa spp. and Dereaocoris sp. Morestan was slightly to moderately toxic to all of the aforementioned species. Ryania showed high toxicity to Campylomma sp., moderately toxic to Anthocoris spp. and Dereaocoris sp. and slightly toxic to Chrysopa spp.

R. D. McMullen:

Toxicity of Fungicides to Pear Psylla

Maneb, 80% WP; Dithane M45, 80% WP; Dithane S-31, 79% WP; Polyram 80W, 80% WP, and NIA 11130, 80% WP gave equal or better kill of all nymphal stages of pear psylla than Perthane, 40% WP, all applied at 5 lbs. of formulated material per 100 gal. Against adults the fungicides were only 30 - 50 percent as effective as

Perthane. None of the materials were effective against eggs. Perthane residues on leaves remained toxic to newly hatched nymphs for one week. Residues of the fungicides were effective for six to eight weeks. No phytotoxicity was noted except for slight bronzing of leaves under heavy deposits of Maneb.

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

An encyrtid wasp parasite of pear psylla, Trechnites insidiosus, was determined for the first time in Hood River, although parasitized psylla nymphs had been observed in a commercial orchard during 1964. The encyrtid was established on psylla in a caged tree but did not control the infestation by October. Several commercial orchards up to seven miles apart are known to harbor the parasite which may have reduced the psylla to a very low level in one young orchard. A second wasp, a pteromalid, was identified as being either a psylla parasite or a hyperparasite from this same location.

John L. Nickel:

Natural control of pear psylla was less effective at San Jose in 1965 than it has been for the past three years. Populations of nymphs and adults in the untreated plots reached peaks of 4 per leaf and 11 per tray respectively and produced much honeydew. Anthocorids whose population had declined early in the Fall of 1964, did not appear in significant numbers until August, and then at a lower level in relation to the prey than in previous years.

Psylla populations in an untreated orchard at Lafayette reached an unprecedented high of 195 adults per tray by early August. Peak nymph populations in September though high at 6.8 per leaf, were less than expected from the large numbers of adults and eggs. This was probably due to the appearance of a fairly large number of anthocorids in late August.

Integrated control studies at San Jose and Walnut Grove indicated Guthion, petroleum oil (Humble 70) and Imidan to be highly effective against pear psylla. Ryania was not effective against pear psylla but was very destructive to Anthocoris. Ryania apparently controlled rust and blister mites and did not result in the build-up of European red and two-spotted mites noted with Imidan and Guthion.

Orchard Mites

John L. Nickel:

Timing tests with Morestan against 2-spotted mites indicated that it gave effective control when applied in either the first cover spray or as a pre-harvest treatment. It was less effective in preventing a serious mite build-up by harvest time when applied in the 2nd cover spray. Superior oil sprays (Humbel 70) at petal fall did not protect the trees against injurious European red mite build up by July. When applied in late May, however, good seasonal control was achieved. The incorporation of petroleum oils (Humbel 70 and Volk Supreme) with the normal Guthion cover sprays gave excellent control of two-spotted and European red mites. Two-spotted mites were able to move onto the trees from ground cover, however, by late August. Moderately high mite populations could be tolerated in June, but relatively low populations in July were able to cause serious leaf burning.

John L. Nickel:

Morestan provided the best and most long-lasting control of European red mites when applied as a preventative spray at petal fall. Petroleum oils (Humble 70 and Volk Supreme) and Milbex were moderately effective as preventative, petal-fall sprays, permitting mite populations of 3 - 4 mites per leaf by mid-July. Morestan, the petroleum oils, and Azadrin were highly effective as mid-summer curative treatments, while Milbex and Micasin gave only fair control.

P. H. Westigard:

Evaluation of materials for control of the carpini or yellow mite indicated a lack of control with some materials effective against the two-spotted mite. Materials found highly efficient included Ovex, Morestan, Trithion and Ethion. Kelthane and Morocide gave only partial control. On the following page is a summary of results obtained with applications of materials evaluated for control of the two-spotted mite:

Control of Two-Spotted Mite
Summary

Material	Rate/100	*-Timing	Rating **- Poor	Fair	Good	Excellent
Aramite	1.5 lbs.	P.H.	x			
DEF	1.0 qt.	P.H.			x	
	1.0 pt.	P.H.				x
Morestan	1.0 lb.	P.H.	x			
	1.0 lb.	P.B.	x			
Milbex	1.0 lb.	P.B.	x			
	1.0 lb.	F.		x		
Shell 9129	1 pt.	P.H.		x		
DO-14 (Omite)	1 lb.	F.		x		
Micasin	1 lb.	F.	x			
Morocide	1/2 lb.	F.		x		
Morocide + Glyodin	1/2 lb. 2 oz.	F.			x	
Morocide + R516	1/2 lb. 2 oz.	F.			x	
Shell 9129	1 lb.	F				x
Shell 9129	1/2 lb.	F.				x
Shell 9129	1/4 lb.	F.	x			
Chipman 11974	1-1/2 lbs.	F.		x		
Hooker HRS 1635	2 lbs.	F.	x			
Chloropropylate	1 lb.	F.			x	
Chloropropylate	1 lb.	F.			x	
Chloropropylate + Tedion	3/4 + 3/4	F.		x		
Chloropropylate + Sequestrene 330	1 lb.	F.	x			
Tedion	1 lb.	F.	x			
CPAS	1 lb.	F.	x			
Kelthane A.P.	2 lbs.	F.			x	
Kelthane A.P.	4 lbs.	F.			x	
Kelthane 5950B	1 lb.	F.			x	
Kelthane 5950B	2 lbs.	F.			x	
Kelthane 5950M	1 lb.	F.			x	
Kelthane 5950M	2 lbs.	F.			x	
Humble Oil WSX 6070		F.			x	
Humble Oil WSX 6070		F.		x		
Volck Supreme Oil		F.			x	
Volck Supreme Oil		F.			x	
Maximol Oil		F.			x	
		F.			x	
Niagara Lt-Med Summer		F.		x		
Shell Lt. Summer		F.		x		
Shell Lt. Summer		F.	x			
Trithion		F.		x		

*- Post harvest (P.H.); Pre-bloom (P.B.); Foliar (F).

**- Rating based on comparison within individual test compared to other materials and untreated check in same test.

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

Lime sulphur-oil applied in February gave better pear leaf blister mite control than when applied during March.

Codling Moth

John L. Nickel:

Guthion at 1 oz. Imidan at 8 oz. and Ryania at 4 lb. active ingredient per 100 gallons of spray were applied to pears on May 19 and June 30. Codling moth infestations at harvest (Aug. 9) were 5.1% (Guthion), 4.0% (Imidan) 10.0% (Ryania) and 74.8% (untreated).

P. H. Westigard:

One trial was conducted for control of the codling moth to test rates and timings of Guthion, Guthion plus oil and Imidan. Deletion of only the first cover in May still resulted in 81.5% wormy fruit. Omitting the first and second covers resulted in 96% wormy fruit very close to the 97% occurring in the untreated portion of the orchard. Guthion at 8 lbs. in 3 covers provided perfect control and only 2% worms occurred where this was reduced to 4 lbs. per acre. Guthion at 2 lbs. per acre in 3 covers gave 18% wormy fruit and Guthion at the same rate plus 4 gallons of Humble oil resulted in 14.5% wormy fruit. Imidan in 3 covers resulted in 2% worms.

S E C T I O N I I

INSECT AND MITE PESTS OF STONE FRUITS

CHERRY INSECTS AND MITES

Cherry Fruit Fly

S. C. Jones:

Sevin 50% WP., 2#/100 and GS-13005 40% WP., 2#/100 were compared for cherry fruit fly control in the Oregon State University orchard during the current season. The GS-13005 plots were sprayed on May 27 and again on June 7. The Sevin plots were sprayed on May 27, June 10 and June 21.

Cherry samples of 2,090 and 2,041 taken from the GS-13005 plots on July 8 and 21 respectively showed no maggots. Cherry samples of 1,896, 1,775 and 1,865 taken from three Sevin plots on July 8 and 13 respectively showed one maggot in the July 13 sample in montmorency cherries. Rather serious foliage injury developed in the plot sprayed with GS-13005. The third application of GS-13005 was omitted because of the injury.

Fruit-Tree Leaf Roller - Cherries

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

Damage to sweet cherries by leaf roller larvae was evaluated in The Dalles area by sampling fruits during harvest. A 2-3 week hatch of overwintering eggs was observed in two heavily-infested orchards. Delayed dormants currently recommended are not controlling the infestations and two applications of DDT (popcorn and petal-fall) reduced the damage to fruit over a single (popcorn) application.

Plum Nursery Mites

E. W. Anthon:

The following materials showed the most promise for the control of this mite: Union Carbide's 20047A, Milbex, Thiodan, Naugatuck's C-940 and Omite, Shell's 9129, Morestan, Morocide, Bay's 5417, 5418, 58733, Humble oil, Volck oil and Nissol.

PEACH INSECTS AND MITES

Green Peach Aphid

E. W. Anthon:

Under field conditions the following materials showed the most promise: Meta-systox, Shell 9129, Union Carbide's 20047A, Thiodan and Baygon wettable powder.

Peach Twig Borer

E. W. Anthon:

Preliminary investigations in the rearing of this insect shows that the larva of this insect may be successfully reared on an artificial diet. Further studies will be needed to rear them through mating and egg laying periods. DDT plus Parathion and Sevin applied on the late summer twig borer larva gave the best control of this insect.

John A. Quist:

Efforts to colonize the peach twig borer in the laboratory have failed. 706 adult moths were emerged from infested apricots. Egg deposition was forced by placing caged adults in the orchard overnight. One complete generation was reared in the laboratory. The female sex pheromone was demonstrated for the twig borer, and a total of 200 moths were collected in 44 traps, each containing five live female moths. White traps collected four times as many moths as black traps. Traps containing sugar water solution as food for female moths collected 25% more moths than those without food. Traps placed high in the tree collected twice those placed low.

McDaniel Mites

E. W. Anthon:

Under field trials the following materials gave good control of this resistant mite: Morestan, Union Carbide's 19786 and 20047A, Shell's 9129, Milbex, Micasin, Naugatuck's Omite, C-940, Morocide, Bay's 5417, 548733, and 5418.

European Red Mite

E. W. Anthon:

Experimental field trials showed the following materials to give good control of this mite: Morestan, Union Carbide's 20047A, 19786, Naugatuck's Omite, C-940, Bay's 5417, 5418, 58733, Shell's 9129 and Morocide.

Two-spotted Mites

E. W. Anthon:

Under laboratory experimental trials the following materials gave good control of this mite: Milbex, Micasin, Bay's 58733, 5417, and Kelthane.

Ladybug Beetles

E. W. Anthon:

Preliminary studies of the toxicity of a few insecticides against Hippodomia convergens show that most of the materials at these high dosages were broadly toxic to larva and adults of the ladybug beetles. The materials that were least toxic to the adults were Thiodan and Tedion. The insecticides were the least toxic to the larva were Morocide, Morestan, Union Carbide 20047A, and Thiodan.

Oriental Fruit Moth

John A. Quist

Miscellaneous mid-summer collections of peach terminals provided experience in rearing the Oriental Fruit Moth, but colonies failed to become established in the laboratory. Two species of parasites were encountered in the summer collections; the principle recovery was the OFM parasite Macrocentrus ancylivorus at 25% parasitism. One specimen was recovered which the U. S. National Museum questionably placed in the genus Diadegma sp. unknown. An Oriental Fruit Moth infestation in Salway peaches late in the season provided material for laboratory colonization. 125 bu. of fruit averaged 25% infestation. The OFM parasite Macrocentrus ancylivorus accounted for nearly 9% parasitism. The codling moth parasite Ascogaster quadridentata accounted for 1% parasitism.

Peach Tree Borer

John A. Quist:

Two new records of peach tree borer parasites were obtained for Colorado. The principle parasitic species of the peach tree borer was Cryptus sp. (albitarsis group) family Ichneumonidae. This species apparently produces 7-15% parasitism. Exact figures are not possible because of high mortality to pupae of the borer. The second species was determined by the U. S. National Museum as Ichneumon ? ambulatorius. The species is known only as a parasite of Noctuidae.

S E C T I O N I I I

INSECT AND MITE PESTS OF NUT CROPS

FILBERT INSECTS AND MITES

Filbert Aphid and Bud Mite

S. C. Jones:

Systemic insecticide UC-21149 10% granular was applied on the ground under eleven year old filbert trees on May 7, 1965. Three single tree plots were treated with 1/2 pound per plot and three with one pound of the granules per plot. The granules were covered immediately with a thin layer of soil and watered down on May 10. A power sprayer without the use of hand guns was used to water down the plots. The plots were sprinkled with an overhead sprinkling system on May 14. Aphid counts were made on June 4, June 22, July 1, July 19 and August 5. Excellent control was obtained for a period of over 60 days. Little or no difference was noted between the 1/2 pound and one pound concentration. The material did not control the filbert bud mite.

Comparison of Certain Pesticides in the Control of the Filbert Aphid

Sevin, Thiodan, Systox and Phosphamidon were compared for the control of the filbert aphid. Each material was replicated three times on heavily infested single tree plots. One foliar spray was applied on June 10 using a power sprayer with hand guns. Aphid counts were made on foliage taken at random in the plots on June 22, July 1, July 19, and August 5.

Systox was most effective giving excellent control for the season. Thiodan and Phosphamidon were effective in controlling aphids for 55 days. Sevin controlled the aphids for 39 days. Additional sprays with Sevin for filbertworm control should give seasonal control of the aphids.

WALNUT INSECTS AND MITES

Walnut Husk Fly

John L. Nickel:

Economic level studies were conducted with the walnut husk fly in Payne and Eureka variety walnuts. Under 1965 conditions, in which walnuts were harvested several weeks earlier than normal, none of the three Payne fields observed developed damaging husk fly populations before the husks split. Sprays were applied to Eureka fields at various population levels. None of the total of 12 plots in 3 fields had a significant number of nuts stained at harvest, though some had accumulated as many as 165 flies per trap before the population was brought down with insecticidal sprays.

Field biological studies indicated that husk fly larvae pupated near the surface in a field which had been irrigated after the final cultivation. In a nearby field, which had been cultivated after the final irrigation most pupae were found between the 3rd and 4th inches below the surface. When pupae were buried at 1/2" and 3 1/2" below the surface, summer emergence was low in all cases, but the few which did emerge suggested a pattern in which winter mortality was greatest for the shallow pupae and summer mortality was greatest for deeply buried pupae.

In tests with systemic insecticides on nuts which were sprayed 1 week before or one week after oviposition, dimethoate, Bidrin, and phosphamidon gave complete control in each case. Phosphamidon was tested at 2 weeks prior to and 2 weeks after oviposition. Though larval kill was excellent in both cases, the 2 week post-oviposition treatment came too late to prevent staining of approximately 25% of the infested nuts. In another experiment, trees which were severely infested with walnut husk fly were sprayed with phosphamidon. The results of this experiment indicated that larval kill occurred soon enough to prevent staining of nuts which had only a moderate amount of mining at the time of treatment.

Walnut Aphid

John L. Nickel:

Economic level studies were initiated at Hollister to assess the effects of different levels of mid-to late season aphid infestations of walnut aphid on walnut yield and quality. All plots had low aphid population in the early part of the season due to a spring BHC application to the entire fields. As populations rose in July and August, however, different plots were treated at different aphid population levels. Plots bearing aphid populations over 20 per leaflet for 0, 1, 2 and five weeks produced 5.3, 7.4, 9.9, and 16.3 per cent shrivelled nut meats, respectively. In the codling moth control plots at Brentwood the DDT plots, which had an aphid population of over 50 per leaflet for 2 weeks in June, had 22.6% nut meats shrivelled, compared to 4.0% for the Guthion plot in which aphid populations never exceeded 0.3 aphids per leaflet.

Studies on natural control of walnut aphid, in an untreated orchard at Brentwood, indicated a sharp drop in the aphid population in mid-July, but only after it had reached the very high level of 145 aphids per leaflet. Temperatures of over 95°F. and a high lady beetle population were associated with this sudden decline but an exact causal relationship has not been worked out.

Codling Moth

John L. Nickel:

Phosphamidon at 8 oz. in the 1st spray, 2 2/3 oz. in the 2nd and 3rd sprays, Guthion at 4 oz., DDT at 1 lb., and Thuricide 90TS at 2 qts. per 100 gallons of spray were applied to Payne walnuts near Brentwood in 300 gallons spray per acre on May 10, June 29, and July 28. Codling moth infestations at harvest were 6.5%, 6.0%, 10.8%, and 14.3% respectively. The erroneous high dosage of Phosphamidon in the first spray caused severe leaf burning. The unusually poor performance of Guthion and DDT was possibly due to the fact that the dosages used were lower than those usually employed against codling moth in walnuts.

S E C T I O N I V

DISEASES OF STONE FRUITS

PEACH DISEASES

Rhizopus Rot

N. S. Luepschen:

In a preharvest spray application for control of Rhizopus decay, Botran at 3/4, 1 and 1 1/3 lbs./100 gals. gave superior control in comparison with Captan, Difolatan or Daconil 2787. The highest concentration of Botran (1 1/3 lbs.) gave residual protection for more than a week following spray application. However, defuzzing of peaches removed a substantial amount of the Botran residue. Wet brushing removed 90% of the residue, decreased control by 50%; dry brushing removed 60% of the residue, decreased control by 45%.

A Botran surfactant study, using municipal tap water (pH 8.2) for the spray water, showed that very little benefit (N.S.) resulted from added surfactants to the Botran 75W formulation.

Botran 75W @ 1 lb./100 plus		%Rhizopus Rot	DCNA - ppm
Atlox 209 -	6 oz.	4	7
Triton B1956 -	6 oz.	8	10
Atlox 210 -	6 oz.	9	9
Ortho X-77 -	6 oz.	11	8
Plyac -	4 oz.	12	11
Tween 20 -	6 oz.	12	8
Triton X-100 -	6 oz.	12	6
Niagra 70 oil -	1 qt.	12	8
Orto spreader-sticker -	4 oz.	13	7
no surfactant -		13	7
Buffer - X	8 oz.	14	4
Multifilm Spray Tac -	6 oz.	20	5
unsprayed checks -		54	0

Cytospora Canker

N. S. Luepschen and L. E. Dickens:

A post-pruning fungicide spray trial, in delayed-dormant stage, in combination with BHC and oil, was made on Giant Elberta trees immediately following pruning. No other wound dressing was used. In November, counts were made of newly infected wounds on cuts of 1/2 inch diameter or larger. Kolofog sulfer (6 lbs.) and Phygon XL (1/2 lb.) gave some control, particularly the former, however the data were inconclusive. Fixed coppers (3 lbs.), Ferbam (2 lbs.), Polysulfide (7 lbs.) and Tag Mercury (1/2 pt.) were ineffective.

S E C T I O N V

DISEASES OF POME FRUITS

APPLE DISEASES

Apple Powdery Mildew

Duane L. Coyier:

Candidate powdery mildew fungicides were tested on apple seedlings grown under burlap shade and in 1-gallon containers. Incidence of powdery mildew and phytotoxicity was recorded at the termination of each test. Karathane was used as a standard. Morestan treatments provided excellent disease control each of the three times the test was repeated. No Morestan injury was noted during cool weather, but it was observed during warm weather. Other fungicides that showed promise for powdery mildew control were: TH-093-F, Hercules 10702, UC 23271, E.F. 12,733, CS-3900 and DuPont 4472. Some of these materials performed better during cool rather than warm weather and vice versa. No phytotoxicity was noted on plants sprayed with CS-3900 and only minor phytotoxicity was observed with DuPont 4472 or TH-093-F.

Morestan dust was compared with karathane dust for control of powdery mildew on Newtown apples under field conditions. The chemicals were applied with a 2-sided tractor mounted Byberg duster. Three applications (4/29, 5/7 and 5/13/65) were made and mildewed terminals were counted on June 24. Full bloom occurred in this block on April 27. Control was excellent in both plots. Only 1.55 percent of the terminals in the karathane plot were infected with mildew and 1.58% were infected in the Morestan plots.

Fungistatic Activity of the Scald Suppressing Compounds, Diphenylamine and Santoquin

L. E. Dopatecki:

Comparative tests with Cyprex were made to determine if suppression of bull's eye rot of apples by D.P.A. and Santoquin was related to fungistatic activity. Cyprex appeared a potent inhibitor of spore germination of *Gloeosporium perennans*, but somewhat less active against mycelial growth or spore respiration. D.P.A. inhibited mycelial growth and spore germination, Santoquin mycelial growth only. Fungistatic values against mycelial growth of D.P.A. and Santoquin at concentrations that suppress scald were essentially similar to the fungistatic value of Cyprex at 1/2 lb. per 100 gals.

PEAR DISEASES

Fireblight Resistance of Standard and Dwarf Strains of Stewart Bartlett

L. E. Lopatecki:

Tests of fireblight resistance of the standard as compared to the dwarf strain of Stewart Bartlett indicates that under Summerland conditions both strains are moderately resistant to blight. Percentages of successful under bark inoculations in the standard and dwarf strains were 26% and 43% respectively, compared to 77% in the control. Needle inoculations produced infection in the control strain only. Rate of movement of blight in tissues of all three strains was essentially similar.

Control of Storage Rots of Anjou Pears with Post-harvest Fungicidal Dips

L. E. Lopatecki:

Anjou pears dumped in water and then packed in poly bags developed 2.6 times as much rot in cold storage as fruit packed dry. Sufficient soda ash added to the water to float the fruit produced a significant reduction in storage rot. Additions of Stop Mold or Captan at 1.0 lb. per 100 gals. did not alter rot control, while Captan at 2 lb. and Difolatan at 3/4 lb. produced a significant reduction. Best results were obtained with Difolatan, with a 78% reduction of storage rot.

S E C T I O N V I

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

SPRAY RESIDUES

K. Williams:

The addition of oil to endosulfan or Carbaryl had little effect on the persistence of these compounds on apple fruit and foliage. Results indicate that the use of summer oils will not result in increased residues at harvest.

A concentrate spray application of Perthane to pears resulted in the following residues on foliage: 4 lbs. actual per acre - 0 days 6.0 ppm; 7 days 3.4 ppm; 21 days 1.9 ppm. 8 lbs. actual per acre - 0 days 11.6 ppm; 7 days 5.4 ppm; 21 days 1.4 ppm. Results show that Perthane residues are reduced to one-half their original value in about 7 days.

Ulo Kiigemagi and L. C. Terriere:

DDT in orchard soils: Soils from two Oregon orchards have been examined for residues of halogenated insecticides. Most of the residues found were DDT analogs and metabolites. Approximately 130 pounds or 33% of the 388 pounds of DDT applied to the Hood River orchard in the last 20 years and 73 pounds or 42% of the 169 pounds applied to the Medford orchard, is still present in the soil. The actual distribution of the DDT in the soil is given in the following table.

Soil level, inches	DDT distribution			
	Hood River		Medford	
	ppm	Per cent	ppm	Per cent
0 - 6	59.8	88.3	38.0	86.8
7 - 12	3.9	5.3	3.3	8.7
13 - 24	1.5	4.7	0.5	2.9
25 - 30	1.1	1.7	---	---
25 - 36	---	---	0.3	1.6

Part per billion levels of the pesticides were present in water thought to emanate from one of the orchards. Waste lands adjacent to the orchards have accumulated about 5 pounds of DDT per acre. Considering all avenues of loss, except evaporation and degradation, approximately 50% of the DDT applied to the orchards has been accounted for.

PHYTOTOXICITY AND COMPATIBILITY

C. V. G. Morgan, K. Williams, H. F. Madsen:

Safety of Dormant Oil Sprays on Winter-Weakened Trees

There has been controversy about the safety of applying dormant oil sprays to orchards following severe winters. The winter of 1964-65 was one of the most injurious winters on record, resulting in a loss of crop on peach, cherry, apricot, Bartlett pears and Newtown apples. Many trees were killed outright and others lost fruit and leaf buds. The situation provided an excellent opportunity to test the safety of dormant sprays. Lime sulphur 4% and 8%, dormant oil 2% and 4% and the two in combination were applied to Newtown, McIntosh, Rome Beauty, Winesap, and Delicious apple trees in several areas of the Okanagan valley. No adverse effect was noted on these trees. On Bartlett pears, oils varying in viscosity from 58.7 to 220 SSU were applied to winter injured trees as both dormant and delayed dormant sprays. No injury was noted from any of the oils on trees which had moderate to severe winter injury.

H. F. Madsen and K. Williams:

The following materials and combinations were evlauated for phytotoxic effects on 8 apple varieties: Morestan; Morestan and Carbaryl, Carbaryl; Carbaryl and oil; Endosulfan; Endosulfan and oil; Guthion and oil; and oil alone. Morestan caused leaf injury and fruit injury to Golden Delicious, Red Delicious, Rome, McIntosh, Spartan, Jonathan and Newtowns. Winesaps showed leaf injury but no fruit injury. Morestan and Carbaryl produced the same type of injury but the effect was more severe. Carbaryl and oil caused moderate leaf damage to all varieties, and fruit damage on Golden Delicious. Endosulfan and oil and Guthion and oil also caused a light fruit russet on Golden Delicious. All of the oil-insecticide combinations produced yellowing and defoliation of the primary leaves on Jonathan.

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

Of the pesticides tested during 1965, the following compounds and combinations resulted in some degree of leaf and/or fruit injury: apples - DuPont 4472, FE330 chelate, Imidan, and Morocide. To pears - Diazinon technical-Polybutene H-300, Perthane-Volck oil, UC 21149, and Morestan alone, prior to, or subsequent to the application of petroleum oils.

Duane L Coyier:

Liquid lime-sulfur (5 gal/100 gal) plus oil emulsion (3 gal/100 gal) was applied to D'Anjou pear buds at several stages of development beginning in the dormant period. The latest spray was applied when the buds had separated and the flower parts were readily distinguishable. Bud counts were made prior to flowering and the fruit count was recorded just before harvest. Late application of lime-sulfur-oil resulted in a substantially lower percent fruit set than unsprayed checks. Injury increased directly with the developmental stage of the buds at the time the spray was applied. These results support data from the two previous seasons.

CONCENTRATE SPRAYING

E. C. Burts:

Results obtained from concentrate spray trials this season again support previously gathered data indicating that this method of application is effective against many of the insect and mite pests of tree fruits. No problems of phytotoxicity were encountered this year with materials applied in concentrate sprays.

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