Investigations into the Effect of Pesticides and Oil on Bartlett Pear Insect and Mite Populations and on Fruit Finish in 1986.

INTRODUCTION

Extensive data exists showing the negative effects of synthetic pyrethroid insecticides on beneficial insects and mites in Bartlett pear orchards. The destruction of predators, especially the predatory mite, Typhlodromus sp., usually results in elevated levels of spider mites. Chemical miticides are then require to control these pest mites. Because of the frequent and often heavy use of miticides in some pear districts, spider mites have developed physiological resistance to many of the currently available mite compounds. Economic mite control is in jeopardy where resistance exists.

It has long been known that use of dormant and foliage oils is effective in reducing populations of spider mites and pear psylla. In fact, many Bartlett pear orchards in California annually rely on dormant and foliage oils as their main miticide and psyllacide. Where pyrethroid use is minimized or eliminated, excellent psylla and mite control can be accomplished with the aid of oil sprays.

There continues to be considerable industry concern regarding the effect of foliage oils on fruit finish. Much of this concern originated when foliage oils were less refined and of considerably lower quality than modern spray oils. Because foliage oils can be of significant value to an integrated mite and psylla management program, the effect of oil residue on fruit finish needs to be re-examined.

It was the intent of this empirical study to develop data showing the relative effects of a pyrethroid-miticide ("hard") chemical program versus a phosphate-oil ("soft") chemical program on the orchard arthropod complex and on fruit finish.

METHODS

Three 10-20 acre commercial Bartlett pear blocks were examined, one block each in El Dorado County, the Sacramento River delta and the Suisun Valley district. Treatments consisted of;

1. "Hard" Program

Pydrin 2.4 EC at 8 ozs. per acre plus Vendex 4L at 1 lb. per acre in each of 3 cover sprays in the Solano and El Dorado County

districts and in the Delta trial a Pydrin 2.4 EC plus Vendex 4L (same rates) in the first cover spray followed by Guthion at 2 lbs. per acre plus Vendex 4L at 1 lb. per acre in the subsequent cover sprays.

2. "Soft" Program

Guthion 50 WP at 2 lbs per acre plus summer oil (Volck supreme in the El Dorado trial and the lighter superior type oil in the other trials) at 4 gal./ac. in each of three cover sprays in each trial.

All sprays were applied in 100-125 gallons of water per acre.

Each replication was evaluated twice during the growing season. A total of 100 leaves were collected from both the tops and bottoms of 20 trees in each replication (400 leaves per trial). In the lab, the leaves were brushed and the brushings examined under a 20X scope for European red mites, 2-spotted mites, rust mites and pear psylla eggs. At the same time the leaf samples were taken, 20 top shoots from each replication were examined for the presence of pear psylla nymphs. The number of psylla infested top shoots were recorded.

Prior to harvest, 100 fruit from each replication were visually scored for lenticle russet. Fruit were removed from the orchard and viewed by the investigators under lighting conditions typical of a pear packing facility. Percent russet was recorded up to a maximum of 20% of the fruit surface russetted. The examiners had no knowledge of which replication was being evaluated.

RESULTS

See Tables 1 through 3.

DISCUSSION

Spider Mites

Spider mites were not a general problem in Bartlett pear orchards in the 3 districts where this study was conducted. This was probably due to the relatively mild temperatures which occurred this summer. Consequently, spider mite populations were not as heavy as they might have been in a warmer year. This phenomenon was reflected in the trial results.

During mid-summer, E. red mites and 2-spotted mites were low in all trials. E. red mites were about twice as numerous under the "soft" program vs. the "hard" program though still very low in numbers. Although well below damaging levels, the 2-spotted mite population was heaviest in the El Dorado trial. This orchard contained much Johnson grass and was the only trial orchard to be disked. The 2-spotted mites typically develop to large numbers

on Johnson grass and then move into pear trees when the grass is cultivated.

Predatory Mites

Predatory mites, when not disturbed by pesticides destructive to their populations, can accomplish the majority of spider mite control in pear orchards. Pyrethroid insecticides are typically very destructive to predatory mite species. The data shows this to have been the case in this study. Predatory mite populations were seven times more numerous in the "soft" program compared to where Pydrin was used. However, predator mites reflected the spider mite populations and never developed to large numbers.

Pear Psylla

Pear psylla were heavy in all trials with the "hard" blocks showing somewhat fewer infested tops than the "soft" blocks. Pydrin does kill more psylla than oil yet obviously did not control psylla to low levels. Psylla in the tops of trees will survive a foliage application of Pydrin where the tops become difficult to cover and penetrate with conventional orchard sprayers. This was most noticeable in the Delta trial. Psylla eggs and hard shells are very difficult to kill with chemicals or oil even where excellent coverage is obtained. This fact, when combined with reduced spray coverage in the tops of trees, explains the presence of numerous psylla in both "hard" and "soft" trials throughout the season.

Russet Evaluation

The total amount of russet was virtually identical between the foliage oil and miticide (no oil) trials. Their appeared to be slightly more russetting in the 15-20% range in the oil trial as compared to the miticide trial. Superior oils were used in all but the El Dorado trial where supreme oil was used. More lenticle greening was noticed on the pears from the El Dorado trial. Supreme oil in the pre-harvest spray may have been the cause of the lenticle greening. This greening was subtle and would probably not have contributed to a reduced grade.

SUMMARY & CONCLUSIONS

The 1986 growing season experienced generally mild temperatures which were not as favorable for spider mite buildups as in some previous seasons. Based on this study, both the "hard" miticide and "soft" oil programs saw similar spider mite populations. Our experiences in other season and recent experience from other western pear growing districts demonstrates that the "soft" programs have consistently fewer spider mite populations as compared to programs which rely unilaterally upon chemical miticides and use of pyrethroid insecticides. Promoting an orchard environment favorable for the development of beneficial species enhances the natural control of spider mites and minimizes the risk of mite damage and the consequent need for

expensive chemical miticides.

Pear psylla control was only slightly better in 2 out of the 3 test orchards where Pydrin was used as foliage treatments and much better in the El Dorado County study. Coverage is critical to summer control of psylla and probably accounted for the differences within the Pydrin blocks in this study. Though pyrethroid insecticides, like Pydrin, can be effective in reducing summer psylla populations, the summer use of these compounds has potential drawbacks. Specifically, summer populations of psylla are almost always present in various and overlapping life stages. The egg and hardshell nymphal stages are very tolerant to chemicals and not controlled well even where coverage is good. Use of chemicals to control summer populations of psylla has led to a high level of resistance to these chemicals in Pacific Northwest pear growing districts. Pyrethroid insecticides currently registered are usually very destructive to many key beneficial species and will often lead to the need for additional chemicals to control secondary pests which occur in the absence of these beneficials. Consequently, pyrethroid insecticides should be avoided during the foliage period. If needed, pyrethroid insecticides should be applied during the dormant period when their impact on beneficials is minimized and the control of overwintering adult psylla is maximized.

Due to the wet springtime conditions, russet was a problem in all of the study orchards. Consequently, the results of the russet evaluation are conclusive only in that there was very little detectable difference in fruit finish quality where oil was or was not used. This corresponds to past results of other investigators into this subject. It appears that the lighter superior oils have less of an impact than Supreme oil. Where concern exists, growers might eliminate oil from the pre-harvest sprays using oil only in earlier cover sprays and deferring to a chemical miticide, where needed, in the final cover spray.

More conclusive results would be possible if this study were conducted during a hot season, favoring spider mite buildups and under weather conditions favoring a clean fruit finish.

Respectfully submitted on January 20 1987,

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TABLE 1

PEAR ZONE TRIALS

MID-SEASON INSECT AND MITE SURVEY

6/30/86 - 7/15/86

	COUNT PER 200 BRUSHED TOP AND BOTTOM LEAVES							COUNT PER 40 TOP SHOOTS
	* ERE	ERA	2SA	PRE	PRA	PPE	RU	PPI
HARD								
SAC DELTA	45	4	2	0	2	4	360	37
SOLANO	68	8	0	0	0	0	-	0
EL DORADO	8	0	72	0	0	0	0	3
TOTAL	121	12	74	0	2	4	360	40
AVG.	40.3	4	24.7	0	0.7	1.3	180	13.3
SOFT								
SAC DELTA	134	20	4	0	14	12	396	20
SOLANO	4	0	0	0	0	2	-	14
EL DORADO	0	2	88	0	0	12	300	40
TOTAL	138	22	92	0	14	26	696	74
AVG.	46	7.3	30.7	0	4.7	8.7	348	24.7

* ERE = European red mite egg, ERA = European red mite adult, 2SA = 2-spotted mite adult, PRE = predator mite egg, PRA = predator mite adult, PPE = pear psylla egg, RU = rust mite motile forms, PPI = pear psylla nymphs

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TABLE 2

PEAR ZONE TRIALS

POST HARVEST INSECT AND MITE SURVEY

1986

	COUNT PER 200 BRUSHED TOP AND BOTTOM LEAVES							COUNT PER 40 TOP SHOOTS
	ERE	ERA	2SA	PRE	PRA	PPE	RU	PPI
HARD								
SAC DELTA	176	30	0	0	2	28	12	40
SOLANO	4	0	0	0	0	0	96	8
EL DORADO	16	2	32	0	0	22	24	12
TOTAL	196	32	32	0	2	50	132	60
AVG.	65.3	10.6	10.6	0	0.7	16.7	44	20
SOFT								
SAC DELTA	86	28	0	0	2	12	24	40
SOLANO	0	0	0	0	0	4	0	23
EL DORADO	0	0	0	0	12	14	36	36
TOTAL	86	28	0	0	14	30	60	99
AVG.	28.7	9.3	0	0	4.7	10	20	33

TABLE 3

PEAR ZONE TRIALS

FRUIT RUSSET EVALUATION

JULY 1986

	NUMBER OF FRUIT RUSSETTED PER 200 FRUIT							
	MITICIDE				OIL			
	5 %	10 %	15 %	20 %	5 %	10 %	15 %	20 %
SAC DELTA	65	48	56	31	62	53	48	37
SOLANO	69	89	29	13	27	59	82	32
EL DORADO	81	83	33	3	61	106	30	3
TOTAL	215	220	118	47	150	218	160	72
	435		165		368		232	

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