Almond Board of California
Annual Report
March 1998

Correct Project Number: 97-WM-o1

Project No.: 97-WM-01 – Almond Culture and Orchard Management

Project Leader: Mr. Warren Micke – (916) 752-2588
University of California
Department of Pomology
One Shields Avenue
Davis, CA 95616

Cooperating Personnel: R. Buchner, J. Connell, R. Duncan, J. Edstrom, M. Freeman, L. Hendricks, B. Holtz, W. Reil, M. Viveros, J. Yeager

Objectives:

1. To compare stress and no stress at early hull split on nut removal and hull rot in a microsprinkler irrigated almond orchard.

2. To evaluate training and pruning systems to maintain the productivity of almonds in tightly spaced hedgerows.

3. To evaluate temporary tree removal in double planted orchards.

4. To compare the effectiveness of Success®, Dipel®, and Lorsban® for dormant or May control of peach twig borer.

5. To determine the timing and number of zinc sprays to correct deficiency symptoms on vigorously growing young almond trees.

6. To determine if potassium fertilizer may be more efficiently applied between trees within the tree row rather than between rows.

7. To validate the spray model for shot hole control for the San Joaquin Valley.

8. To evaluate combinations of materials and treatment timings to optimize spring disease control in almonds.

9. To compare different pruning techniques on mature almond trees.

Procedures, Results and Discussion: See attached

COMPARISON OF NUT REMOVAL AT HARVEST AND HULL ROT UNDER MICROSPRINKLER IRRIGATION MANAGEMENT

Wilbur Reil, Yolo/Solano Farm Advisor

OBJECTIVES

Farmers continue to strive to improve irrigation efficiency because of both the increasing cost of water and power and the availability of only limited amounts of water. Drip irrigation and microsprinkler irrigation are increasingly becoming popular. These trials are designed to compare nut removal at harvest and hull rot from trees with differing irrigation management at hull split.

PLANS AND PROCEDURES

Experiments conducted between 1992 and 1996 showed improved nut removal at harvest and reduced hull rot on drip irrigated trees that were moisture stressed for a 2 to 3 week period at early hull split. The same results were not obtained in a microsprinkler irrigated block in 1996. It was postulated that the stress may not have occurred at the correct time to be beneficial.

Two experiments were established in two microsprinkler irrigated almond orchards in 1997. Both experiments were conducted on Nonpareil rows with one trial in a Lovell peach rootstock block and the second in a peach almond block. The orchard age was 8 and 7 years respectively. The canopy was estimated at approximately 80% cover in the peach and 90% in the hybrid block. Both trials contained either the wet treatments where water was maintained at the current irrigation rates or the dry treatment where the rate was reduced to 50% rate approximately two weeks before anticipated hull split and maintained at this level for one month. It was estimated that the no stress block was irrigated at 120% ET during June and July whereas the stress block received 70% ET. There was 2 treatments of 3 trees replicated 3 times.

RESULTS:

Trials this year in a microsprinkler orchard were designed to create a mild stress during June and July compared to a well irrigated orchard (70% ET compared to 120% ET) on two different rootstocks (Titon Peach/Almond and Lovell peach). Data is summarized in the following table. Significant differences occurred between the No stress and the Stress treatments for nuts remaining on the tree. Although the probability was reasonably high at 0.12 and 0.09 there was not a significant difference at 0.05% for hull rot in either rootstock.

Average count per Nonpareil tree of the number of nuts remaining after normal harvest shaking and the number of hull rot strikes as identified by dead spurs with nuts and dead leaves attached.

Treatment	Nuts Remaining After Harvest		Hull Rot Strikes	
	P/Almond	Peach	P/Almond	Peach
No stress	17.7	79.7	1.33	2.56
Stress	5.3	17.9	0.33	0.22
Probability	0.049	0.038	0.12	0.09

CONCLUSIONS:

These data suggest reduced moisture in the tree during the hull split period may reduce the incidence of hull rot and improve nut removal at harvest. Trials with above ground drip that had the water reduced to 50% ET at early hull split and the buried drip that also had the amount of water reduced in half had less nuts remaining on the tree after shaking than the trees maintained at 100% ET in trials conducted between 1992 and 1996. Trees under adequate or luxurious moisture status such as the 100% ET during hull split had a higher amount of hull rot in all years. The surface was wet approximately the same length of time as the 50% ET treatment. The humidity in the tree canopy was low in all systems suggesting that humidity may not affect hull rot whereas the moisture status within the tree itself may be the cause.

From these data it appears that stress occurring before and during hull split will promote better nut removal at harvest and may reduce the incidence of hull rot in microsprinkler almond orchards.

The higher number of nuts left on the tree after shaking in the system receiving full ET throughout hull split suggests that nut abscission may be enhanced by some stress during the maturation process. Some moisture is needed to stimulate hull split but perhaps intermediate or approximately 50% to 70% ET may provide sufficient moisture for proper hull split while enhancing nut removal. Hull rot was also reduced with the stressed treatment.

SUSTAINING YIELDS IN HEDGEROW ALMONDS

John P. Edstrom
U.C. Cooperative Extension Farm Advisor
Manager Nickels Soil Laboratory

In 1979, a Nonpareil - Price (1:1) almond block was planted 7' x 22' (270 trees/acre) at the Nickels Soil Laboratory in Arbuckle. The soil series is Class II - Class III Arbuckle gravelly loam; irrigation is by single hose drip. The following four training treatments were used for this plot:

1) Temporary Hedge -- standard pruning for permanent trees, with temporary trees gradually whisked back and then removed after their 8th year (1986), leaving a 14' x 22' spacing.
2) Permanent Hedge -- trained to three scaffolds, standard pruned and maintained at 7' x 22'.
3) Two Scaffold Hedge -- a 7' x 22' hedge trained with two primary limbs growing out into the row middles and standard pruned.
4) Unpruned Hedge -- a 7' x 22' hedge trained to three scaffolds and then essentially unpruned since.

Long term yields from this 19 year old hedgerow continue to be monitored. Production for 1997 can be seen in Table I, which shows substantial yields continue to be produced in this tightly spaced block. Again this year, yields from the Temporary Hedge (135 trees/acre) were significantly below those of the other three Permanent Hedge (270 trees/acre) treatments, while all three Permanent Hedge types had equal yields.

TABLE I.

Treatment	Yields
2 Scaffold	2953
Unpruned	2680
Permanent	2498
Temporary	2081*

Accumulative yields for the Temporary Hedge through the 19th leaf lag approximately 6,500 pounds behind the other three treatments (see Table II). The continued low yield from the Temporary Hedge treatment suggests that alternate tree removal may be a questionable practice, even in tightly spaced hedgerow almonds. However, the peculiarities of this test site should be considered when interpreting these yield figures. This two cultivar planting (Nonpareil and Price) has developed on Class II/III gravelly loam soils under a single hose drip irrigation system. These limitations have resulted in a restricted root zone and have possibly reduced or delayed the growth of permanent trees into their expanded space (from 7' spacing to 14' spacing). Additionally, the adjacent tightly spaced pollenizer rows created heavily shaded conditions, further inhibiting fruitwood regrowth on the 14' x 22' spaced Nonpareil plots. Given more favorable "regrowth" conditions, this hedge removal treatment may have regained high productivity and proven, over time, to be an economically viable system. Certainly under our conditions with nearly 6,500 lbs. in accumulated lost production, this is not an advisable hedge management strategy.

Close spaced almond hedgerows appear to be quite forgiving with respect to pruning/training methods. Accumulative yields show no difference between trees pruned to Two-Scaffold, Permanent (3-scaffold) or left Unpruned (after scaffolds established).

Loss of lower fruitwood continues in this planting, especially in the unpruned trees. As the trees age, increasingly more crop remains high in the trees after harvest, especially in the unpruned trees. The inter-twined branches may not receive sufficient force from the shaker for complete crop removal.

We know of no other experimental data that shows unpruned almonds to produce yields equal to standard pruned trees over this length of time.

However, the sustained productivity in this test of the Unpruned Hedge merits consideration when planning a pruning strategy for almond hedgerows. Our savings, in pruning costs over the span of this trial were considerable.

TABLE II. <u>Yields by Hedgerow System for 1987 - 97</u>

Kernel Pounds per Acre
Leaf/Year

Treatment	9th 1987	10th 1988	11th 1989	12th 1990	13th 1991	14th 1992	15th 1993	16th 1994	17th 1995	18th 1996	19th 1997	Accum.[1/] 1984-96
2 Scaffold	2720	1498	2746	3470	2992	2079	1943	2835	1598	2968	2953	32,041
Unpruned	2474	1626	2870	3072	3036	2471	1804	2799	1215	2833	2680	30,817
Permanent	2149	1932	2680	3333	2254	2268	1189	2678	1297	2624	2498	29,546
Temporary	1472	1308	2046	2450	2576	1739	1280	2448	1079	2076	2081	24,442

[1/] Accumulative Yields Since Production began in 1984.

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Removing Temporary Trees in Double Planted Orchards
Joseph H. Connell, Warren Micke, and Jim Yeager.

Problem and Objectives:

When a double planted orchard crowds, extra trees are commonly thinned and then removed. Reasons given for tree removal include: improved light penetration, fruitwood renewal, and maintaining the orchard's future productivity. The objective of this trial is to evaluate temporary tree removal by comparing two treatments:

1. Maintaining a hedgerow indefinitely with standard pruning.
2. Removal of temporary trees after whisking back by gradual pole saw thinning or large chain saw cuts.

Methods:

For seven years, 1989 through 1995, we attempted to minimize crop loss following temporary tree removal by gradually cutting back the temporary trees. We managed sunlight so that the temporary trees didn't inhibit the growth of the permanent trees. Wood in the lower canopy of the temporary trees that didn't affect the permanent trees was kept. The upper canopy of temporary trees was thinned out to allow the permanent trees to spread and overgrow the temporaries. The permanent trees expanded to fill the orchard space as temporary trees were gradually thinned.

The temporary trees were removed following the 1995 harvest. Data collected in 1996 and 1997 has begun to document the treatment effects on yield. The effect of tree removal on remaining tree size will also be assessed.

Results:

During these seven years, crop reductions from thinning out the temporary trees were not statistically significant suggesting an appropriate rate of tree removal. However, in real terms, the accumulated seven year yield reduction on a per acre basis due to gradual tree thinning amounted to 1805 kernel pounds of Buttes and 707 kernel pounds of Missions. Chain saw whisking reduced seven year accumulated Butte yields by 1702 kernel pounds and Mission yields by 1590 kernel pounds. Although thinning out of the temporary trees was done very gradually, the yield reductions were substantial.

Following the 1995 tree removal, yields were reduced further in 1996 and 1997 even though the temporary trees had already been cut back for seven years. Average yields for the three treatments expressed in kernel pounds are shown in the following table:

Yield per acre* following the 1995 post-harvest removal of temporary trees in the gradually thinned and chain saw whisked treatments.

	Butte lbs/ac		Mission lbs/ac	
Treatment	1996	1997	1996	1997
Maintained hedgerow	1182a	3064a	1734a	2700a
Gradually thinned then removed	831 b	1626 b	1068 b	1671 b
Chain saw whisked then removed	755 b	2050 b	890 b	1701 b

*per-acre yields are calculated on a 140 tree/acre basis where the hedgerow is maintained and on a 70 tree/acre basis for the other two treatments. Numbers within columns followed by the same letter are not significantly different at the 5% level.

The permanent trees grew larger and filled more space as the temporary trees were gradually thinned or chain saw whisked. Yields were highest on a per-tree-basis in both treatments where temporary trees were cut back since the remaining trees were larger than those maintained in the hedgerow. This increase in yield per tree was not sufficient to make up for the fact that there were only half as many trees left in these treatments compared to the treatment where all trees were kept and the hedgerow was maintained. For both varieties, per acre yields are highest where we continue to maintain the double-planted hedgerow.

Conclusions:

We had hoped that yields would not be seriously reduced by the 1995 tree removal since the temporary trees had already been cut back for seven years. This was not the case. It's clear that removing temporary trees has been costly due to the yield loss over the years when the trees were being pruned back and in the past two years since the temporary trees were removed. It's doubtful that these losses can be made up over the remaining life of the orchard.

It appears that double planting is appropriate when early returns are necessary to develop an orchard and, once planted, all trees should be kept for the life of the orchard. Under the conditions in this trial, "temporary" tree removal hasn't provided any benefits even when done very gradually. We plan to continue to collect yield data to determine if and when the plots with trees removed will catch up to or exceed the yields of the crowded plots where the hedgerow is maintained indefinitely.

EVALUATING SUCCESS® FOR OVERWINTERING PTB CONTROL IN ALMOND-1997

Principal Investigators:

Lonnie C. Hendricks, Farm Advisor, Merced County

Walt Bentley, Area IPM Advisor, UC Kearney Research Center

Everett Younce, Lab and Field Technician, Merced County

Simon Bautista, UCCE Intern

Cooperators:

Morimoto Farms, Livingston, CA

Barat Bisabri, DowElanco

Peter Yu, DowElanco

Craig Plunkett, Abbott Labs

Introduction:

The peach twig borer (PTB), *Anarsia lineatella* is a major pest of almonds in California and can be an especially severe pest in Merced County. The PTB is usually controlled by dormant sprays of oil plus insecticide or with a bloomtime spray of *Bacillus thuringiensis* (Bt). The use of dormant sprays are being questioned because OP insecticides have been found in local rivers. These contaminants are probably resulting from dormant OP applications to orchards. Some other pesticides used in the dormant applications may cause summer mite population increases. SUCCESS® (DowElanco), is the common name for a product derived from the fungus *Saccharopolyspora spinosa.* SUCCESS® appears to control a number of insect pests while having low toxicity to warm blooded animals and beneficials. Control of the overwintering generation of PTB with SUCCESS® was tested in this experiment. Dipel® *Bacillus thuringiensis* (Abbott) was used as a standard bloomtime spray for PTB, and Lorsban® (Chlorpyriphos) (DowElanco) was used as a standard dormant OP spray.

Procedures:

Third leaf (planted '95) Nonpareil and Carmel almond trees at Morimoto Farms in Livingston, California were used to evaluate peach twig borer control with SUCCESS 2SC® (DowElanco), SUCCESS 2SC® plus Omni oil, Dipel ES® and Dipel DF® (Abbott), and Lorsban® (DowElanco) plus dormant spray oil. Each treatment was applied to 18 trees in a randomized complete block design. Applications were made with a high pressure sprayer at approximately 1 gallon per tree. Total trees are 108 (18 Reps X 6 Treatments).

Treatments were applied at the following timings:

INSECTICIDE	RATE/ACRE	TIMING	RATE/20 GAL	COLOR CODE
LORSBAN® + OMNI OIL	4 PT. 4 GAL	1/17/97 -DORMANT	0.4 PT. 3.2 PT.	BLUE
DIPEL DF®	1 LB	2/18, 3/6/97	0.1 LB	YELLOW
DIPEL ES®	1 QT	2/18, 3/6	3.2 OZ	RED
SUCCESS 2SC®	5.7 OZ	1/17/97 -DORMANT	0.6 OZ	BLACK/ORANGE
SUCCESS 2SC® + OMNI OIL	5.7 OZ 4 GAL	1/27- DORMANT	0.6 OZ 3.2 PT.	ORANGE
CHECK (UNTREATED)	-	-	-	WHITE

Results:

Evaluation of the treatments was done by counting the number of peach twig borer, *Anarsia lineatella* strikes per tree. This count was conducted on April 7, 1997.

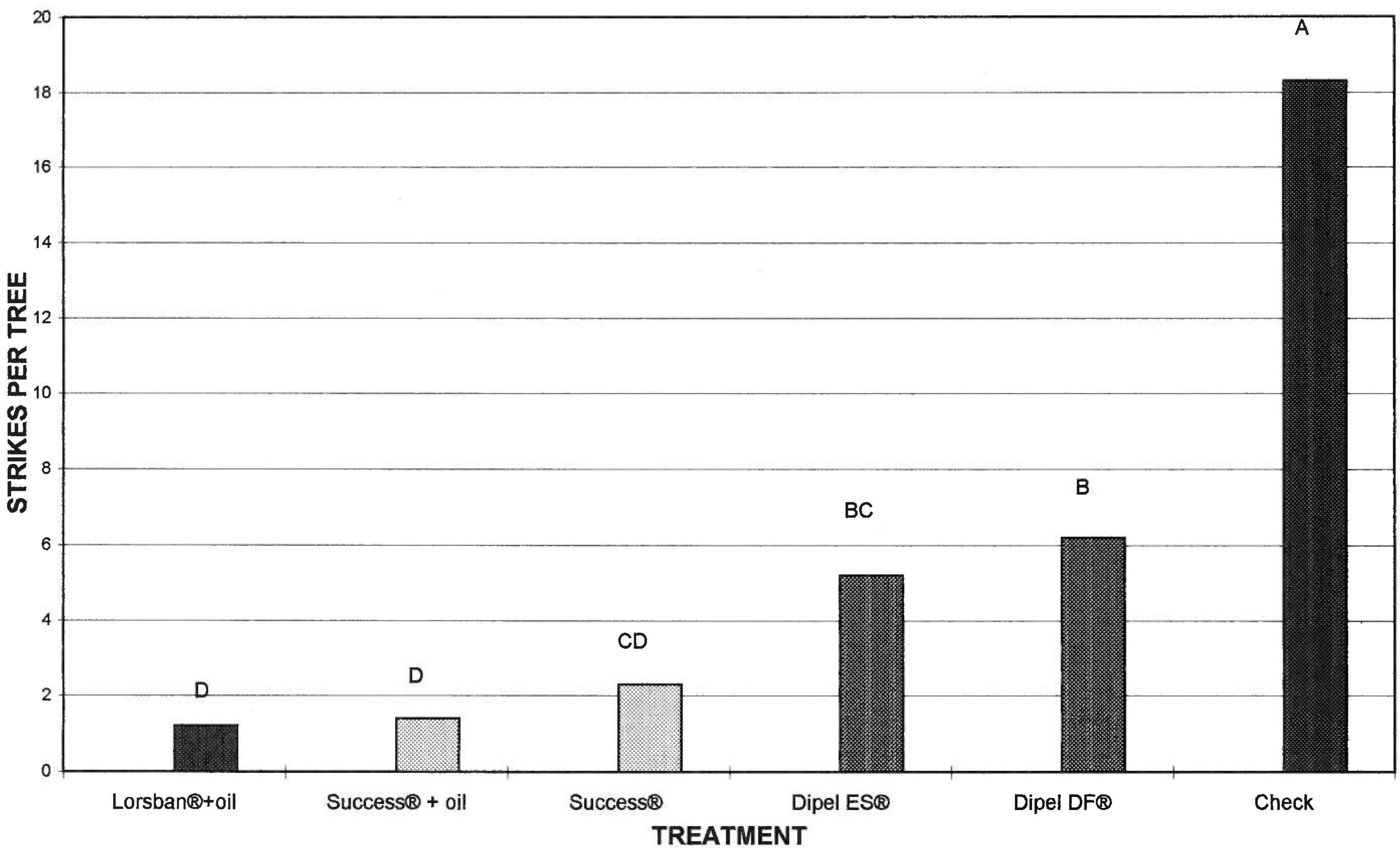
Evaluation of treatments on April 7, 1997. PTB strikes per tree.

INSECTICIDE	COLOR CODE	STRIKES/TREE AVG. OF 9 TREES
Lorsban® + OMNI OIL	BLUE	1.2 D
SUCCESS® 2SC + OIL	ORANGE	1.4 D
SUCCESS® 2SC	BLACK/ORANGE	2.3 CD
DIPEL ES®	RED	5.2 BC
DIPEL DF®	YELLOW	6.2 B
CHECK (UNTREATED)	WHITE	18.3 A

Conclusions:

No dormant treatment was applied in this orchard, and the peach twig borer population was moderately high. The untreated check had statistically the highest numbers of twig borer strikes per tree by a wide margin compared to any insecticide treatment. The SUCCESS® treatments, both with and without Omni oil were statistically equal to Lorsban® plus oil. The addition of oil numerically increased the effectiveness of SUCCESS®, but not statistically. The two formulations of Dipel® provided good PTB control, but statistically provided less control than SUCCESS® with oil and Lorsban® plus oil.

OVERWINTERING GENERATION PTB CONTROL - 1997



EVALUATING SUCCESS® FOR MAY GENERATION PTB CONTROL IN ALMOND-1997

Principal Investigators:

Lonnie C. Hendricks, Farm Advisor, Merced County

Walt Bentley, Area IPM Advisor, UC Kearney Research Center

Everett Younce, Lab and Field Technician, Merced County

Simon Bautista, UCCE Intern

Cooperators:

Morimoto Farms, Livingston, CA

Barat Bisabri, DowElanco

Peter Yu, DowElanco

Craig Plunkett, Abbott Labs

Introduction:

The peach twig borer (PTB), *Anarsia lineatella* is a major pest of almonds in California and can be a severe pest in Merced County. Control is accomplished by spraying in the dormant, May or hullsplit period. The May and other summer sprays for control of PTB may be disruptive and cause increases in spider mite and scale problems. Insecticides with low potential to disrupt biological control of spider mites and scale insects would be very useful for in-season applications. This test plot compared the use of SUCCESS® (DowElanco), which is the common name for a product derived from the bacterium *Saccharopolyspora spinosa,* with Bt and chlorpyriphos for control of PTB in May. Bt sprays have been used successfully in May and at hullsplit where pest populations are low. SUCCESS® is a candidate for use in this period. Lorsban® is a useful in-season insecticide, but it can sometimes disrupt bio-control.

Procedures:

Second leaf (planted '96) almond trees at Morimoto Farms in Winton, California were sprayed with several insecticide treatments to evaluate peach twig borer control with SUCCESS 2SC® (DowElanco), Dipel ES® (Abbott), and Lorsban® (DowElanco). Each treatment was applied to 18 trees in a randomized complete block design. Applications were made with a high pressure sprayer at approximately 1 gallon per tree. Total trees are 60 (12 Reps X 5 Treatments). The varieties in this planting are Nonpareil:Carmel:Monterey:Sonora.

Table 1. Treatments and application dates.

INSECTICIDE	RATE/ACRE	TIMING	RATE/20 GAL	COLOR CODE
LORSBAN®	4 PT.	5/9/97	0.4 PT.	BLUE
DIPEL ES®	1 QT	5/9, 5/19	3.2 OZ	RED
SUCCESS 2SC®	4 OZ	5/9/97	0.4 OZ	YELLOW
SUCCESS 2SC®	6 OZ	5/9/97	0.6 OZ	ORANGE
CHECK	-	-	-	WHITE

Results:

Evaluation of the treatments was done by counting the number of peach twig borer, *Anarsia lineatella* strikes per tree on two dates, May 28 and June 3, 1997. Shoot tips with strikes were remove on May 28, so only new strikes were counted on June 3. The total number of May generation strikes is reported in the following table.

Table 2. PTB strikes counted on two dates and the average of both counts.

TREATMENT	COLOR CODE	TOTAL 5/28	TOTAL 6/3	AVG BOTH DATES
LORSBAN® 4 PT	BLUE	45	24	5.8 C*
DIPEL ES® 1 QT	RED	106	68	14.5 B
SUCCESS 2SC® 4 OZ	YELLOW	54	20	6.2 C
SUCCESS 2SC® 6 OZ	ORANGE	24	16	3.3 C
CHECK	WHITE	231	89	26.7 A

*Duncan's multiple range test for treatment means.

Peach silver mite, *Aculus cornutus* were present in this orchard in high numbers in July. On July 10, 1997 ten leaves were collected from each tree. The peach silver mite (PSM) were counted in 1 square inch of the upper surface of each leaf. There are 12 trees per treatment times 10 leaves per tree which equals 120 leaf surfaces per treatment.

Table 3. Peach silver mite, *Aculus cornutus* counted July 10, 1997.

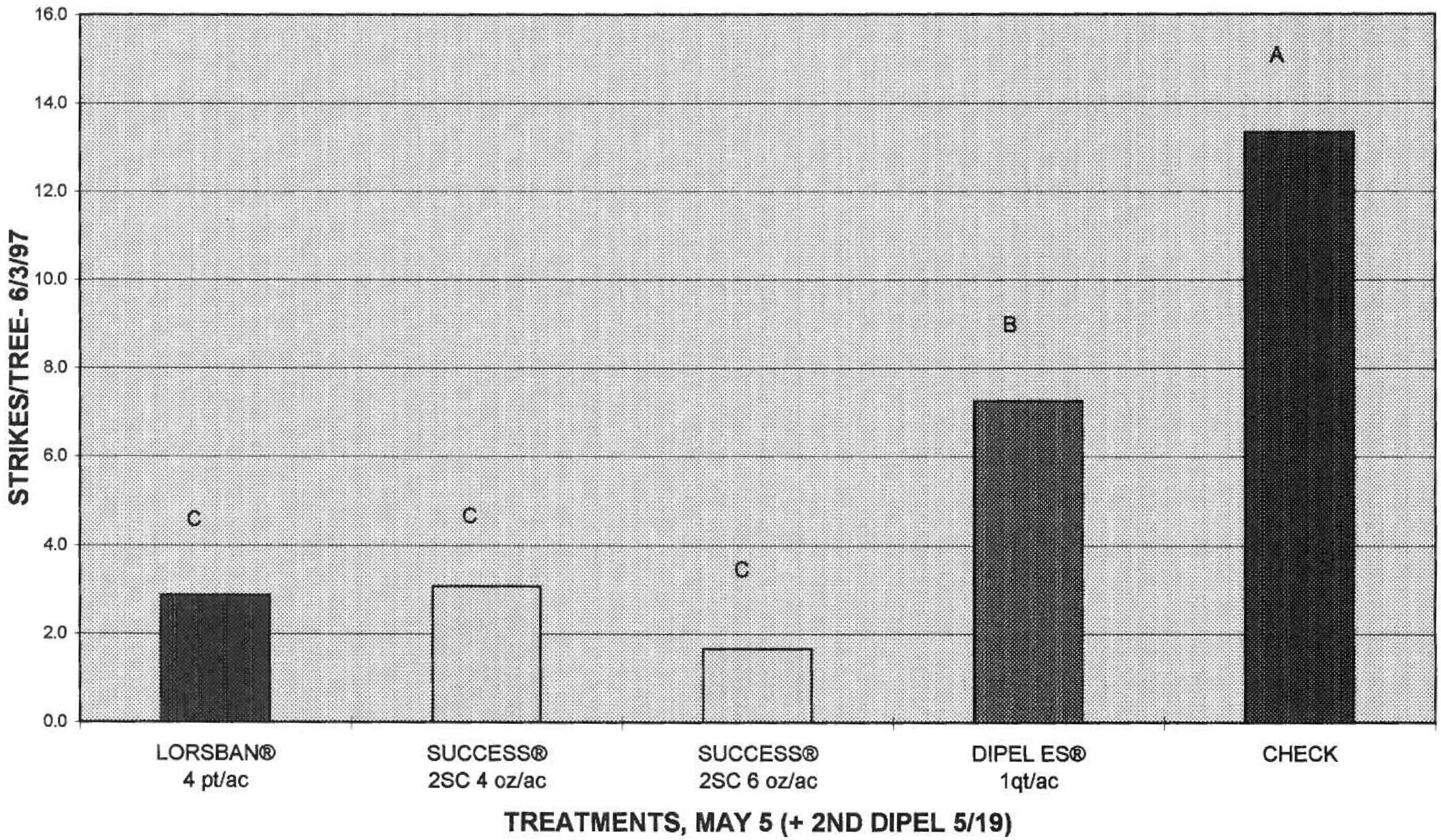
TREATMENT	COLOR CODE	TOTAL PSM 7/10/97	PSM/TREE 7/10/97
LORSBAN® 4 PT	BLUE	3030	253
DIPEL ES® 1 QT	RED	3060	255
SUCCESS 2SC® 4 OZ	YELLOW	3313	276
SUCCESS 2SC® 6 OZ	ORANGE	3332	278
CHECK	WHITE	2963	247 N.S.

Conclusions:

No dormant treatment was applied in this orchard, and the peach twig borer population was high. The untreated check had the highest numbers of twig borer strikes per tree compared to any insecticide treatment. The SUCCESS® treatments, applied at both 4 ounces and 6 ounces per acre were statistically equal to Lorsban® at 4 pints per acre. The Dipel ES® provided partial PTB control. Dipel was statistically better than no treatment, but statistically not as effective as SUCCESS® or Lorsban®.

The peach silver mite were very evenly distributed through the test area, and there was no significant difference by treatment. The treatments did not affect the PSM populations. There were virtually no web-spinning mites in this orchard at this sampling date.

PTB CONTROL TRIAL, MAY 1997



Correction of Zinc Deficiency Symptoms in Young Almond Trees

Mario Viveros, UC Farm Advisor in Kern County

Zinc deficiency symptoms are common in vigorously growing almond trees in Kern County. Trees most affected by zinc deficiency symptoms are those in their first, second, third and fourth growing seasons. The degree of zinc deficiency varies from orchard to orchard depending on soil type and amount of vigor.

A first leaf nonpareil orchard growing in sandy soil was selected in the spring of 1996. Spring, summer and fall spray treatments were applied, but the winter and spring (1997) sprays could not be applied, due to rains and flooding. Thus, I was forced to abandon this experiment. A new orchard in sandy soil was selected in the spring of 1997. The following treatments were selected, randomized and replicated: 1) untreated control, 2) spring, 3) summer, 4) fall, 5) spring + summer, 6) spring + summer + fall, 7) spring + summer + fall + winter, and 8) winter. Unfortunately, no data was taken from this experiment either, since the grower accidently sprayed the experiment with zinc.

I am planning to establish another zinc experiment in the spring of 1998.

Potassium Fertilizer Placement Study

Roger Duncan, UCCE Farm Advisor, Stanislaus County

Annual Report to the Almond Board - Year two of three year study.

Objectives:

1) **To determine if potassium fertilizer can be applied more efficiently in the herbicide strip where roots may be more concentrated, closer to the surface, and less affected by soil compaction.**

2) **Revisit current University of California recommendations for "adequate" potassium leaf levels.**

Introduction:

Trials were established in two, mature almond orchards (cvs. Nonpareil & Carmel) in Stanislaus County to meet the above stated objectives. Trial A was established in 1996 in the Hickman area of Stanislaus County; Trial B was established in 1997 near the town of Empire. The soil in both locations is classified as a sandy loam. In Trial A, sulfate of potash (0-0-51-17) was applied in January 1996 at rates of 0, 600, or 1200 pounds per acre. In Trial B, sulfate of potash was applied in February 1997 at rates of 0, 250, 500, or 1000 pounds per acre. Both plots compared applying potassium fertilizer in the conventional manner (in bands 6-8 feet from the trees) to applications in bands between trees in the herbicide strip. Both trials were arranged in randomized complete block designs with six replications per treatment and three treated trees per replication. Leaf samples were collected in July and sent to the UC DANR laboratory for analysis of potassium content.

Three to four days after the trees were commercially shaken at harvest, all almonds from the data trees were hand raked, collected and weighed in the field. Field weights included almond meats, shells, hulls, and some vegetative orchard floor debris. Five pound samples of the field weighed material were collected for calculation of actual meat weights per tree and determination of percent doubles and shriveled meats. Harvest data was collected only for the Nonpareil variety.

Results:

There were no consistent effects of fertilizer rate or placement on leaf potassium levels, nut size, or final yield in either trial. In addition, there was no clear relationship between leaf potassium level and yield of individual trees. Although trees that received the highest rates of potassium fertilizer had numerically higher leaf potassium levels in Trial A, differences were not statistically different ($P \leq 0.05$) due to high variability between trees. In Trial A, the untreated trees had an average leaf potassium level of 2.0%, well above the established critical level of 1.4% for a July leaf sample. It is possible that increasing leaf potassium levels above 2.0% will have no significant effect on yield. In Trial B where pretreatment leaf analyses indicated a potassium deficiency in the orchard, potassium fertilizer was applied in February, 1997 and may not have had sufficient time to affect 1997 season yields. Analyses of July sampled leaves in Trial B were not meaningful due to an errant foliar application of potassium nitrate for mite control a few days before leaf collection. Data will be collected for one more year from these plots.

1997 Harvest Data - Trial A

Potassium Fertilizer Placement Study, Stanislaus County

(Potassium fertilizer applied January, 1996)

Treatment	July Leaf Potassium (% K^+)*	Weight (g) per 100 good meats*	Percent doubles*	Percent shrivel*	Yield per Tree (lb.)*	Yield per acre (tons)*
Unfertilized	2.0	113.6	1.0	0.8	39.4	2980
600 lb / acre conventional	2.2	104.2	0.4	1.4	31.4	2375
1200 lb / acre conventional	2.5	114.8	0.2	1.2	33.6	2538
600 lb / acre herb. strip	2.0	107.4	0.6	1.8	28.8	2176
1200 lb / acre herb. strip	2.3	106.9	1.4	0.8	32.4	2450

*Differences not significant at $P \leq 0.05$

1997 Harvest Data - Trial B

(Potassium fertilizer applied February, 1997)

Treatment	July Leaf Potassium (% K^+)*	Weight (g) per 100 good meats*	Percent doubles*	Percent shrivel*	Yield per Tree (lb.)*	Yield per acre (tons)*
Unfertilized		144.3	0.5	2.3	35.3	2669
250 lb / acre conventional		143.3	0	3.3	33.5	2533
500 lb / acre conventional		132.7	1.3	1.3	38.3	2895
1000 lb / acre conventional		135.8	0.8	1.3	33.6	2540
250 lb / acre herb. strip		139.0	1.0	2.0	31.9	2412
500 lb / acre herb. strip		139.3	0.3	0.3	32.4	2449
1000 lb / acre herb. strip		136.1	0.3	2.3	36.2	2737

*Differences not significant at $P \leq 0.05$

disk:rsrch97\ptshrprt

Shot Hole (Wilsonomyces carpophilus) Disease and Spray Model Validation
Brent A. Holtz
Cooperators: Beth Teviotdale and Roger Duncan
Problem and Objective:
Treatment for shot hole, a disease caused by the plant pathogenic fungus *Wilsonomyces carpophilus* (*Stigminia carpophila*), has primarily relied on fungicide treatments applied when leaf tissues emerge from the bud. In some years, especially in orchards with typically low levels of shot hole, treatment may consist of a single spray at the jacket stage of bloom. But in other orchards, where higher levels of shot hole have been observed, additional sprays have proven necessary if rains continue. Most growers treat for shot hole based on previous orchard history and the current season rainfall, sometimes applying several sprays for shot hole control. A spray model has been developed (Dr. Adaskaveg) for shot hole control which is based on spraying for the disease only after sporodochia, the reproductive structures of the fungus, have been observed. Spraying based on this model may prevent the application of unnecessary sprays.

Dormant treatments of Kocide DF at 12 and 8 lbs/acre were compared to a control treatment. Full bloom sprays of Roval and Rally were compared to unsprayed controls in subplots. Ziram sprays were applied 2 weeks after petal fall. Additional Ziram spray would have been applied if it had rained or sporodochia had appeared. Unfortunately, though the experiment was conducted in an orchard which had been heavily diseased the previous year, there was not enough spring rainfall this year for sporodochia or lesion development. Consequently we were unable to rate the plot or test our model.

A fungicide efficacy trial against shot hole was also performed. The fungicides tested included Abound 25C, Break 45 WP, Bravo Weather Stik, Captan 50W, Elite 45DF+Induce, Funginex, Indar 75, Manex 37F, Procure 50W, Rally 40W+Latron, Switch 62.5 WG, and Ziram 76W. Again we were unable to rate the plot.

Conclusion
The experiment is being repeated in 1998 in order to verify the model for the Southern San Joaquin Valley.

Crop:	ALMOND. cv. Livingston	Year:	1997
Disease:	SHOT HOLE, BROWN ROT *Wilsonomyces carpophilus,* *Monilinia laxa*	Objective:	DORMANT, MONITOR
		Location:	STANISLAUS COUNTY

Dormant treatments (main factors): (date of application?) Material	Rate a.f./acre	No disease present
Kocide DF	12.0 lbs/acre	↓
Kocide DF	8.0 lbs/acre	
Untreated		

Monitoring (subplots) Full bloom	Leafing	No disease present
ROV	ZIR	↓
RAL + L	ZIR	
ROV	ZIR only after sporodochia appear	
RAL + L	ZIR only after sporodochia appear	
Untreated		

Code	Material	Rate a.f./acre
RAL	Rally 40W + L	8.0 oz
ROV	Rovral 50W	1.0 lb
ZIR	Ziram 76W	8.0 lb
L	Latron B1956	8.0 oz/100 gal

Application:	Handgun
Psi:	150
Gal/tree:	5.0
Tree spacing:	23 x 23
Tree/acre:	82

Design:	Split plot
Replication:	4

Rainfall (CIMIS Station #71, Modesto)

Date	Inches	Days
Jan 1-7	1.59	4
22-28	4.77	3
Feb 1-7	0.08	1
Mar 8-14	0.04	1
15-21	0.04	1
22-28	0.04	1
Apr 15-21	0.12	1
May 22-28	0.16	1
Jun 1-7	0.04	1
8-14	0.04	1

All precipitation between 1 Jan and 14 June occurred on dates listed.

Crop:	ALMOND, cv. Livingston	Year:	1997
Disease:	SHOT HOLE	Objective:	EFFICACY
	Wilsonomyces carpophilus,	Location:	STANISLAUS COUNT

Full bloom	Weeks after petal fall	No disease present
	Two-three	
18 Feb	21 Mar	
ABD	ABD	↓
BRV-4 1/8	BRV-31/8	
BRK	BRK	
CAP	CAP	
ELT+I	ELT+I	
FUN	FUN	
IND+L	IND+L	
MNX	MNX	
RAL+L	RAL+L	
SWT	SWT	
ZIR	ZIR	
PRO-8	PRO-8	
PRO-12	PRO-12	
UNTREATED		

Code	Material	Rate a.f. per acre
ABD	Abound 25C	12.8 fl oz
BRK	Break 45WP	4.0 oz
BRV	Bravo Weather Stik	41/8 or 3 1/8 oz
CAP	Captan 50W	9.0 lb
ELT	Elite 45DF+I	6.0 fl oz
FUN	Funginex	16.0 fl oz
IND	Indar 75W	2.0 oz
MNX	Manex 37F	1.5 qt
PRO-8 or 12	Procure 50W	8.0 or 12.0 oz
RAL	Rally 40W + L	8.0 oz
SWT	Switch 62.5 WG	12.0 oz
ZIR	Ziram 76W	8.0 lb.
I	Induce	8.0 oz/100 gal
L	Latron B1956	8.0 oz/100 gal

Application:	Handgun
Psi:	150
Gal/tree:	5.0
Tree spacing:	23 x 23
Tree/acre:	82

Design:	Randomized complete block
Replication:	6

Rainfall (CIMIS Station #71, Modesto)

Date	Inches	Days
Mar 8-14	0.04	1
15-21	0.04	1
22-28	0.04	1
Apr 15-21	0.12	1
May 22-28	0.16	1
Jun 1-7	0.04	1
8-14	0.04	1

All precipitation between 8 March and 14 June occurred on dates listed.

Tehama County Almond Spring Disease Control Strategies

Richard P. Buchner[1], Beth L. Teviotdale[2], and Bruce Carroll[3]

Spring diseases are a significant problem for Northern California Almond growers. Each year, decisions are made as to which disease represents the greatest threat and which spray treatments will provide the most cost effective control. This plot was designed to investigate various spray programs for Brown Rot (*Monilinia laxa*) and Almond Scab (*Cladosporium carpophilum*).

Procedure

Mature Northern California (Tehama County) Carmel almonds were sprayed at green tip/pink bud, full bloom, two weeks and five weeks after petal fall with Abound 25EC, Bravo Weather Stick, Captan 50WP, Rovral 50WP, Topsin 70WP, and/or Ziram 76WP. Spray timing, treatments and combinations were designed to represent a comprehensive bloom disease control strategy. The experiment consisted of eleven single tree treatments replicated five times (RCB) with handgun applications. Brown rot strikes per tree and percent defoliation were evaluated. Brown rot disease pressure was relatively light (8.2 strikes per untreated tree). Defoliation for unsprayed trees was 71.0 percent rated on September 19, 1997.

Results and Discussion

Differences between individual spray programs were minimal (Table 1). Almost all of the spray programs were statistically better than the untreated control, suggesting each program was effective at controlling the target disease. The exception was treatment 10. That program included only one early treatment (Roval® at green tip) and two post bloom treatments (Captan® two weeks after petal fall and Ziram® five weeks after petal fall). This combination tended to be the least effective for both diseases. Although not currently registered, green tip and full bloom applications of Abound® resulted in good brown rot control.

Ziram® performed well as an Almond scab control treatment. One Ziram® application at five weeks after petal fall resulted in acceptable disease control. Abound® also performed well as a scab control treatment. Programs which included Abound® or Bravo® tended to give better control of scab and had the fewest brown rot infections.

Table 1 — Crop: ALMOND, cv. Carmel; Disease: BROWN ROT, SCAB, *Monilinia laxa*, *Cladosporium carpophilum*; Year: 1997; Objective: PROGRAMS; Location: TEHAMA

Green tip	Full bloom	Weeks after petal fall		Brown rot	Scab
		Two	Five	No. strikes/tree	Defoliation (%)
7 Feb	19 Feb	5 Mar	28 Mar	14 April	19 Sep
1 ABD	ABD	CAP	ZIR	0.0 c	28.0 bc
2 ROV	TOP+ZIR		ZIR	0.0 c	28.0 bc
3 TOP+ZIR	TOP+ZIR	CAP	ZIR	0.4 bc	32.0 bc
4 ROV	TOP+ZIR	CAP	ZIR	0.4 bc	26.0 bc
5 ROV	BRV-4 1/8	BRV-3 1/8	ZIR	1.2 bc	21.0 c
6 ROV	ROV	ABD	ABD	1.4 bc	21.0 c
7 TOP+ZIR		CAP	ZIR	1.4 bc	25.0 bc
8 ROV	ROV		ZIR	1.6 bc	32.0 bc
9 ROV	ROV	CAP	ZIR	1.8 bc	24.0 bc
10 ROV		CAP	ZIR	3.8 ab	35.0 b
11 CONTROL				8.2 a	71.0 a

Code	Material	Rate a.f. per acre
ABD	Abound 25C	12.8 fl oz
BRV	Brova Weather Stik	4 1/8 or 3 1/8 pts
CAP	Captan 50W	9.0 lb
ROV	Rovral 50W	1.0 lb
TOP	Topsin 70W	1.5 lb
ZIR	Ziram 76W	8.0 lb

Application:	Hand-gun
Psi:	350
Gal/tree:	5.0
Tree spacing:	25'x25'
Trees/acre:	70

[1]Richard P. Buchner, UCCE Farm Advisor, Tehama County.
[2]Beth L. Teviotdale, UCCE Plant Pathology Specialist, KAC.
[3]Bruce Carroll, Crop Consultant, Tehama County.

THE EFFECT OF DIFFERENTIAL PRUNING TREATMENTS ON MATURE ALMOND TREES--Mark Freeman, U.C. Farm Advisor in Fresno County

The plot was established on 20-year-old Nonpareil and Carmel trees during the winter of 1996-97. Differential pruning treatments were made with tower pruners and from the ground. Unfortunately, the Nonpareil trees exhibited severe noninfectious bud failure symptoms this spring. Even though the trees had a good nut set and yield, the plot was terminated at this location because of bud failure's potential impact on future yield and tree vigor. During the winter of 1997-98, the plot was postponed again.

Attach to Orch. Mgmt. 97-WM-01

A comparison of the responses of peach twig borer, San Jose scale and the scale parasitoid, *Encarsia perniciosi* to dormant sprays in almond

Principal Investigators:
Lonnie C. Hendricks, Farm Advisor, Merced County
Walt Bentley, Area IPM Advisor, UC Kearney Research Center
Simon Bautista, Field Assistant, Merced County

Cooperators:
David Arakelian, Arakelian Farms
Barat Bisabri, Dow AgroSciences
Peter Yu, Dow AgroSciences

Introduction:

The peach twig borer (PTB), *Anarsia lineatella* is a major pest of almonds in California and can be an especially severe pest in Merced County. The PTB is usually controlled by dormant sprays of oil plus insecticide or with a bloomtime spray of *Bacillus thuringiensis* (Bt). The use of dormant sprays is being questioned because organophosphate (OP) insecticides are being found in local rivers. These contaminants probably originate from dormant OP applications to orchards.

Dormant sprays of oil plus insecticide are also applied to almonds for control of San Jose Scale (SJS) *Quadraspidiotus perniciosus*. There is a possibility that dormant sprays could adversely impact beneficial arthropods, resulting in increased problems with San Jose scale and web-spinning summer mites. This experiment was designed to test the control of PTB and San Jose scale with several dormant sprays and to monitor the scale parasitoid, *Encarsia perniciosi.* Web spinning mites were also monitored.

Procedures:

A young, bearing almond orchard with Nonpareil, Carmel and Sonora varieties in Livingston, CA was chosen to test dormant pesticide applications. SUCCESS® (Dow AgroSciences), a product derived from *Saccharopolyspora spinosa* was tested with diazinon and Asana® in dormant treatments. Each treatment was applied to three replicates of 9 to 12 trees by 13 rows with a PTO driven Aerofan sprayer pulled by a Heston hydrostatic 80-66 tractor at 2.4 mph. Tree spacing is 21' X 18' with 101 trees/ac. Asana® and Success® sprays were applied on January 21, 1998, and the diazinon treatment was applied on January 22, 1998. All treatments were applied at 100 gpa.

Treatments:
1) diazinon 4EC @ 2 qt/ac + supreme oil @ 5 gpa + 8 # Kocide 101
2) Success®* 2SC @ 6 oz/ac + supreme oil @ 5 gpa + 8 # Kocide 101
3) Asana® XL @ 10 oz/ac + supreme oil @ 5 gpa + 8 # Kocide 101
4) Untreated Control
* spinosad derived from *Saccharopolyspora spinosa*

Two PTB traps, 2 NOW traps and 2 San Jose Scale pheromone traps were placed in each treatment replication in March (six per treatment). Traps were monitored and read weekly through August. Twospotted mite *Tetranichus urticae*, the European red mite *Panonychus ulmi* and the Western orchard predator mite *Metaseiulus occidentalis* were also monitored weekly.

Samples of nuts were taken from the windrows at harvest, cracked and evaluated to determine the reject levels for NOW, PTB, ants and other causes.

Results:

All insecticide treatments reduced PTB catches in pheromone traps by nearly 2/3 in the first flight, but did not affect the second flight catches. PTB catches in the check on May 8th were highly significantly different from all other treatment catches for that date. See **Figure 1**. The first flight of PTB began April 25th and ended July 3rd. The second flight began July 13th and ended August 21st. PTB damage in 'Nonpareil' nut samples collected from harvest windrows was 0.9% in the untreated check, 0.6% for diazinon, 0.5% for Success®, and 0.3% for Asana®. PTB reject levels were significantly lower in the Asana® and Success® treatments as compared to check. See **Figure 2**.

Shrivel was also a very common reason for rejects in 1998. Shrivel was unrelated to the dormant spray treatments, and caused much greater losses than insects in this orchard. See **Figure 3**.

All insecticide treatments reduced San Jose scale male counts in pheromone traps by 80% or more in the 1st flight in late March, and had no apparent effect on the very small August flight. Check counts of SJS males were highly significantly greater on March 27th compared to all treatments. See **Figure 4**. However, San Jose scale has not become a problem even in the unsprayed check.

Trap counts of *Encarsia perniciosi* were very sharply reduced by the Asana® spray throughout the trapping period from March to September. Success® and diazinon showed almost equal, moderate reductions of *Encarsia perniciosi* as compared to the catches in the unsprayed check as seen in **Figure 5**. *Encarsia* peak numbers were significantly higher in the check on April 24th, but not significant at the August 30th peak. **Figure 6** compares season long total catches of SJS males with *Encarsia* catches. Note the sharp reduction in total numbers of *Encarsia* in the Asana® treatment.

Navel orangeworm was almost nonexistent on the NOW egg traps, but we did find 0.3% to 0.7 % kernel damage in the samples which we attributed to NOW. The highest level was in the untreated check, which probably means that NOW was found in nuts which had been damaged initially by PTB.

Twospotted mite suddenly increased to high levels in early July. Western orchard predator mite was not prevalent at that time. The orchard was sprayed to prevent damage, and no evaluation could be made between treatments. Spider mite numbers were very similar across treatments and check before the orchard was sprayed.

Conclusions:

Dormant treatments reduced PTB catches in the pheromone traps in the first flight, because overwintering larvae were killed and the total population was reduced. This trap response was surprising, since pheromone traps are not usually a good tool by which to estimate population size. Dormant spray effects did not modify the second flight catches. PTB damage in the harvest samples from windrowed 'Nonpareil' nuts was significantly higher at 0.9% in the untreated check than in the Success® (0.5%) or the Asana® (0.3%) treatments. Diazinon (0.6%) was not statistically better than check nor worse than the Success® and Asana® treatments.

All insecticide treatments reduced SJS male catches in the 1st flight, but had no apparent effect on the August flight. The SJS pheromone traps did seemingly reflect population size. *Encarsia* seems to be controlling the San Jose scale in the unsprayed Check.

Trap counts of the SJS parasitoid *Encarsia perniciosi* were very sharply reduced by the Asana® spray throughout the trapping period from March to September. This indicates a possible problem with disruption of biological control of SJS in an orchard in which SJS has become a major pest. Growers and PCAs should carefully consider this possible problem when choosing a pesticide for dormant application. Success® and diazinon showed almost identical, moderate reductions of *Encarsia perniciosi* as compared to the catches in the unsprayed Check.

Navel orangeworm is only a minor pest in this orchard at this time and these dormant sprays did not seem to be a factor with the web spinning mite populations.

Figure 1. PTB MOTH CATCHES 1998

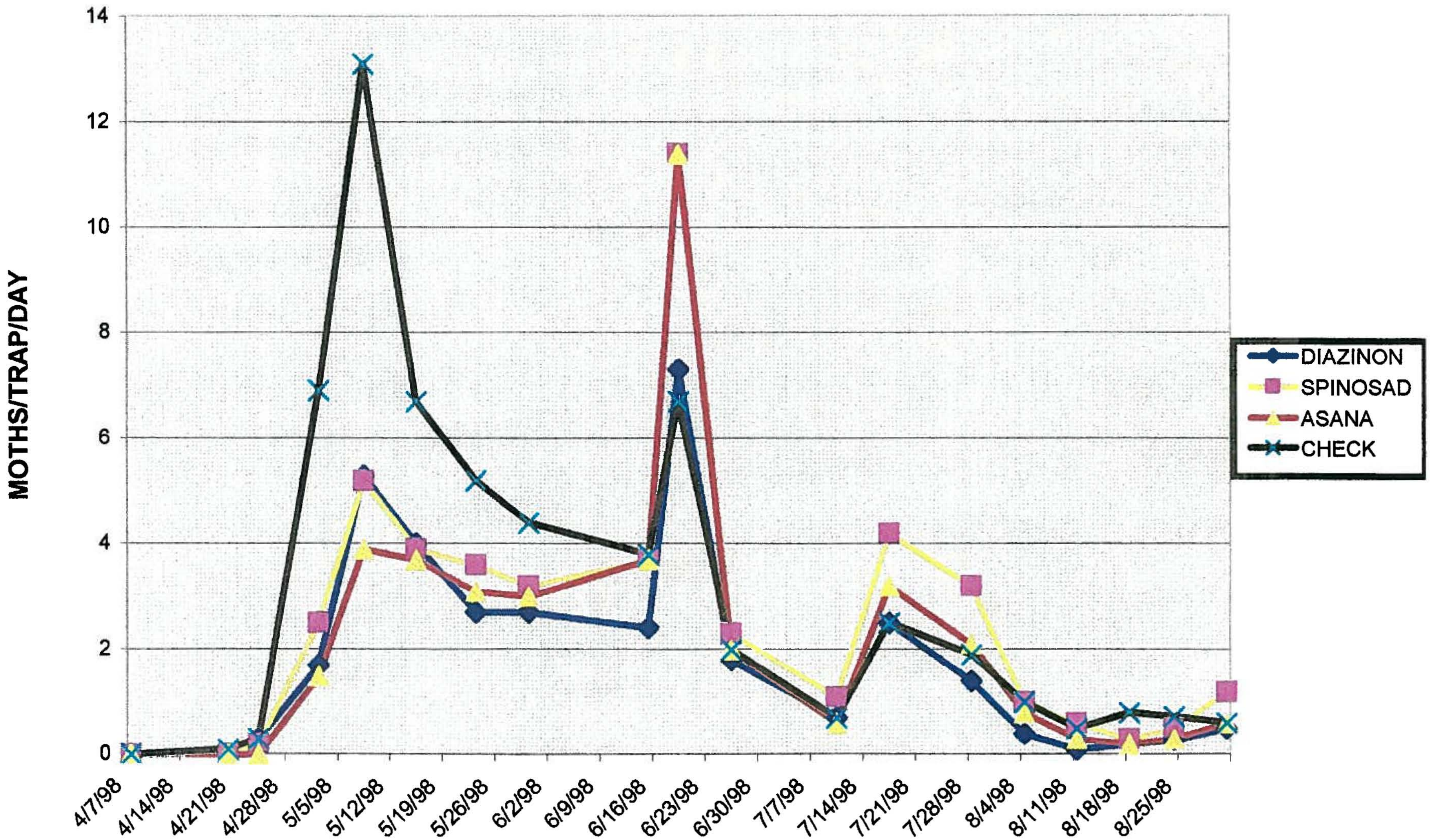


Figure 2. REJECTS FROM INSECTS RELATED TO DORMANT SPRAYS

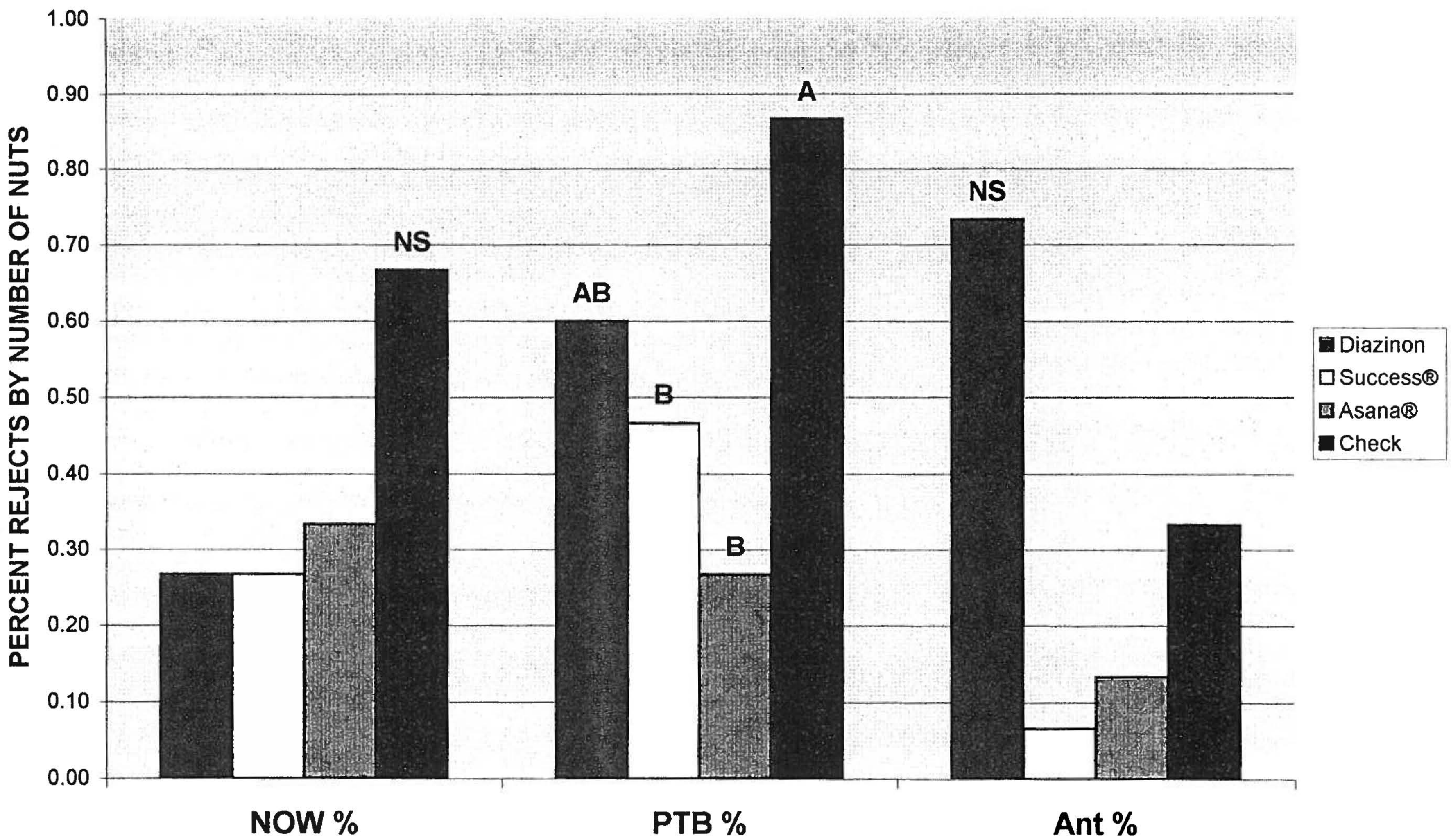


Figure 3. ALL INSECT DAMAGE AND SHRIVEL IN DORMANT TREATMENTS

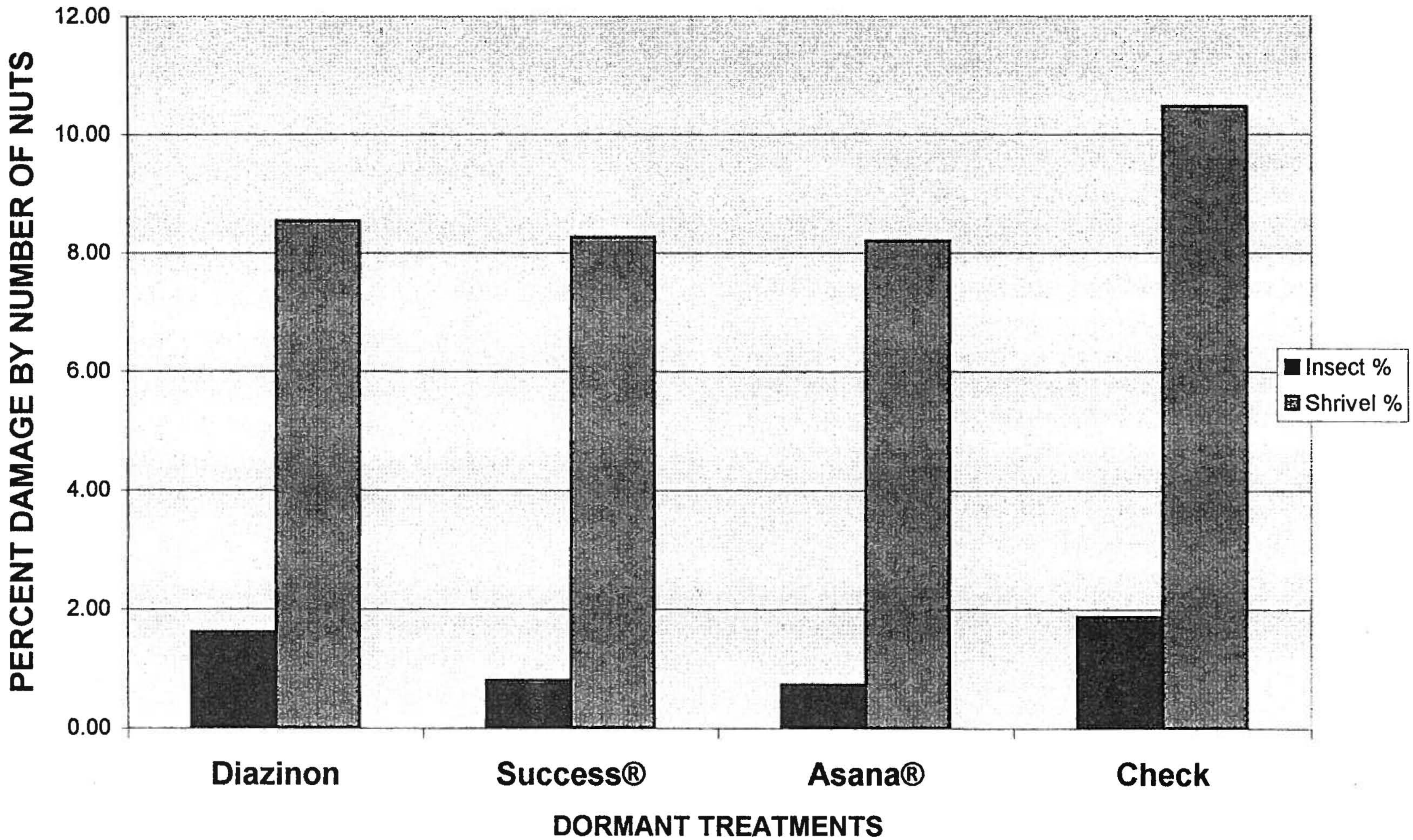


Figure 4. SAN JOSE SCALE CONTROL EXPERIMENTS - 1998

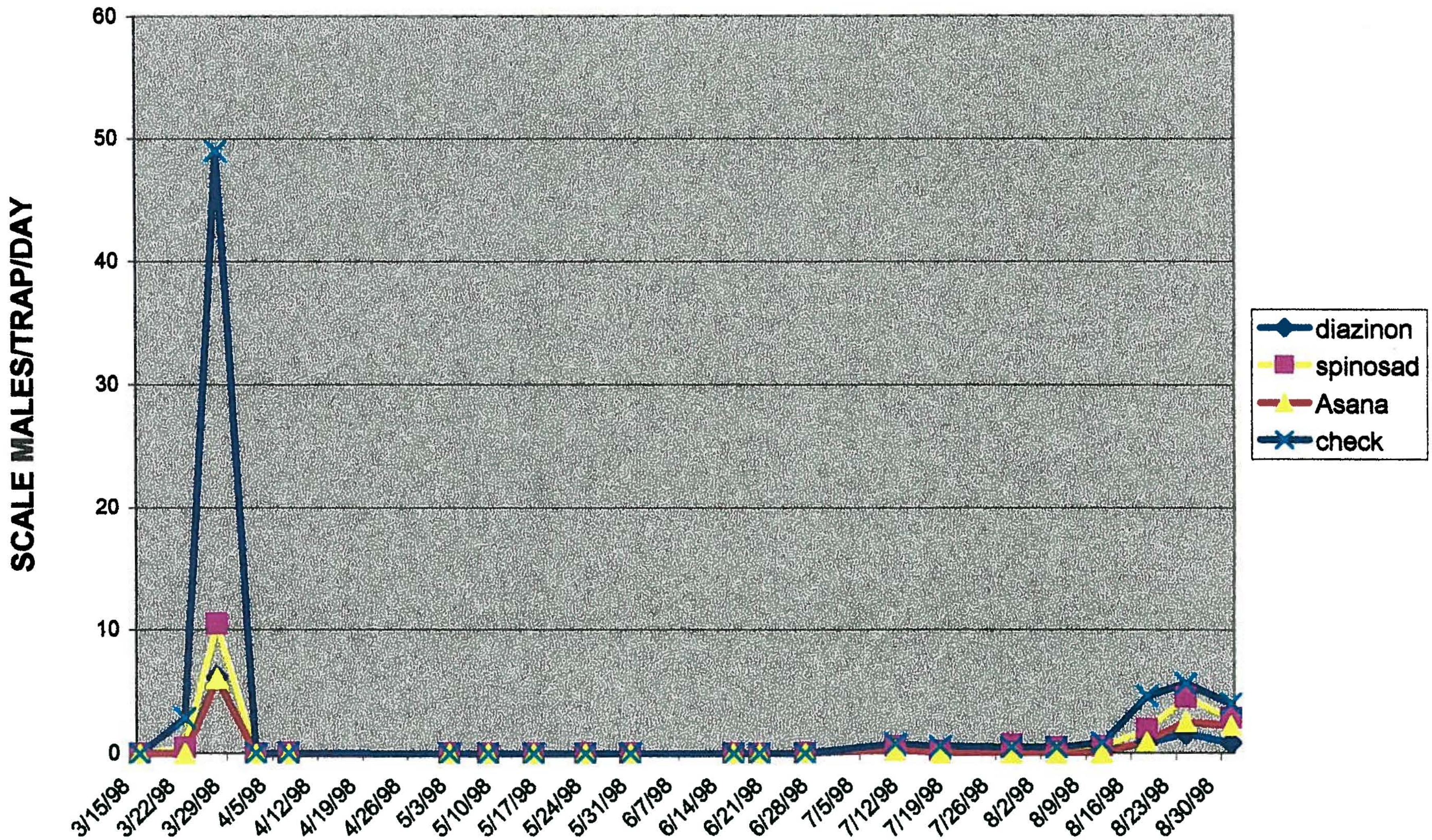


Figure 5. DORMANT SPRAY EFFECTS TO ENCARSIA

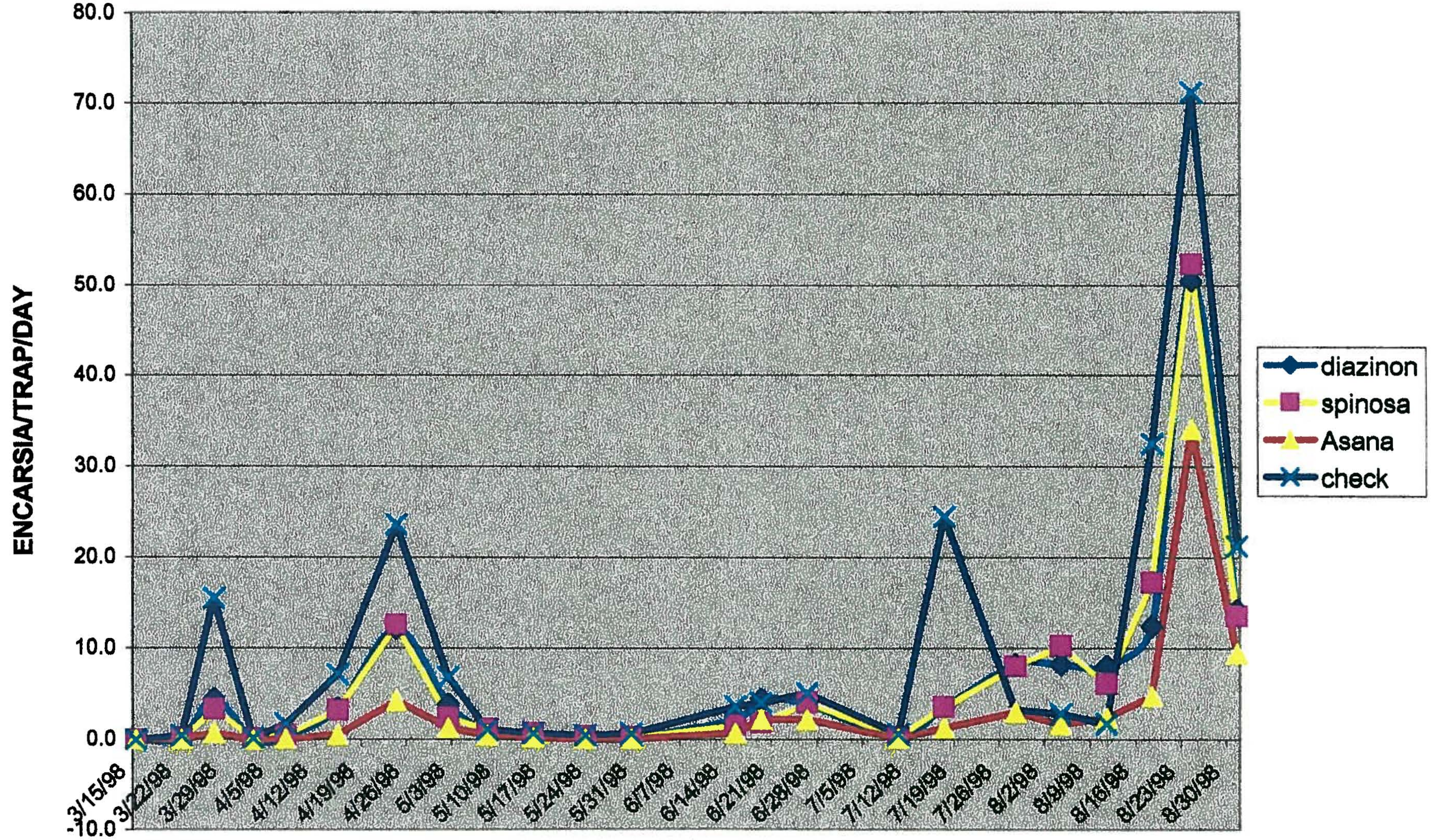
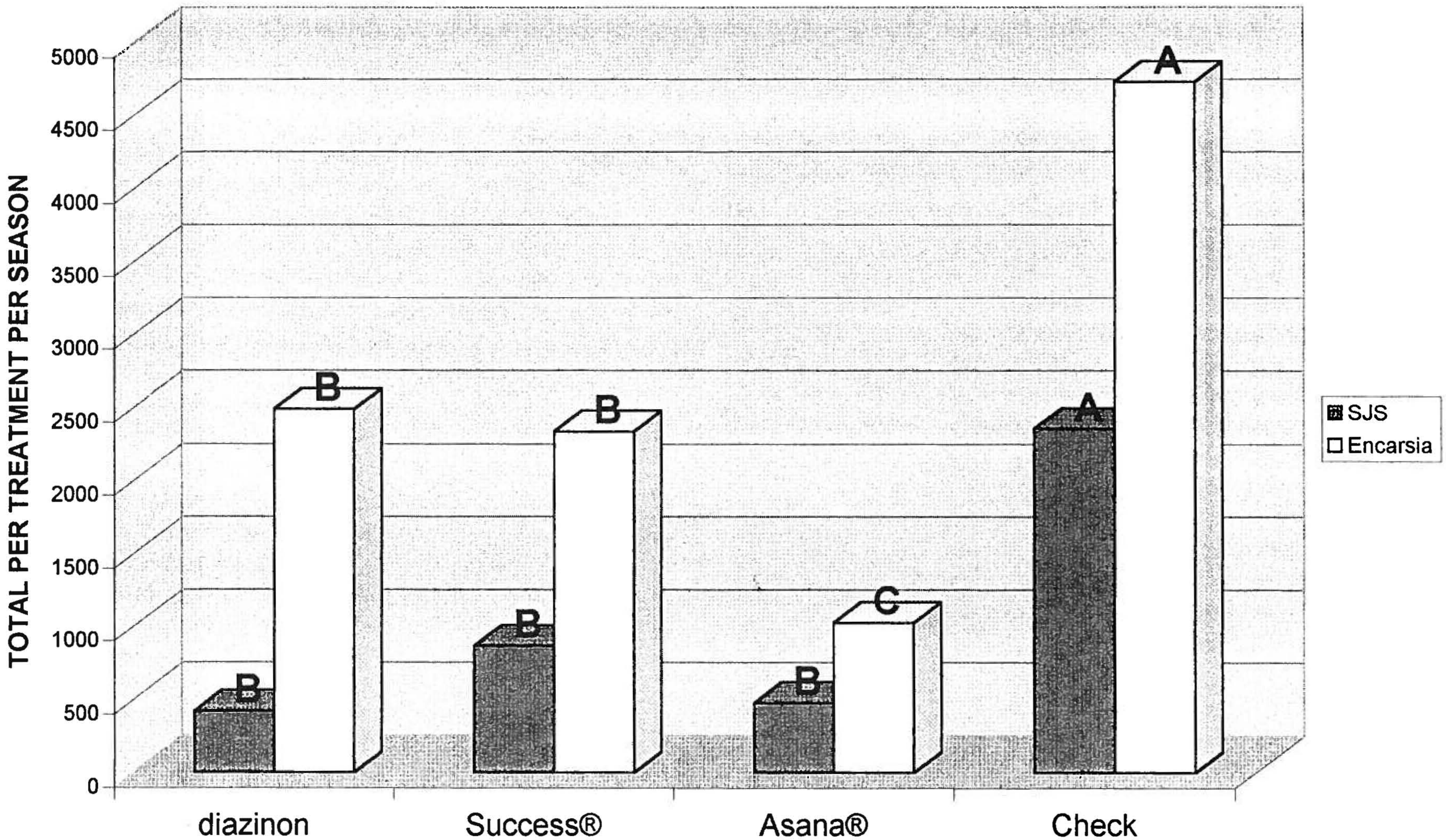
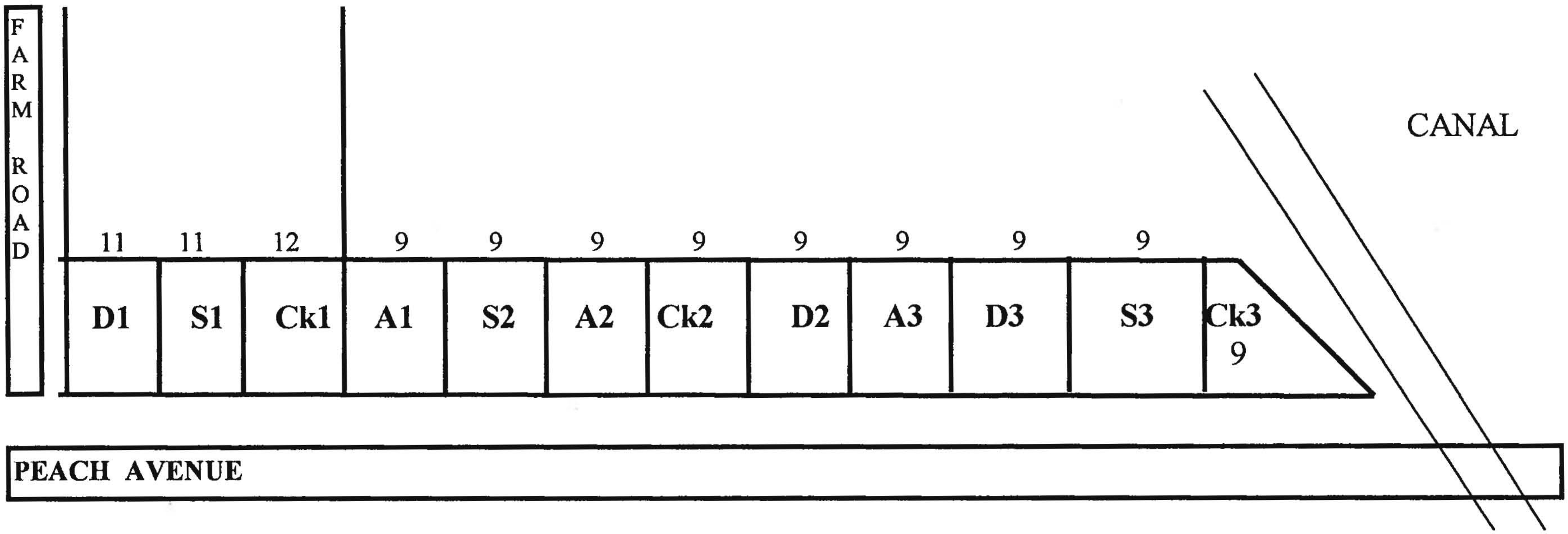


Figure 6. DORMANT SPRAY EFFECTS 1998



ARAKELIAN FARMS
PTB CONTROL EXPERIMENT 1998
PEACH AVE., LIVINGSTON, CA



Notes: Spacing is 21' X 18' = 101 trees/ac. Each treatment was one 500-gallon tank applied to 13 X 29 trees plus extra rows to = 500 trees with PTO driven Aerofan pulled by Heston hydrostatic 80-66 at 2.4 mph.
On January 21, 1998, Asana and Success sprays applied to first 13 tree rows on south border of this orchard and remainder of tanks sprayed to rows to north of experiment. The diazinon treatment will be applied on January 22, 1998. Weather at 1:30 pm was ~55°F with broken clouds and slight NW breeze changing to SE to calm by 6 pm.

<u>Blue</u> D = diazinon 4EC @ 2 qt/ac + supreme oil @ 5 gpa + 8 # Kocide 101 sprayed 1/22/98 11-1 pm.
<u>Yellow</u> S = Success 2SC @ 6 oz/ac + supreme oil @ 5 gpa + 8 # Kocide 101 sprayed 1/21/98 3-6 pm.
<u>Red</u> A = Asana XL @ 10 oz/ac + supreme oil @ 5 gpa + 8 # Kocide 101 sprayed 1/21/98 1:30-3 pm.
<u>White</u> Ck = Untreated Control

ANALYSES OF VARIANCE IN THIS REPORT:

PTB FLIGHT 5/8/98

TREATMENT	MEAN
CHECK	78.7 A*
DIAZINON	32.0 B
SUCCESS®	31.0 B
ASANA®	23.2 B

* 1% LEVEL

PTB: HARVEST % REJECTS

TREATMENT	MEAN
CHECK	4.3 A*
DIAZINON	3.0 AB
SUCCESS®	2.3 B
ASANA®	1.3 B

* 5% LEVEL

NOW: HARVEST % REJECTS

TREATMENT	MEAN
CHECK	3.3 NS
DIAZINON	1.3
SUCCESS®	1.3
ASANA®	1.7

ANT: HARVEST % REJECTS

TREATMENT	MEAN
CHECK	1.7 NS
DIAZINON	3.7
SUCCESS®	0.3
ASANA®	0.7

SJS FLIGHT 3/27/98

TREATMENT	MEAN
CHECK	246 A*
DIAZINON	31 B
SUCCESS®	53 B
ASANA®	31 B

* 1% LEVEL

***Encarsia* FLIGHT 4/24/98**

TREATMENT	MEAN
CHECK	213 A*
DIAZINON	109 AB
SUCCESS®	113 AB
ASANA®	39 B

* 1% LEVEL

***Encarsia* FLIGHT 8/30/98**

TREATMENT	MEAN
CHECK	71 NS
DIAZINON	51
SUCCESS®	52
ASANA®	34

SJS TOTALFLIGHT 1998

TREATMENT	MEAN
CHECK	785 A*
DIAZINON	139 B
SUCCESS®	287 B
ASANA®	158 B

* 1% LEVEL

***Encarsia* TOTAL FLIGHT 1998**

TREATMENT	MEAN
CHECK	1578 A*
DIAZINON	829 AB
SUCCESS®	779 AB
ASANA®	341 B

* 5% LEVEL

PEACH SILVER MITE CONTROL IN ALMONDS IN 1998

Principal Investigators:
Lonnie C. Hendricks, Farm Advisor, Merced County
Simon Bautista, UCCE Field Assistant, Merced County
Everett Younce, Lab and Field Technician, Merced County

Cooperators:
Stan Morimoto, Morimoto Farms
Carol Regusci, BASF Corporation

The Situation:

The Peach Silver Mite (PSM), *Aculus cornutus* is a relatively minor pest of mature almond trees, but has become increasingly injurious to young almond trees under five to six years of age. High populations can cause burning, shotholing, and twisting of the leaves, stunting of the growing point of the shoot, and defoliation. This damage can easily be confused with a nutrient deficiency symptom such as potassium deficiency, or a disease such as shothole. The symptoms might also be confused with leafhopper damage.

Pesticide applications to control the other common mite species such as the Pacific spider mite *Tetranichus pacificus,* twospotted mite *Tetranichus urticae* and the European red mite *Panonychus ulmi* will usually control Peach silver mite. Sulfur has been a cheap and effective control as well. There has been some concern that sulfur applications could reduce the numbers of the Western orchard predator mite, *Metaseiulus occidentalis*, but my research in 1997 indicated that this was not a valid concern.

There is interest in using materials other than the current miticides for controlling this pest. Pyramite® (pyridaben) 60% WP is new miticide for use in almonds, and very little is known about its effect on PSM and predator mites. In this experiment, Pyramite® was compared with Agri-Mek® 0.15 EC, Omite® 30WP, Omni oil, laundry soap, and wettable sulfur for control of PSM in Morimoto Farms orchard in Livingston, CA.

Procedures:

A second-leaf almond orchard was selected for these mite control treatments due to the extremely high population of PSM in the orchard in June 1998. A high pressure sprayer was used to apply a target rate of 200 gallons per acre. The experiment consisted of nine treatments sprayed on July 9, 1998 with eight single-tree replications in a randomized complete block design.

The treatments were:
DATE OF APPLICATION: July 9, 1998

COLOR	TREATMENT	RATE/100 G	RATE /10 G	RATE/AC
BLUE	OMITE® 30 WP	1.0 lb	0.1 lb	2.0 lb
YEL/BLK	OMNI-OIL	0.5 gal	0.05 gal	1.0 gal
YELLOW	SULFUR	2.5 lb	0.25 lb	5.0 lb
RED	AGRI-MEK® OMNI-OIL	2.5 oz 0.5 gal	0.25 oz 0.05 gal	5.0 oz 1.0 gal
ORANGE	DETERGENT "CLOUT"	0.5 lb	0.05 lb	1.0 lb
RED/WHITE	PYRAMITE®	3.3 oz	0.33 oz	6.6 oz
BLK/ORNG	PYRAMITE®	2.2 oz	0.22 oz	4.4 oz
PINK	PYRAMITE®	1.1 oz	0.11 oz	2.2 oz
WHITE	CHECK	(UNTREATED)		

Notes:
July 9, 1998, used 10 gallons for 8 trees per treatment. Slight NW breeze and 70° to 80° F.
AGRI-MEK® 0.25 fl oz = 7.5 ml in 10 gal
OMNI-OIL 0.05 gal = 6.4 fl oz in 10 gal
PYRAMITE® 0.33 oz = 9.9 grams in 10 gal

Counts of Peach silver mite, twospotted mite, and Western orchard predator mite were made each week from July 8, 1998 through August 21, 1998 by selecting 10 representative leaves at random from each tree (80 leaves per treatment) and counting these by using a binocular microscope in the UCCE Merced laboratory. Due to the very high numbers of mites, only one square inch of the upper surface of each leaf was counted. These are the numbers tabulated on the sheet attached to this report. Unfortunately, the leaf samples were composited, so no statistical analysis of the data is possible.

Results:

All treatments rapidly reduced the population of PSM. The graph entitled "Figure 1. PSM CONTROL EXPERIMENT 1998" shows a sharp reduction in PSM for three weeks following treatment. Even the very low rate of Pyramite® at 2.2 oz/acre reduced PSM populations to less than 10% of the pretreatment counts. Note that **Figure 1 is a log scale**

graph. The PSM population in the untreated check remained at nearly a constant high level for the four weeks following treatment. At week five the PSM population dropped in the check to about 10% of the pretreatment level, due to predation. Pyramite® at 4.4 oz and 6.6 oz, Omite® at 2 LB and Agri-Mek® at 5 oz/acre all held PSM populations below 1 per square inch for three weeks or more. Sulfur was a long lasting and effective treatment as well. Clout detergent and Omni oil gave quick knockdown, but were ineffective past three weeks.

The twospotted spider mite populations reached a maximum of less than 1 per leaf at the end of this experiment and were insignificant throughout the test period.

Predator mite levels were low with a maximum of 24 per 80 leaves five weeks after treatment. The highest levels were in the untreated check, Clout detergent, and the 2.2 oz rate of Pyramite®. The predator mite was not readily found in many orchards in 1998.

Conclusions:

All treatments gave a rapid reduction in PSM for three weeks following treatments. Pyramite® at 4.4 oz and 6.6 oz/acre, Omite® at 2 LB/acre and Agri-Mek® at 5 oz/acre all held PSM populations below 1 per square inch for three weeks or more. Sulfur was a long lasting and effective treatment. Clout detergent and Omni oil produced a quick knockdown, but were ineffective beyond three weeks.

The PSM population in all treatments was beginning to decline by August 21st, due to natural causes including predation by the Western orchard predator mite, *Metaseiulus occidentalis.*

Predator mite levels were low and number built slowly through the period of observation. The highest levels were in the untreated check, Clout detergent, and the 2.2 oz rate of Pyramite®. The predator mite was not present in adequate numbers to make a good evaluation of the effects of the miticides on its survival.

PEACH SILVER MITE CONTROL PLOT-1998

MORIMOTO FARMS, LIVINGSTON, CA

APPLICATION DATE: JULY 9, 1998

Number of PSM on 1 sq. inch of 10 leaves/tree X 8 trees = 80 leaves.

COLOR	TREATMENT	8-Jul-98	17-Jul	24-Jul	31-Jul	7-Aug	21-Aug
BLUE	OMITE 30 WP @ 2 LB/AC	1926	11	19	22	82	42
YEL/BLK	OMNI OIL @ 1 GPA	1876	6	144	115	830	103
YELLOW	SULFUR @ 5 LB/AC	1499	28	130	127	146	39
RED	AGRI-MEK @ 5 OZ+ OMNI OIL @ 1 GPA	2020	12	1	3	9	24
ORANGE	CLOUT DETERGENT @ 1 LB/AC	1849	35	187	163	593	162
RED/WHIT	PYRAMITE @ 6.6 OZ/AC	2045	16	58	50	149	63
ORANGE/I	PYRAMITE @ 4.4 OZ/AC	1630	8	0	0	123	80
PINK	PYRAMITE @ 2.2 OZ/AC	1904	183	173	142	77	36
WHITE	UNTREATED CHECK	2436	1019	1077	880	819	104

APPLICATION DATE: JULY 9, 1998

Number of PREDATOR MITES on 80 leaves X 1 sq. inch each.

COLOR	TREATMENT	8-Jul-98	17-Jul	24-Jul	31-Jul	7-Aug	21-Aug
BLUE	OMITE 30 WP @ 2 LB/AC	0	0	4	5	7	8
YEL/BLK	OMNI OIL @ 1 GPA	0	0	0	0	8	0
YELLOW	SULFUR @ 5 LB/AC	0	1	2	2	5	2
RED	AGRI-MEK @ 5 OZ+ OMNI OIL @ 1 GPA	0	1	1	2	0	0
ORANGE	CLOUT DETERGENT @ 1 LB/AC	0	1	2	2	24	12
RED/WHIT	PYRAMITE @ 6.6 OZ/AC	0	0	4	2	3	4
BLK/ORAN	PYRAMITE @ 4.4 OZ/AC	0	0	0	2	3	4
PINK	PYRAMITE @ 2.2 OZ/AC	0	5	10	8	3	5
WHITE	UNTREATED CHECK	0	7	11	11	9	11

APPLICATION DATE: JULY 9, 1998

Number of TWO-SPOTTED MITES on 80 leaves X 1 sq. inch each.

COLOR	TREATMENT	8-Jul-98	17-Jul	24-Jul	31-Jul	7-Aug	21-Aug
BLUE	OMITE 30 WP @ 2 LB/AC	0	0	0	0	1	28
YEL/BLK	OMNI OIL @ 1 GPA	0	0	0	0	1	10
YELLOW	SULFUR @ 5 LB/AC	0	0	0	0	12	65
RED	AGRI-MEK @ 5 OZ+ OMNI OIL @ 1 GPA	0	0	0	0	0	0
ORANGE	CLOUT DETERGENT @ 1 LB/AC	0	0	0	0	7	50
RED/WHIT	PYRAMITE @ 6.6 OZ/AC	0	0	1	1	3	0
BLK/ORAN	PYRAMITE @ 4.4 OZ/AC	0	0	0	1	9	10
PINK	PYRAMITE @ 2.2 OZ/AC	0	0	0	0	25	17
WHITE	UNTREATED CHECK	0	0	0	0	8	35

Figure 1. PSM CONTROL EXPERIMENT 1998

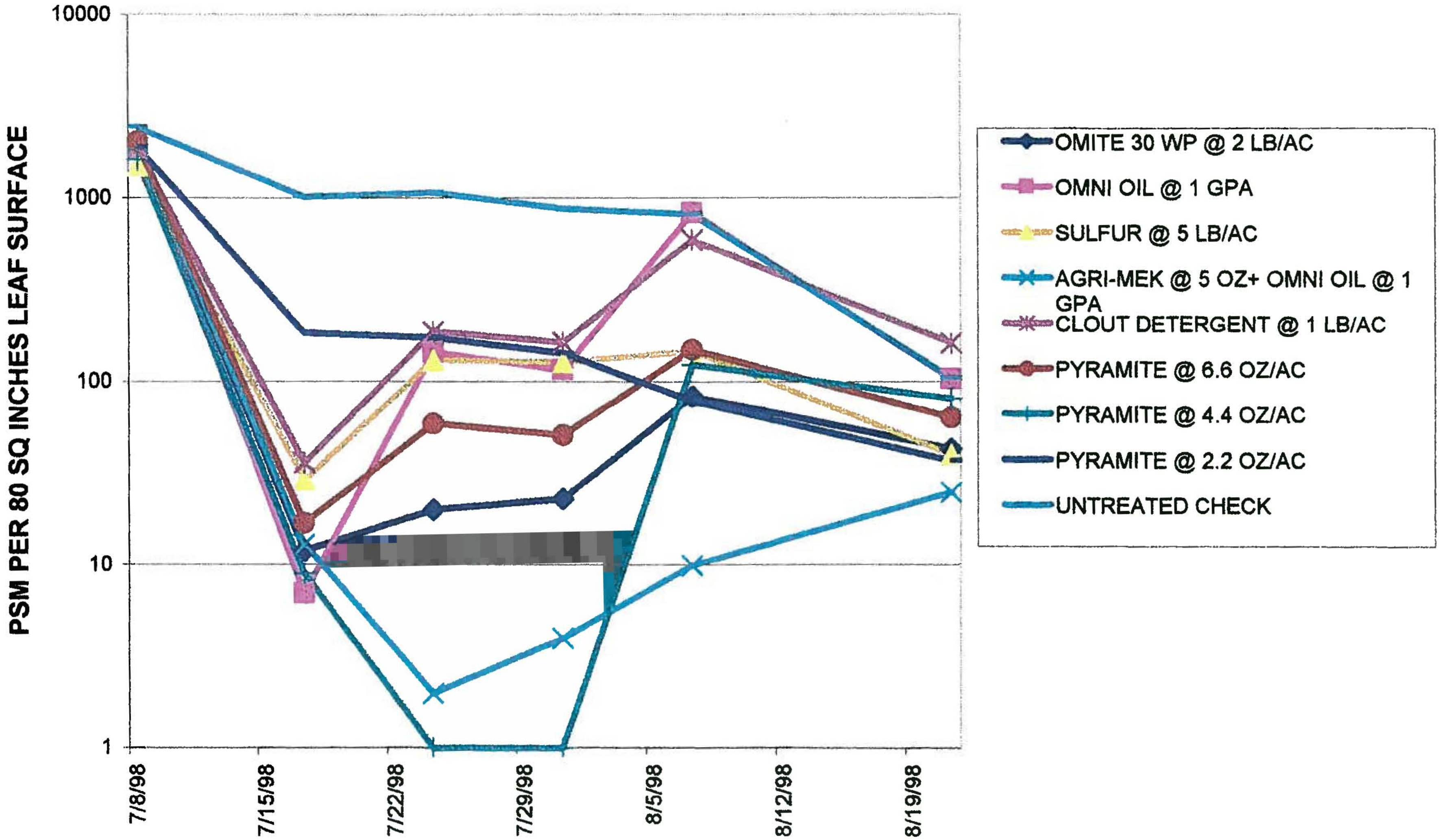


Figure 2. MITICIDE EFFECTS TO PREDATOR MITES - 1998