ANNUAL REPORT - 1984

INTEGRATED PEST MANAGEMENT FOR ALMONDS

84-C8

Project Number: 84-C8

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1984 was the fourth full year of my association with this project. The objectives for 1984 were:

1) Continued educational efforts on monitoring and sampling techniques for arthropod pests of almonds.

2) Refinement of a presence-absence sampling plan for Tetranychus mites, and initiation of educational programs for mite management.

3) Defining effects of in-season insecticide applications on predatory mites and Tetranychus mites, and analysis of temperature and predator effects on mite abundance.

INTERPRETIVE SUMMARY 84-C8

Objective 1, Educational Efforts -

Traps and other supplies were provided to cooperating Farm Advisors and Area IPM Specialists for use in validating and extending phenology for the navel orangeworm, the San Jose Scale, the peach twig borer, and the oriental fruit moth. These individuals used the materials in their ongoing educational programs, providing growers and pest control advisors an opportunity to compare their observations to those of UC staff.

Information about sampling and monitoring for the navel orangeworm, the oriental fruit moth, and ants were assembled into several publications using UC publications, trade journals, and journal articles as outlets for dissemination (see attached publications list - Appendix I). Many extension talks were also given throughout the state.

As co-project leader with Dr. Karen Klonsky of the Department of Agricultural Economics at UC Davis, and also involving Dr. John Baritelle and Joseph Moffitt of the USDA Boyden Laboratories at UC Riverside, an Evaluation of California's Almond IPM Program is being conducted as part of a larger national evaluation of IPM case histories. This is a follow-up of the survey conducted several years ago by Dr. J.C. Headley. External Funding of $30,700 was secured to conduct the program.

The primary objective of this project is to provide an in depth evaluation of the almond IPM program developed and implemented by the University of California with industry, federal, and state support. Specific objectives are to:

A) Provide complete background material including the biological aspects and history of the program.

B) Develop on-farm budgets for almond production with and without the IPM program.

C) Identify socio-economic differences between adopters and non-adopters and degree of adoption of the almond IPM program.

D) Determine impact of the IPM program on the almond industry, consumers, input suppliers, consultants, the chemical industry and the environment.

E) Estimate average profit and variation in profit of production with and without the IPM program.

Objective 2, Presence-Absence Sampling -

Counting mites is a time-consuming process. Conventional techniques, such as using the mite brushing machine, provide a constant and fairly accurate estimate of mite populations, however, limitations include the amount of time and equipment required to use these techniques. Therefore, a group of us including Drs. Marjorie Hoy, Ted Wilson and Bill Barnett developed a practical sampling alternative for the *Tetranychus* spider mites in almond orchards. The program was presented in a handout at the 1983 research conference, in several publications (Appendix I), at several extension meetings, and in the field on demonstration plots. It will also be included in the new Almond IPM manual.

The presence-absence sequential sampling plan provides an estimate of whether or not treatment is required, and can be used as part of a weekly orchard monitoring program. Some areas within an orchard, such as those near roadways or on a streak of sandy soil, have greater potential for mite outbreaks than the rest of the orchard. If it is possible to treat only those areas instead of the entire orchard, they should be sampled separately. To reduce the effect of between-tree variance within an orchard, the number of sampled from each tree should be reduced, thus increasing the number of trees sampled.

Figure 1 shows the relationship between proportion of infested leaves and number of *Tetranychus* mites per leaf in the presence of predators (principally *Metaseiulus occidentalis*) and in the absence of predators. As might be expected, *Tetranychus* mites are less clumped in the presence of predators. Figures 2 and 3 are tables derived from these relationships permitting the conversion of proportion infested leaves to number of mites per leaf. These values can be used to calculate mite-days if this threshold is preferred over that based on percent infested leaves.

Monitoring should include understanding the role of predatory mite *M. occidentalis* and other predators including *Stethorus* spp., lacewings, and six-spotted thrips, and managing these predators if they are present in the orchard. When approaching the decision thresholds 22% infested leaves in the absence of predators or 45% infested leaves in the presence of predators, or 100 to 125 mite-days when converting to number of mites per leaf, it is important to consider predator populations. If no predators are present, don't wait for them to appear. A common failure of a mite management program is waiting too long to apply an acaricide. When predators are present, low rates of an acaricide should be used to preserve their food source if an acaricide must be applied. We have observed that when the proportion of leaves infested with predators approaches the proportion of leaves infested with *Tetranychus* mites, the spider mite population will decline shortly. If the proportion of leaves infested with predators is 1/4 to 1/3 that of the proportion of leaves infested with *Tetranychus* mites, the spider mite population could decline in two or three weeks after the predator/prey ratio improves. In this case the current *Tetranychus* level must be considered. If it is approaching a treatment threshold a treatment must be applied. Again, low rates of acaricides should be used to provide food for the predators. Aerial applications combined with low rates are a good combination.

We have assisted Dr. Marjorie Hoy in producing a leaflet entitled 'Managing Mites in Almonds: an Integrated Approach' which outlines our current knowledge of mite management. It will be distributed at extension meetings this winter.

Objective 3, Mite Development

During the past two seasons, plots were established in Durham and Fresno to determine the influence to carbaryl (Sevin), azinphosmethyl (Guthion), and permethrin (Pounce) on predatory mites and the rate at which *Tetranychus* mites increase following application of those materials. A third plot established at Bakersfield tested the impact of carbaryl, diazinon, permethrin, and different rates of two pyrethroids not registered for use on almonds, cyfluthrin (Baythroid) and flucythrinate (Pay-off), on the same parameters.

Our results, some of which were presented in part last year, were very interesting. In 1983 and again at Durham in 1984 (Figure 4, Tables 1 and 2), both carbaryl and permethrin caused significantly greater loss of predatory mites and significantly greater number of *Tetranychus* mites following the application of either material as either a May spray or a hullsplit spray than that of the unsprayed checks. At Durham, plots sprayed with azinphosmethyl did not cause significantly greater mortality or *Tetranychus* mite increase than the control. However, at Fresno azinphosmethyl did cause a higher rate of increase than the control, but this increase occurred much later than that observed for either carbaryl or permethrin. All rates of cyfluthrin and flucythrinate tested at Bakersfield were comparable to carbaryl and permethrin in their effect on predators and the rate of *Tetranychus* mite increase. All plots treated with carbaryl or the pyrethroids (permethrin, cyfluthrin, flucythrinate) reached treatable levels of *Tetranychus* mites at sometime following their application. When predators were present in the test orchard, the control plots seldom reached treatable levels. Similar results have been reported by researchers elsewhere on many orchard and field crops.

The effect of pyrethroid sprays on the abundance of *Tetranychus* mites the following season was apparent on each of our plots. In every case an in-season permethrin treatment (whether a May spray or a hullsplit spray) resulted in significantly higher levels of *Tetranychus* mites early the following spring than that level observed for plots treated with carbaryl, azinphosmethyl, or not treated (Figures 11-12, Table 7). In some cases, treatable *Tetranychus* mite levels requiring treatment occurred as early as late April or early May in the pyrethroid-treated plots.

Extreme caution should be exercised when choosing to use permethrin in an orchard because of its impact on *Tetranychus* mites both in the remainder of the season following its applications, and in the subsequent season. Costs to be considered in addition to disrupting the mite system of an orchard should include the price of additional acaricide sprays, and the possibility of increasing levels of mite resistance.

These data are also being analyzed to determine predator-prey ratios which populations of *Tetranychus* mites will decline. Preliminary results would indicate that a ratio of one predator-infested leaf to one *Tetranychus*-infested leaf at population densities approaching or exceeding the treatment threshold will typically result in reduced Tetranychus-infested leaves the following week. When converted to the number of mites per leaf equivalent, this is roughly the same ratio proposed by Drs. Hoy and Wilson in their *Hilgardia* article.

These data are also being analyzed to determine the rate of increase in Tetranychus mite abundance as a function of temperature, density, chemical treatment and predator abundance. It is hoped that this analysis will yield a recommendation for the frequency of monitoring using the presence-absence method.

APPENDIX I

Almond Publications - 1984

Weakley, C.V., R.E. Rice, and F.G. Zalom. 1984. Monitoring oriental fruit moth development with day-degrees. UC Div. of Agr. Sci. Leaflet 7157.

Wilson, L.T., M.A. Hoy, F.G. Zalom, and J.M. Smilanick. 1984. The within-tree distribution and clumping pattern of mites in almond orchards: with comments on predator-prey interactions. Hilgardia. 52(7):1-13.

Zalom, F.G., W.W. Barnett, and C.V. Weakley. 1984. Demonstrating winter sanitation for managing the navel orangeworm, Paramyelois transitella (Walker) in commercial almond orchards. Protection Ecol. u:37-41.

Zalom, F.G., and W. Bentley. 1984. Ant management in almonds. Almond Facts 49(3):33.

Zalom, F.G., M.A. Hoy, L.T. Wilson, and W.W. Barnett. 1984. Presence-absence sequential sampling for web-spinning mites in almonds. Hilgardia. 52(7)14-24.

Zalom, F.G., C. Weakley, W.W. Barnett, L.C. Hendricks, W. Bentley, and J.H. Connell. 1984. Winter sanitation and early harvest effective against major almond pests. Calif. Ariz. Farm Press. 6(26):9.

Zalom, F.G., C. Weakley, L.C. Hendricks, W.J. Bentley, W.W. Barnett, and J.H. Connell. 1984. Cultural management of the navel orangeworm by winter sanitation. Calif. Agric. 38(3-4):28.

Zalom, F.G., L.T. Wilson, M.A. Hoy, W.W. Barnett, and J.M. Smilanick 1984. Sampling Tetranychus spider mites in almonds. Calif. Agric. 38(5-6):17-9.

Zalom, F.G., and W. Bentley. Southern fire ant (Solenopsis xyloni McCook) damage to harvested almonds in California. J. Econ. Entomol. (Accepted)

Figure 1

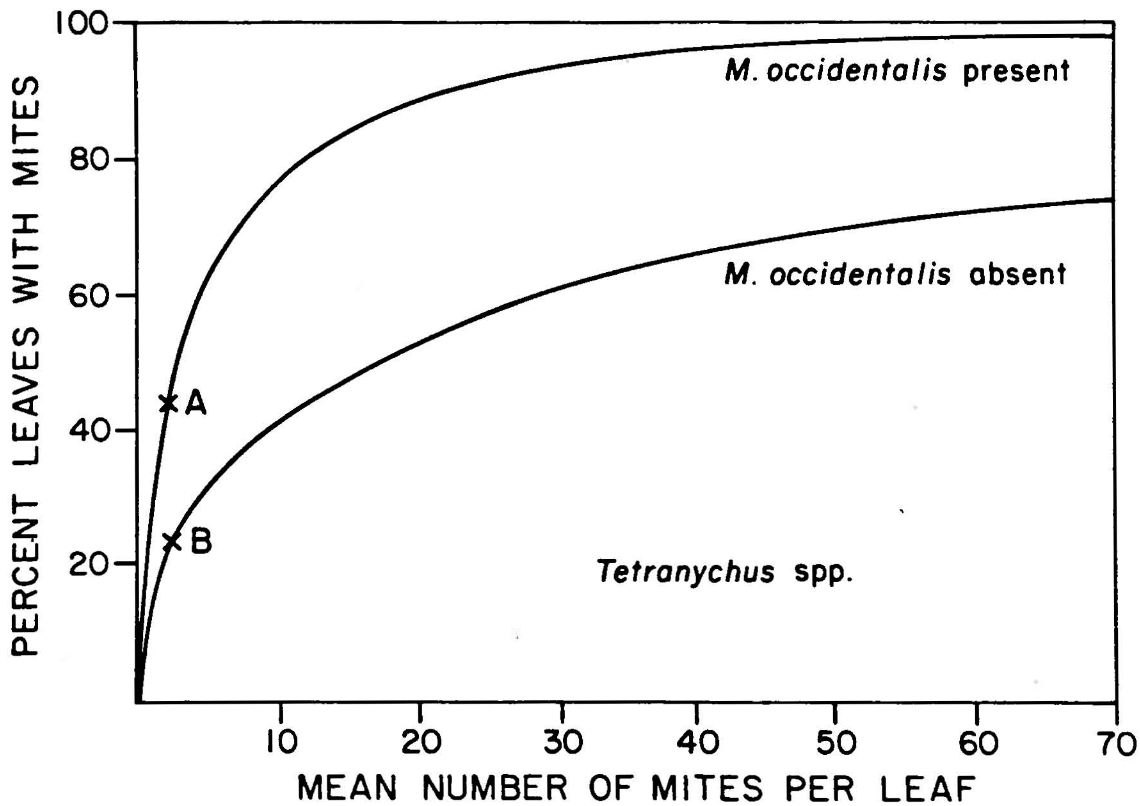

100
80
60
40
20
PERCENT LEAVES WITH MITES
M. occidentalis present
M. occidentalis absent
A
B
Tetranychus spp.
10
20
30
40
50
60
70
MEAN NUMBER OF MITES PER LEAF

Figure 2

Tetranychus urticae w/predators present

Conversion Table for proportion infested leaves

vs. mean number of mites per leaf

P(I)	$\bar{x}$	P(I)	$\bar{x}$
.02	.016	.52	3.2
.04	.04	.54	3.5
.06	.075	.56	3.8
.08	.11	.58	4.2
.10	.16	.60	4.6
.12	.21	.62	5.1
.14	.27	.64	5.5
.16	.33	.66	6.0
.18	.40	.68	6.6
.20	.48	.70	7.3
.22	.57	.72	8.0
.24	.66	.74	8.75
.26	.76	.76	9.65
.28	.87	.78	10.65
.30	.99	.80	11.85
.32	1.13	.82	13.25
.34	1.25	.84	14.8
.36	1.4	.86	16.7
.38	1.6	.88	19.0
.40	1.75	.90	22.0
.42	1.95	.92	26.0
.44	2.15	.94	31.0
.46	2.40	.96	40.0
.48	2.65	.98	56.0
.50	2.90	1.0	$\geq$ 95

Figure 3

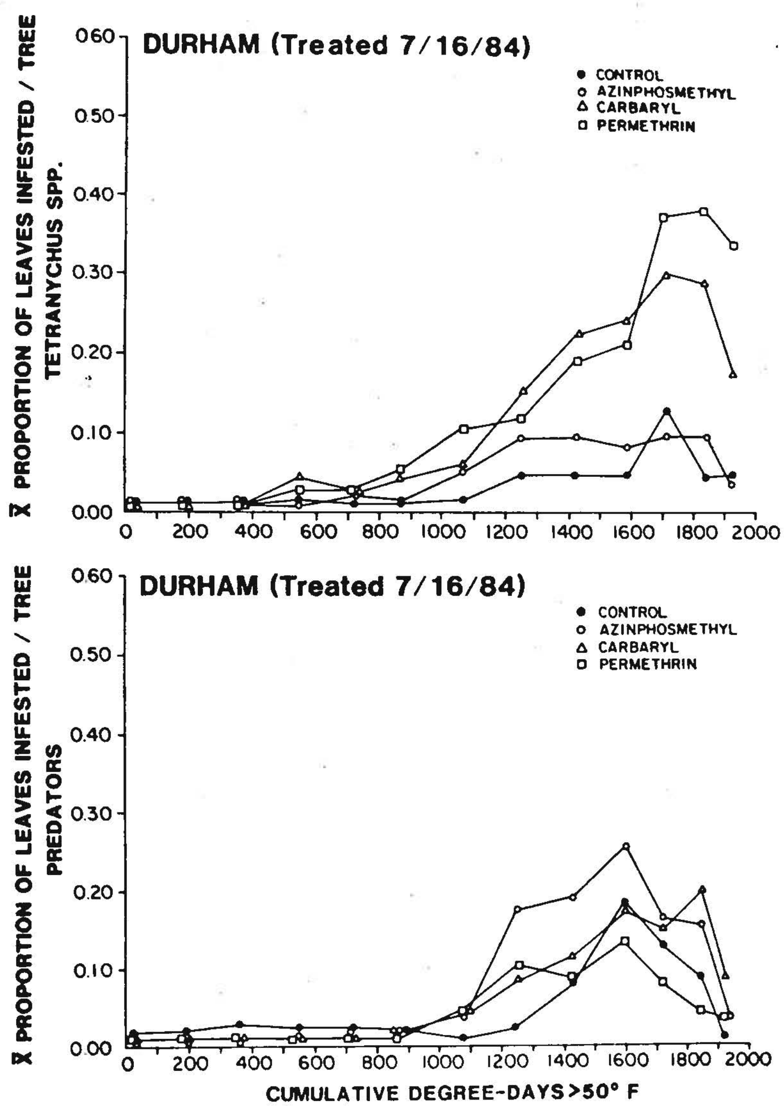
Tetranychus urticae w/Predators absent

Conversion Table for proportion infested leaves vs.

mean number of mites per leaf

P(I)	$\bar{x}$	P(I)	$\bar{x}$
.02	.025	.52	19.4
.04	.10	.54	21.7
.06	.19	.56	24.4
.08	.32	.58	27.5
.10	.49	.60	30.0
.12	.68	.62	34.0
.14	.92	.64	38.0
.16	1.2	.66	43.0
.18	1.54	.68	48.0
.20	1.90	.70	54.0
.22	2.34	.72	60.0
.24	2.82	.74	68.0
.26	3.36	.76	76.0
.28	3.98	.78	86.0
.30	4.66	.80	98.0
.32	5.42	.82	112.0
.34	6.26	.84	129.0
.36	7.20	.86	150.0
.38	8.24	.88	176.0
.40	9.4	.90	210.0
.42	10.68	.92	255.0
.44	12.1	.94	322.0
.46	13.6	.96	435.0
.48	15.4	.98	660.0
.50	17.3	1.0	$\geq$ 300.0

Figure 4


DURHAM (Treated 7/16/84)
CONTROL
AZINPHOSMETHYL
CARBARYL
PERMETHRIN
X̄ PROPORTION OF LEAVES INFESTED / TREE
TETRANYCHUS SPP.
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0
200
400
600
800
1000
1200
1400
1600
1800
2000
DURHAM (Treated 7/16/84)
CONTROL
AZINPHOSMETHYL
CARBARYL
PERMETHRIN
X̄ PROPORTION OF LEAVES INFESTED / TREE
PREDATORS
CUMULATIVE DEGREE-DAYS >50° F

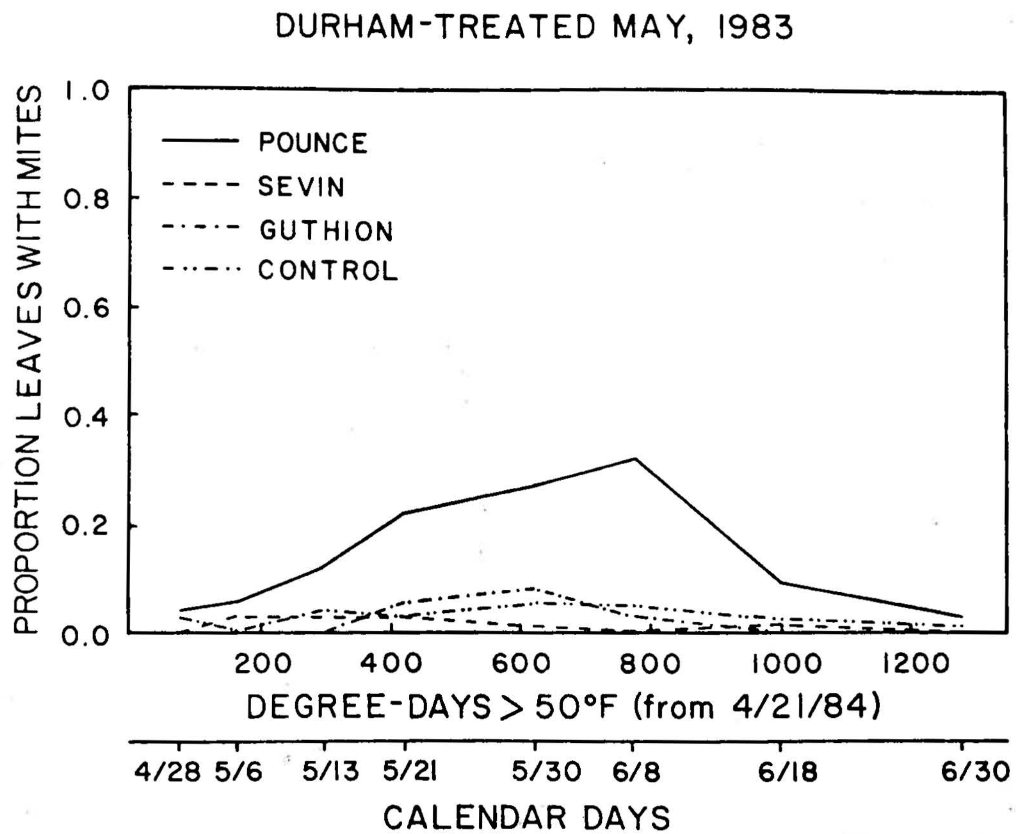

DURHAM-TREATED MAY, 1983
PROPORTION LEAVES WITH MITES
1.0
0.8
0.6
0.4
0.2
0.0
POUNCE
SEVIN
GUTHION
CONTROL
200
400
600
800
1000
1200
DEGREE-DAYS > 50°F (from 4/21/84)
4/28
5/6
5/13
5/21
5/30
6/8
6/18
6/30
CALENDAR DAYS

Figure 5

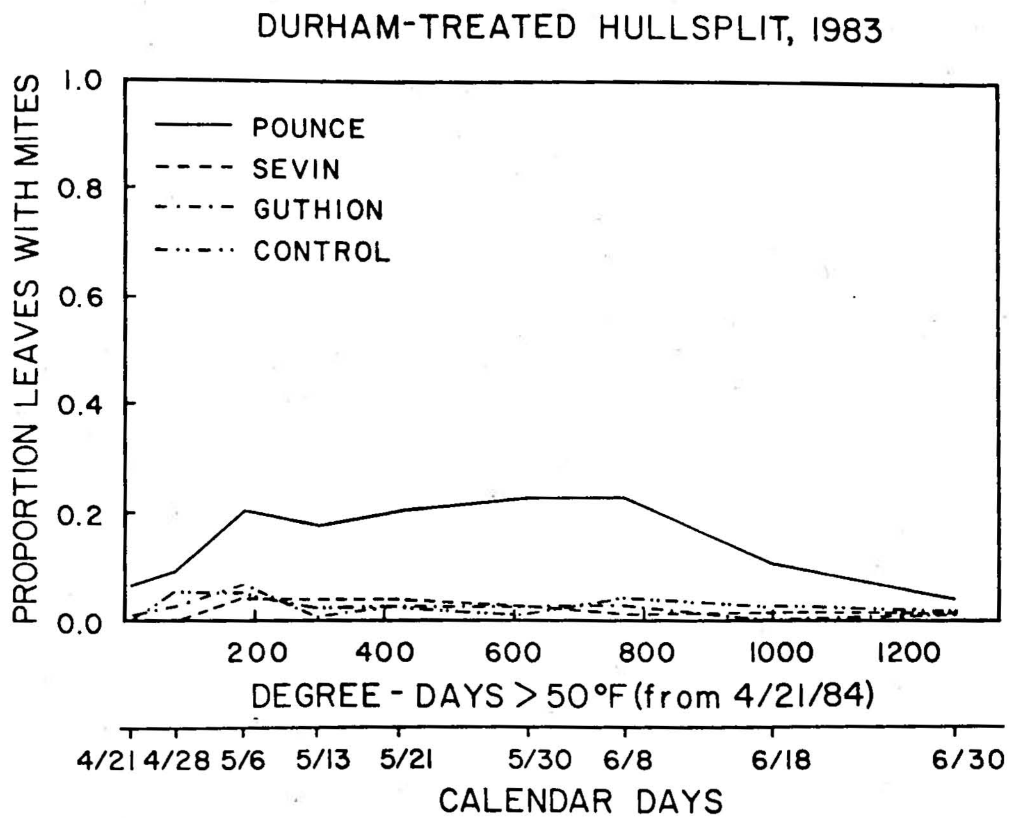

DURHAM-TREATED HULLSPLIT, 1983
PROPORTION LEAVES WITH MITES
1.0
0.8
0.6
0.4
0.2
0.0
POUNCE
SEVIN
GUTHION
CONTROL
200
400
600
800
1000
1200
DEGREE - DAYS > 50°F (from 4/21/84)
4/21
4/28
5/6
5/13
5/21
5/30
6/8
6/18
6/30
CALENDAR DAYS

Figure 6

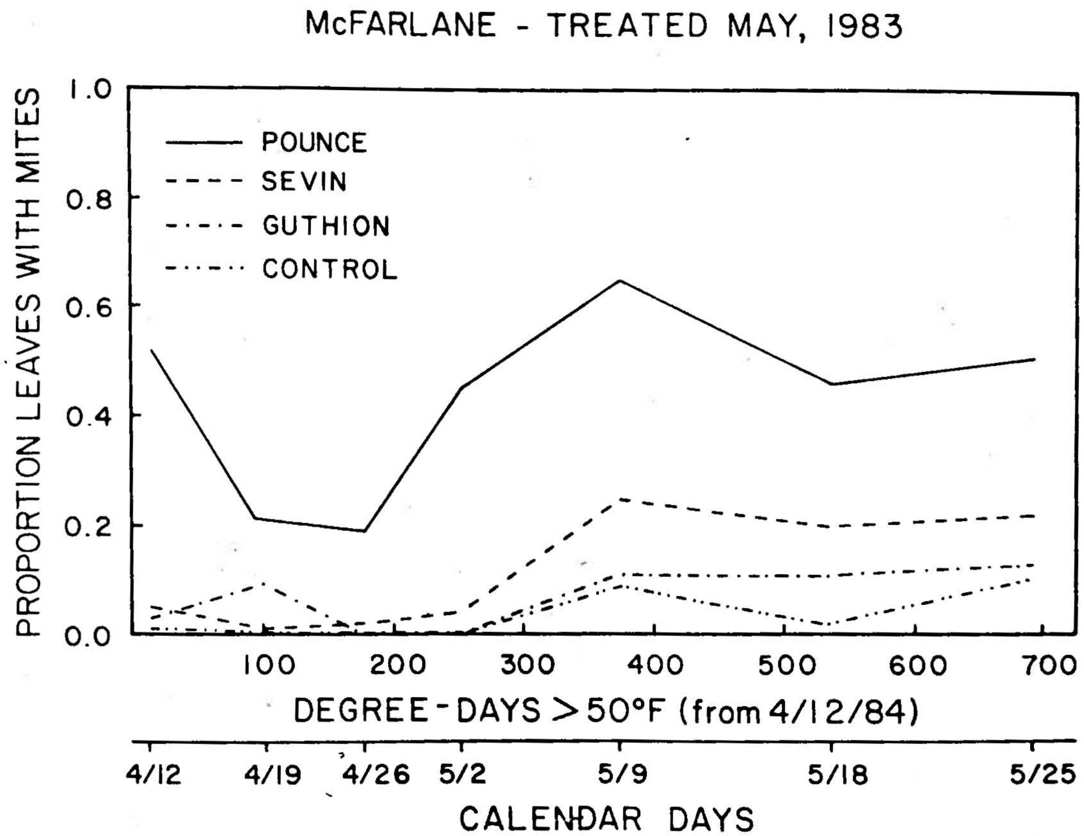

McFARLANE - TREATED MAY, 1983
PROPORTION LEAVES WITH MITES
1.0
0.8
0.6
0.4
0.2
0.0
POUNCE
SEVIN
GUTHION
CONTROL
100
200
300
400
500
600
700
DEGREE-DAYS > 50°F (from 4/12/84)
4/12
4/19
4/26
5/2
5/9
5/18
5/25
CALENDAR DAYS

Figure 7

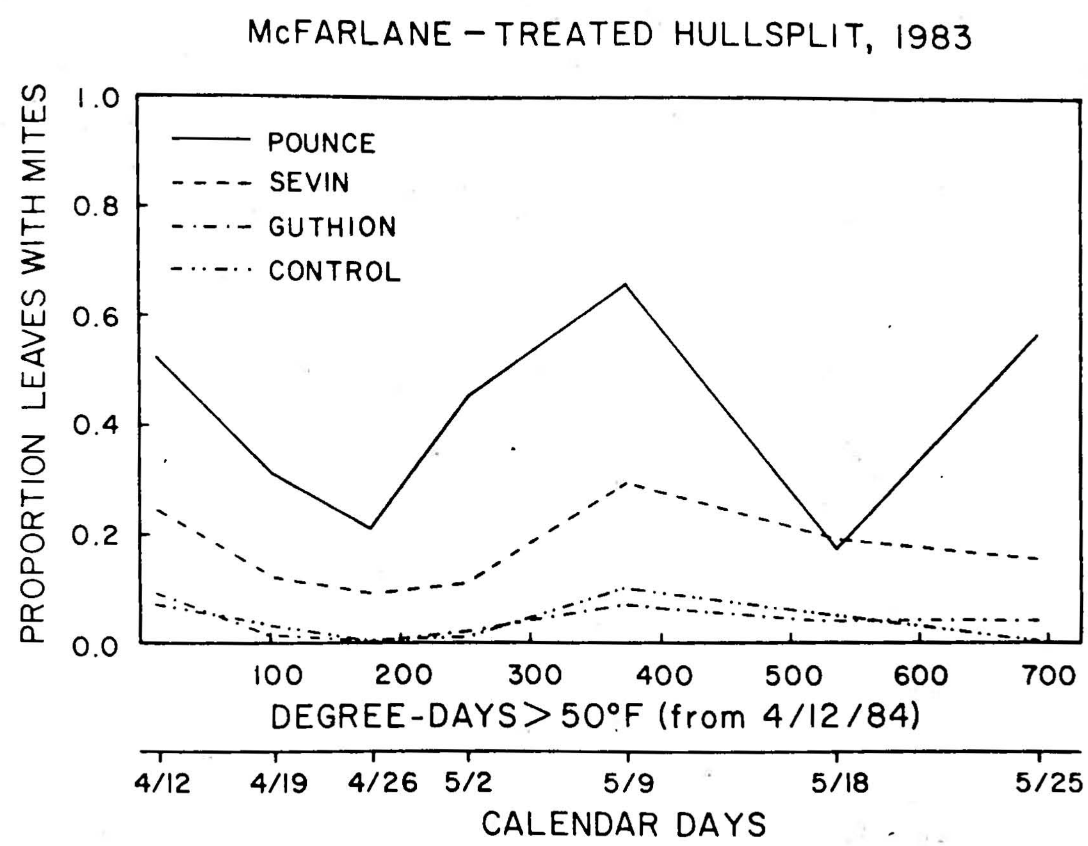

McFARLANE - TREATED HULLSPLIT, 1983
PROPORTION LEAVES WITH MITES
1.0
0.8
0.6
0.4
0.2
0.0
POUNCE
SEVIN
GUTHION
CONTROL
100
200
300
400
500
600
700
DEGREE-DAYS > 50°F (from 4/12/84)
4/12
4/19
4/26
5/2
5/9
5/18
5/25
CALENDAR DAYS

Figure 8

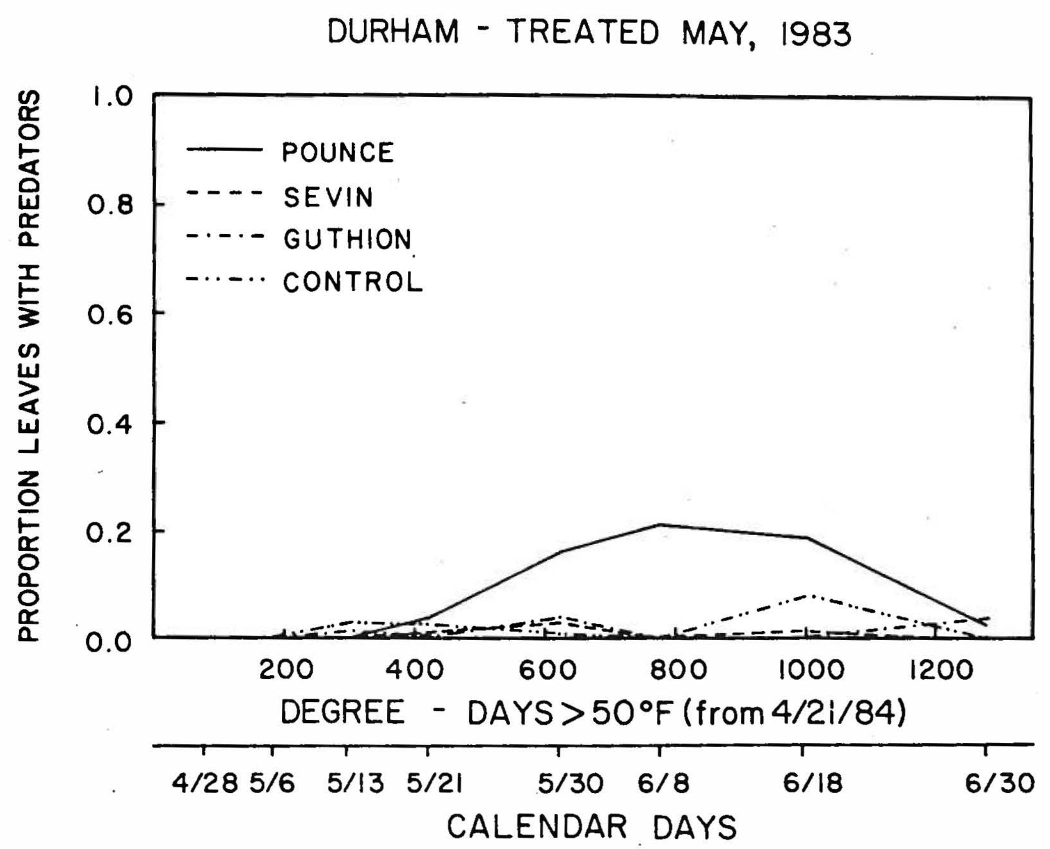

DURHAM - TREATED MAY, 1983
PROPORTION LEAVES WITH PREDATORS
1.0
0.8
0.6
0.4
0.2
0.0
POUNCE
SEVIN
GUTHION
CONTROL
200
400
600
800
1000
1200
DEGREE - DAYS > 50°F (from 4/21/84)
4/28
5/6
5/13
5/21
5/30
6/8
6/18
6/30
CALENDAR DAYS

Figure 9

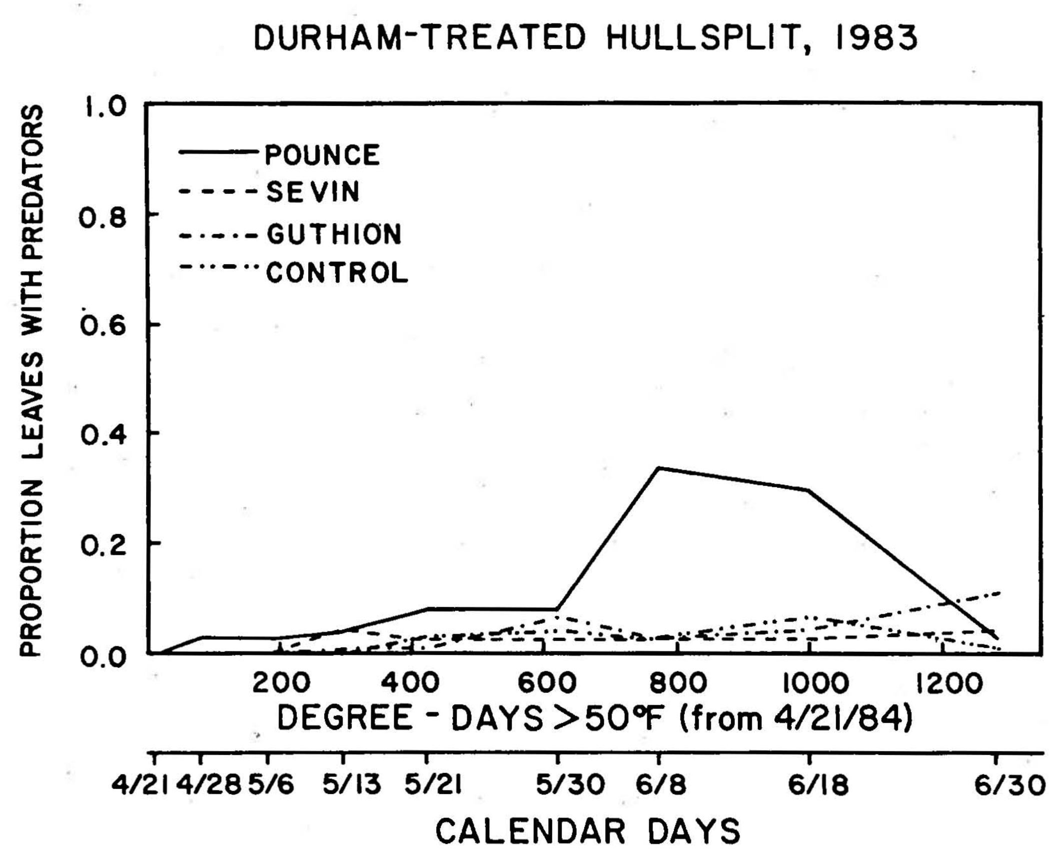
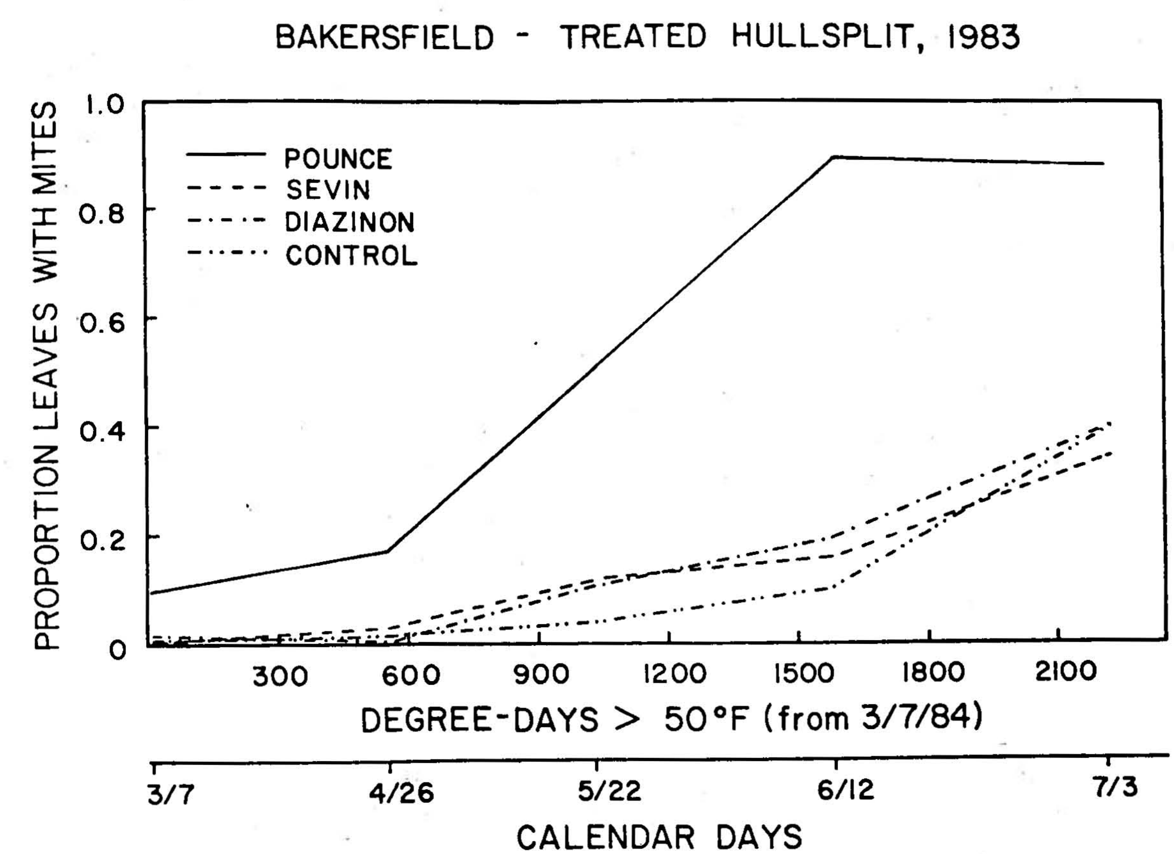

DURHAM-TREATED HULLSPLIT, 1983
PROPORTION LEAVES WITH PREDATORS
1.0
0.8
0.6
0.4
0.2
0.0
POUNCE
SEVIN
GUTHION
CONTROL
200
400
600
800
1000
1200
DEGREE - DAYS >50°F (from 4/21/84)
4/21
4/28
5/6
5/13
5/21
5/30
6/8
6/18
6/30
CALENDAR DAYS

Figure 10

Figure 11



BAKERSFIELD - TREATED HULLSPLIT, 1983
PROPORTION LEAVES WITH MITES
1.0
0.8
0.6
0.4
0.2
0
POUNCE
SEVIN
DIAZINON
CONTROL
300
600
900
1200
1500
1800
2100
DEGREE-DAYS > 50°F (from 3/7/84)
3/7
4/26
5/22
6/12
7/3
CALENDAR DAYS

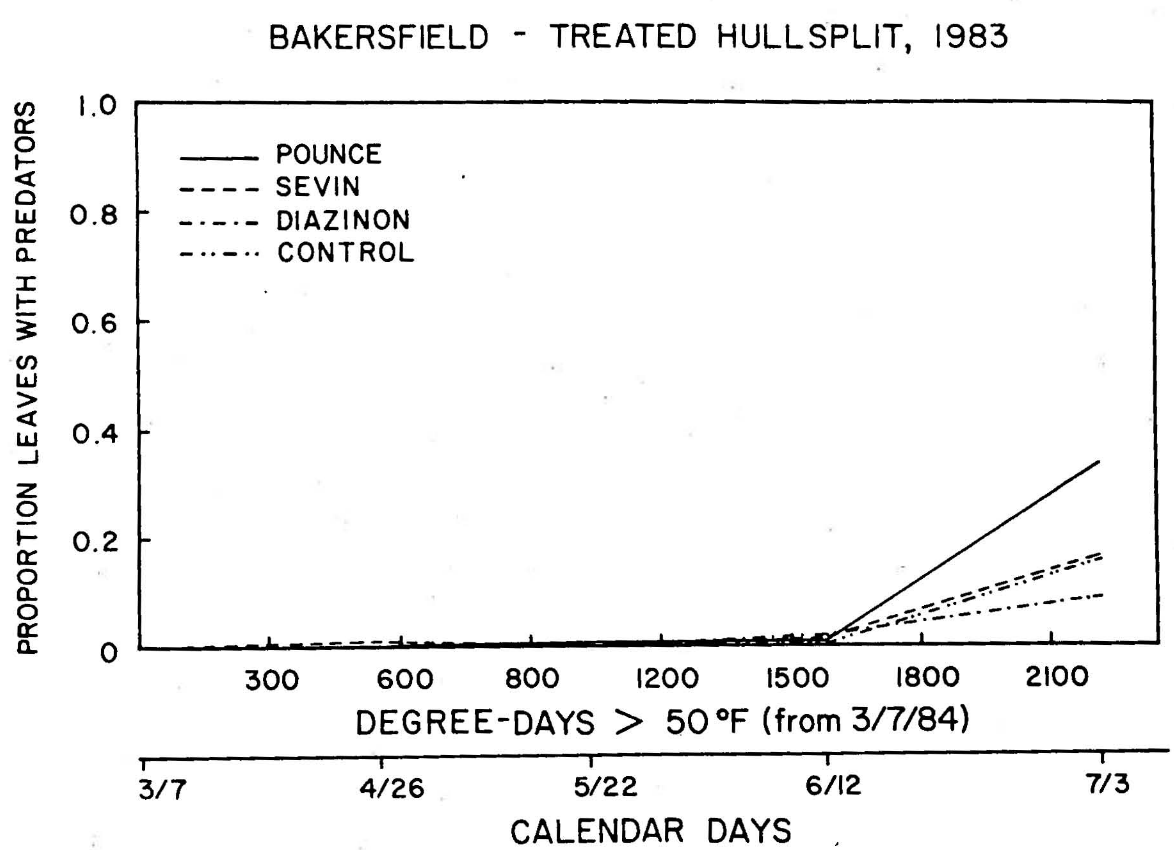

BAKERSFIELD - TREATED HULLSPLIT, 1983
PROPORTION LEAVES WITH PREDATORS
1.0
0.8
0.6
0.4
0.2
0
POUNCE
SEVIN
DIAZINON
CONTROL
300
600
800
1200
1500
1800
2100
DEGREE-DAYS > 50 °F (from 3/7/84)
3/7
4/26
5/22
6/12
7/3
CALENDAR DAYS

Figure 12

Spider Mites Durham 1984

Date	Treatment	P(I) Mean	P(I) SD	Duncan's (at 5% level)
7/23/84	Pounce	0.000	0.000	A
	Sevin	0.000	0.000	A
	Guthion	0.000	0.000	A
	Control	0.010	0.014	A
7/30/84	Pounce	0.005	0.011	A
	Sevin	0.000	0.000	A
	Guthion	0.005	0.011	A
	Control	0.000	0.000	A
8/6/84	Pounce	0.000	0.000	A
	Sevin	0.010	0.022	A
	Guthion	0.000	0.000	A
	Control	0.000	0.000	A
8/13/84	Pounce	0.030	0.033	AB
	Sevin	0.045	0.037	A
	Guthion	0.005	0.011	B
	Control	0.010	0.050	B
8/20/84	Pounce	0.025	0.018	A
	Sevin	0.030	0.021	A
	Gution	0.025	0.025	A
	Control	0.005	0.011	A
8/27/84	Pounce	0.055	0.048	A
	Sevin	0.040	0.029	A
	Guthion	0.015	0.014	A
	Control	0.010	0.014	A
9/4/84	Pounce	0.105	0.041	A
	Sevin	0.060	0.038	B
	Guthion	0.050	0.035	B
	Control	0.015	0.022	B
9/10/84	Pounce	0.115	0.042	A
	Sevin	0.150	0.035	A
	Guthion	0.090	0.095	AB
	Control	0.045	0.021	B

(TABLE 2 CON'D)

Spider Mites Durham 1984

Date	Treatment	P(I) Mean	P(I) SD	Duncan's (at 5% level)
9/17/84	Pounce	0.190	0.091	A
	Sevin	0.225	0.109	A
	Guthion	0.094	0.111	B
	Control	0.060	0.014	B
9/24/84	Pounce	0.210	0.078	A
	Sevin	0.240	0.082	A
	Guthion	0.080	0.086	B
	Control	0.045	0.021	B
10/1/84	Pounce	0.375	0.170	A
	Sevin	0.300	0.200	A
	Guthion	0.095	0.078	B
	Control	0.125	0.095	B

TABLE 2

M. occidentalis Durham 1984

Date	Treatment	P(I) Mean	P(I) SD	Duncan's (at 5% level)
7/23/84	Pounce	0.000	0.000	A
	Sevin	0.000	0.000	A
	Guthion	0.000	0.000	A
	Control	0.020	0.021	B
7/30/84	Pounce	0.000	0.000	A
	Sevin	0.000	0.000	A
	Guthion	0.000	0.000	A
	Control	0.020	0.021	B
8/6/84	Pounce	0.000	0.000	A
	Sevin	0.000	0.000	A
	Guthion	0.000	0.000	A
	Control	0.030	0.041	A
8/13/84	Pounce	0.000	0.000	A
	Sevin	0.000	0.000	A
	Guthion	0.005	0.011	A
	Control	0.020	0.033	A
8/20/84	Pounce	0.000	0.000	A
	Sevin	0.000	0.000	A
	Guthion	0.001	0.014	AB
	Control	0.020	0.021	B
8/27/84	Pounce	0.000	0.000	A
	Sevin	0.010	0.014	A
	Guthion	0.005	0.011	A
	Control	0.020	0.021	A
9/4/84	Pounce	0.000	0.000	A
	Sevin	0.005	0.011	A
	Guthion	0.030	0.021	B
	Control	0.005	0.011	A
9/10/84	Pounce	0.000	0.000	A
	Sevin	0.010	0.022	A
	Guthion	0.080	0.054	B
	Control	0.000	0.000	A

M. occidentalis Durham 1984

Date	Treatment	P(I) Mean	SD	Duncan's (at 5% level)
9/17/84	Pounce	0.000	0.000	A
	Sevin	0.045	0.051	B
	Guthion	0.105	0.062	C
	Control	0.035	0.042	AB
9/24/84	Pounce	0.000	0.000	A
	Sevin	0.070	0.093	A
	Guthion	0.150	0.073	B
	Control	0.040	0.038	A
10/1/84	Pounce	0.015	0.014	A
	Sevin	0.090	0.095	AB
	Guthion	0.155	0.027	B
	Control	0.045	0.027	A

TABLE 3

D[illegible]IAM PLOTS TREATED MAY, [illegible]83 P(I) ⇒ 15 LEAVES/TREE

		EGG			MOTILE			COMBINED			TOTAL PREDATORS		
DATE	TREATMENT	$\bar{X}$	SD	5%	$\bar{X}$	SD	5%	$\bar{X}$	SD	5%	$\bar{X}$	SD	5%
4/21/84	Pounce	< NO DATA TAKEN >											
	Sevin												
	Guthion												
	Control												
4/28/84	Pounce	0.027	0.037	A	0.013	0.030	A	0.040	0.037	A	0.000	0.000	A
	Sevin	0.000	0.000	A	0.000	0.000	A	0.000	0.000	B	0.000	0.000	A
	Guthion	0.000	0.000	A	0.000	0.000	A	0.000	0.000	B	0.000	0.000	A
	Control	0.027	0.037	A	0.000	0.000	A	0.027	0.037	AB	0.000	0.000	A
5/6/84	Pounce	0.040	0.037	A	0.040	0.037	A	0.053	0.056	A	0.000	0.000	A
	Sevin	0.027	0.037	AB	0.000	0.000	B	0.027	0.037	AB	0.000	0.000	A
	Guthion	0.000	0.000	B	0.000	0.000	B	0.000	0.000	B	0.000	0.000	A
	Control	0.000	0.000	B	0.000	0.000	B	0.000	0.000	B	0.000	0.000	A
5/13/84	Pounce	0.067	0.094	A	0.093	0.076	A	0.120	0.099	A	0.000	0.000	A
	Sevin	0.013	0.030	A	0.013	0.030	B	0.027	0.037	B	0.000	0.000	A
	Guthion	0.000	0.000	A	0.000	0.000	B	0.000	0.000	B	0.013	0.030	A
	Control	0.040	0.037	A	0.027	0.037	AB	0.040	0.037	B	0.027	0.060	A

(TABLE 3 CON'D)

DUR[illegible]AM PLOTS - TREATED MAY, 198[illegible]   P(I) ⇒ 15 LEAVES/TREE

DATE	TREATMENT	EGG $\bar{X}$	EGG SD	EGG 5%	MOTILE $\bar{X}$	MOTILE SD	MOTILE 5%	COMBINED $\bar{X}$	COMBINED SD	COMBINED 5%	TOTAL PREDATORS $\bar{X}$	TOTAL PREDATORS SD	TOTAL PREDATORS 5%
[illegible]/21/84	Pounce	0.133	0.125	A	0.173	0.130	A	0.213	0.145	A	0.040	0.037	A
	Sevin	0.000	0.000	B	0.027	0.037	B	0.027	0.037	B	0.013	0.030	A
	Guthion	0.053	0.056	AB	0.000	0.000	B	0.053	0.056	B	0.000	0.000	A
	Control	0.013	0.030	B	0.027	0.037	B	0.027	0.037	B	0.027	0.037	A
[illegible]/30/84	Pounce	0.133	0.082	A	0.240	0.167	A	0.267	0.149	A	0.160	0.186	A
	Sevin	0.000	0.000	B	0.013	0.030	B	0.013	0.030	B	0.027	0.060	A
	Guthion	0.000	0.000	B	0.080	0.087	B	0.080	0.087	B	0.040	0.037	A
	Control	0.027	0.037	B	0.040	0.060	B	0.053	0.056	B	0.013	0.030	A
[illegible]/8/84	Pounce	0.173	0.060	A	0.227	0.153	A	0.320	0.110	A	0.213	0.119	A
	Sevin	0.000	0.000	B	0.000	0.000	B	0.000	0.000	B	0.000	0.000	B
	Guthion	0.000	0.000	B	0.027	0.037	B	0.027	0.037	B	0.000	0.000	B
	Control	0.027	0.037	B	0.040	0.037	B	0.053	0.056	B	0.000	0.000	B
[illegible]/18/84	Pounce	0.067	0.094	A	0.040	0.037	A	0.093	0.076	A	0.187	0.110	A
	Sevin	0.013	0.030	B	0.000	0.000	A	0.013	0.030	B	0.013	0.030	B
	Guthion	0.000	0.000	B	0.000	0.000	A	0.000	0.000	B	0.000	0.000	B
	Control	0.000	0.000	B	0.027	0.037	A	0.027	0.037	B	0.080	0.073	B

(TABLE 3 CONT'D)

URHAM PLOTS - TREATED M, 1983   P(I) ⇒ 15 LEAVES, REE

DATE	TREATMENT	EGG $\bar{X}$	EGG SD	EGG 5%	MOTILE $\bar{X}$	MOTILE SD	MOTILE 5%	COMBINED $\bar{X}$	COMBINED SD	COMBINED 5%	TOTAL PREDATORS $\bar{X}$	TOTAL PREDATORS SD	TOTAL PREDATORS 5%
6/30/84	Pounce	0.013	0.030	A	0.027	0.037	A	0.027	0.037	A	0.027	0.037	A
	Sevin	0.000	0.000	A	0.000	0.000	A	0.000	0.000	A	0.000	0.000	A
	Guthion	0.000	0.000	A	0.000	0.000	A	0.000	0.000	A	0.040	0.060	A
	Control	0.013	0.030	A	0.000	0.000	A	0.013	0.030	A	0.000	0.000	A

Table 7

I[illegible]RHAM PLOTS - TREATED JU[illegible], 1983 P(I) ⇒ 15 LEAVES [illegible]REE

		EGG			MOTILE			COMBINED			TOTAL PREDATORS		
DATE	TREATMENT	$\bar{X}$	SD	5%	$\bar{X}$	SD	5%	$\bar{X}$	SD	5%	$\bar{X}$	SD	5%
[illegible]/21/84	Pounce	0.027	0.037	A	0.040	0.060	A	0.067	0.047	A	0.000	0.000	A
	Sevin	0.000	0.000	A	0.000	0.000	A	0.000	0.000	B	0.000	0.000	A
	Guthion	0.013	0.030	A	0.000	0.000	A	0.013	0.030	B	0.000	0.000	A
	Control	0.000	0.000	A	0.000	0.000	A	0.000	0.000	B	0.000	0.000	A
4/28/84	Pounce	0.093	0.059	A	0.053	0.073	A	0.093	0.059	A	0.027	0.037	A
	Sevin	0.000	0.000	B	0.000	0.000	A	0.000	0.000	B	0.000	0.000	A
	Guthion	0.027	0.037	B	0.000	0.000	A	0.027	0.037	B	0.000	0.000	A
	Control	0.013	0.030	B	0.054	0.030	A	0.054	0.030	AB	0.000	0.000	A
5/6/84	Pounce	0.173	0.121	A	0.107	0.076	A	0.200	0.125	A	0.027	0.037	A
	Sevin	0.040	0.037	B	0.013	0.030	B	0.040	0.037	B	0.000	0.000	A
	Guthion	0.054	0.030	B	0.013	0.030	B	0.067	0.000	B	0.000	0.000	A
	Control	0.054	0.056	B	0.027	0.037	B	0.053	0.056	B	0.000	0.000	A
5/13/84	Pounce	0.133	0.067	A	0.147	0.073	A	0.173	0.060	A	0.040	0.037	A
	Sevin	0.000	0.000	B	0.040	0.060	B	0.040	0.060	B	0.040	0.037	A
	Guthion	0.013	0.030	B	0.000	0.000	B	0.013	0.030	B	0.013	0.030	A
	Control	0.027	0.037	B	0.027	0.037	B	0.027	0.037	B	0.000	0.000	A

(TABLE 4 CON'D)

DURHAM PLOTS – TREATED [illegible]-4, 1983 P(I) ⇒ 15 LEAVE[illegible] TREE

DATE	TREATMENT	EGG $\bar{X}$	EGG SD	EGG 5%	MOTILE $\bar{X}$	MOTILE SD	MOTILE 5%	COMBINED $\bar{X}$	COMBINED SD	COMBINED 5%	TOTAL PREDATORS $\bar{X}$	TOTAL PREDATORS SD	TOTAL PREDATORS 5%
5/21/84	Pounce	0.133	0.067	A	0.187	0.056	A	0.200	0.067	A	0.080	0.056	A
	Sevin	0.026	0.037	B	0.027	0.060	B	0.040	0.060	B	0.027	0.037	AB
	Guthion	0.000	0.000	B	0.027	0.037	B	0.027	0.037	B	0.013	0.030	B
	Control	0.013	0.030	B	0.027	0.037	B	0.027	0.037	B	0.027	0.037	AB
5/30/84	Pounce	0.106	0.060	A	0.213	0.119	A	0.227	0.121	A	0.080	0.073	A
	Sevin	0.027	0.037	B	0.013	0.030	B	0.027	0.037	B	0.027	0.037	A
	Guthion	0.027	0.037	B	0.027	0.037	B	0.027	0.037	B	0.067	0.067	A
	Control	0.000	0.000	B	0.013	0.030	B	0.013	0.030	B	0.040	0.037	A
6/8/84	Pounce	0.160	0.112	A	0.173	0.167	A	0.227	0.138	A	0.333	0.082	A
	Sevin	0.013	0.030	B	0.000	0.000	B	0.013	0.030	B	0.027	0.060	B
	Guthion	0.027	0.037	B	0.000	0.000	B	0.027	0.037	B	0.027	0.060	B
	Control	0.013	0.030	B	0.027	0.037	B	0.040	0.037	B	0.027	0.060	B
6/18/84	Pounce	0.093	0.101	A	0.027	0.037	A	0.107	0.101	A	0.293	0.101	A
	Sevin	0.000	0.000	B	0.013	0.030	A	0.013	0.030	B	0.027	0.037	B
	Guthion	0.000	0.000	B	0.000	0.000	A	0.000	0.000	B	0.040	0.037	B
	Control	0.013	0.030	B	0.013	0.030	A	0.027	0.059	B	0.067	0.067	B

D[illegible]HAM PLOTS - TREATED [illegible]ULY, 1983 P(I) ⇒ 15 LEAVES [illegible] TREE

		EGG			MOTILE			COMBINED			TOTAL PREDATORS		
DATE	TREATMENT	$\bar{X}$	SD	5%	$\bar{X}$	SD	5%	$\bar{X}$	SD	5%	$\bar{X}$	SD	5%
6/30/84	Pounce	0.040	0.060	A	0.013	0.030	A	0.040	0.060	A	0.027	0.037	A
	Sevin	0.013	0.030	A	0.000	0.000	A	0.013	0.030	A	0.040	0.089	A
	Guthion	0.000	0.000	A	0.013	0.030	A	0.013	0.030	A	0.107	0.101	A
	Control	0.000	0.000	A	0.013	0.030	A	0.013	0.030	A	0.013	0.030	A

TABLE B

McFARLANE (A) TREATED MAY, 1983

(Average Number of [illegible] per Leaf
50 Leaves [illegible])

		SPIDER MITE EGGS			MOTILE SPIDER MITES			PREDATOR EGGS			MOTILE PREDATORS		
DATE	TREATMENT	$\overline{X}$	SD	5%	$\overline{X}$	SD	5%	$\overline{X}$	SD	5%	$\overline{X}$	SD	5%
4/12/84	Pounce	4.240	2.660	A	5.156	1.713	A	0.000	0.000	A	0.000	0.000	A
	Sevin	0.380	2.425	B	0.060	0.035	B	0.000	0.000	A	0.000	0.000	A
	Guthion	1.400	0.249	B	0.040	0.069	B	0.000	0.000	A	0.000	0.000	A
	Control	0.020	0.035	B	0.020	0.035	B	0.000	0.000	A	0.000	0.000	A
4/19/84	Pounce	3.100	1.077	A	0.460	0.154	A	0.000	0.000	A	0.000	0.000	A
	Sevin	0.100	0.104	B	0.020	0.035	B	0.000	0.000	A	0.000	0.000	A
	Guthion	0.260	0.164	B	0.100	0.104	B	0.000	0.000	A	0.000	0.000	A
	Control	0.000	0.000	B	0.000	0.000	B	0.000	0.000	A	0.000	0.000	A
4/26/84	Pounce	2.128	2.055	A	0.384	0.570	A	0.000	0.000	A	0.000	0.000	A
	Sevin	0.336	0.707	B	0.032	0.072	B	0.000	0.000	A	0.000	0.000	A
	Guthion	0.016	0.036	B	0.000	0.000	B	0.000	0.000	A	0.000	0.000	A
	Control	0.080	0.113	B	0.000	0.000	B	0.000	0.000	A	0.000	0.000	A
5/2/84	Pounce	4.144	4.384	A	2.336	2.081	A	0.000	0.000	A	0.000	0.000	A
	Sevin	0.192	0.230	B	0.048	0.072	B	0.000	0.000	A	0.000	0.000	A
	Guthion	0.000	0.000	B	0.000	0.000	B	0.000	0.000	A	0.000	0.000	A
	Control	0.296	0.215	B	0.000	0.000	B	0.000	0.000	A	0.000	0.000	A
5/9/84	Pounce	5.152	2.511	A	5.792	4.174	A	0.000	0.000	A	0.000	0.000	A
	Sevin	1.104	1.237	B	0.752	0.934	B	0.000	0.000	A	0.000	0.000	A
	Guthion	0.432	0.608	B	[illegible]	0.303	B	0.000	0.000	A	0.000	0.000	A
	Control	0.208	0.297	B	[illegible]	0.209	B	0.000	0.000	A	0.000	0.000	A
5/18/84	Pounce	5.296	4.544	A	2.384	3.330	A	0.016	0.036	A	0.000	0.000	A
	Sevin	2.160	3.612	A B	0.400	0.435	B	0.000	0.000	A	0.000	0.000	A
	Guthion	0.144	0.236	B	0.192	0.386	B	0.000	0.000	A	0.000	0.000	A
	Control	0.256	0.249	B	0.032	0.072	B	0.000	0.000	A	0.000	0.000	A
5/25/84	Pounce	9.856	3.632	A	3.024	1.384	A	0.044	0.035	A	0.024	0.033	A B
	Sevin	1.088	1.446	B	0.544	1.042	B	0.032	0.027	A B	0.056	0.058	A
	Guthion	0.944	1.272	B	0.272	0.356	B	0.000	0.000	B	0.000	0.000	B
	Control	0.720	0.551	B	0.144	0.088	B	0.032	0.027	A B	0.000	0.000	B

Table 6

McFARLANE (B) TREATED JULY, [illegible]

(Average Number of mites per leaf 50 Leaves brushed

DATE	TREATMENT	SPIDER MITE EGGS $\bar{X}$	SPIDER MITE EGGS SD	SPIDER MITE EGGS 5%	MOTILE SPIDER MITES $\bar{X}$	MOTILE SPIDER MITES SD	MOTILE SPIDER MITES 5%	PREDATOR EGGS $\bar{X}$	PREDATOR EGGS SD	PREDATOR EGGS 5%	MOTILE PREDATORS $\bar{X}$	MOTILE PREDATORS SD	MOTILE PREDATORS 5%
1/12/84	Pounce	5.160	2.912	A	3.140	1.925	A	0.000	0.000	A	0.000	0.000	A
	Sevin	1.440	1.994	B	0.600	0.561	B	0.000	0.000	A	0.000	0.000	A
	Guthion	0.280	0.200	B	0.100	0.066	B	0.000	0.000	A	0.000	0.000	A
	Control	0.112	0.134	B	0.080	0.139	B	0.000	0.000	A	0.000	0.000	A
1/19/84	Pounce	10.100	10.754	A	1.060	0.443	A	0.000	0.000	A	0.000	0.000	A
	Sevin	1.840	3.003	B	0.240	0.330	B	0.000	0.000	A	0.000	0.000	A
	Guthion	0.040	0.069	B	0.020	0.035	B	0.000	0.000	A	0.000	0.000	A
	Control	0.060	0.104	B	0.040	0.069	B	0.000	0.000	A	0.000	0.000	A
1/26/84	Pounce	3.808	3.763	A	0.464	0.450	A	0.000	0.000	B	0.000	0.000	A
	Sevin	0.464	0.909	B	0.128	0.244	A B	0.000	0.000	B	0.000	0.000	A
	Guthion	0.000	0.000	B	0.000	0.000	B	0.000	0.000	B	0.000	0.000	A
	Control	0.288	0.644	B	0.000	0.000	B	0.032	0.027	A	0.000	0.000	A
5/2/84	Pounce	4.320	4.351	A	2.368	2.080	A	0.000	0.000	B	0.000	0.000	A
	Sevin	0.336	0.425	B	0.160	0.126	B	0.032	0.027	A	0.000	0.000	A
	Guthion	0.032	0.072	B	0.032	0.044	B	0.000	0.000	B	0.000	0.000	A
	Control	0.048	0.107	B	0.016	0.036	B	0.000	0.000	B	0.000	0.000	A
5/9/84	Pounce	6.480	2.662	A	6.000	3.647	A	0.000	0.000	A	0.000	0.000	B
	Sevin	1.024	0.992	B	0.912	0.927	B	0.000	0.000	A	0.032	0.027	A
	Guthion	0.160	0.188	B	0.096	0.214	B	0.000	0.000	A	0.000	0.000	B
	Control	0.576	0.811	B	0.144	0.243	B	0.000	0.000	A	0.000	0.000	B
/18/84	Pounce	5.000	4.006	A	0.340	0.454	A	0.000	0.000	A	0.000	0.000	A
	Sevin	0.832	1.399	B	0.384	0.728	A	0.000	0.000	A	0.000	0.000	A
	Guthion	0.096	0.067	B	0.048	0.044	A	0.000	0.000	A	0.000	0.000	A
	Control	0.128	0.201	B	0.064	0.143	A	0.000	0.000	A	0.000	0.000	A
/25/84	Pounce	7.664	5.227	A	3.968	2.543	A	0.000	0.000	A	0.000	0.000	B
	Sevin	0.992	1.178	B	0.336	0.394	B	0.000	0.000	A	0.032	0.027	A
	Guthion	0.048	0.072	B	0.048	0.107	B	0.000	0.000	A	0.032	0.027	A
	Control	0.000	0.000	B	0.016	0.036	B	0.000	0.000	A	0.000	0.000	B

D[illegible]SFIELD PLOTS [illegible]ED HU[illegible] 190[illegible] t(I) ⇒ 1[illegible] LEAVES/ TRE[illegible]

DATE	TREATMENT	EGG $\bar{x}$	EGG SD	EGG 5%	MOTILE $\bar{X}$	MOTILE SD	MOTILE 5%	COMBINED $\bar{X}$	COMBINED SD	COMBINED 5%	TOTAL PREDATOR MI[illegible] $\bar{X}$	TOTAL PREDATOR MI[illegible] SD
3/7/84	Control	0.007	0.021		0.000	0.000		0.007	0.021		0.000	0.000
	Pounce	0.057	0.021		0.038	0.029	d	0.095	0.043	d	0.000	0.000
	Baythroid - High	0.057	0.049		0.086	0.075	a	0.143	0.073	c	0.000	0.000
	Baythroid - Med.	0.033	0.046		0.022	0.032		0.059	0.049		0.000	0.000
	Baythroid - Low	0.045	0.044		0.037	0.064		0.081	0.082		0.000	0.000
	Payoff - High	0.029	0.033		0.096	0.064	a	0.126	0.073	c	0.000	0.000
	Payoff - Med.	0.067	0.070		0.037	0.046		0.104	0.078	d	0.000	0.000
	Payoff - Low	0.040	0.072		0.020	0.032		0.060	0.066		0.000	0.000
	Sevin	0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000
	Diazinon	0.000	0.000		0.017	0.041		0.017	0.041		0.000	0.000
4/26/84	Control	0.000	0.000		0.007	0.021		0.007	0.021		0.000	0.000
	Pounce	0.076	0.049	c	0.095	0.069	b	0.171	0.053	e	0.000	0.000
	Baythroid - High	0.038	0.043		0.114	0.052	b	0.153	0.075	e	0.000	0.000
	Baythroid - Med	0.067	0.063		0.155	0.186	b	0.222	0.206	c	0.000	0.000
	Baythroid - Low	0.059	0.049		0.081	0.103		0.141	0.142		0.007	0.021
	Payoff - High	0.074	0.086		0.171	0.141	e	0.245	0.191	c	0.000	0.000
	Payoff - Med.	0.074	0.066	c	0.155	0.147	b	0.229	0.154	c	0.000	0.000
	Payoff - Low	0.060	0.124		0.087	0.083		0.147	0.163		0.000	0.000
	Sevin	0.007	0.021		0.022	0.032		0.029	0.046		0.007	0.021
	Diazinon	0.000	0.000		0.009	0.021		0.009	0.021		0.000	0.000
5/22/84	Control	0.000	0.000		0.040	0.056		0.040	0.056		0.000	0.000
	Pounce	0.086	0.060	b	0.429	0.121	c	0.514	0.128	c	0.009	0.021
	Baythroid - High	0.057	0.058		0.543	0.161	c	0.600	0.191	c	0.000	0.000
	Baythroid - Med.	0.059	0.049		0.473	0.268	c	0.533	0.283	c	0.000	0.000
	Baythroid - Low	0.052	0.052		0.360	0.257	c	0.413	0.644	c	0.000	0.000
	Payoff - High	0.045	0.063		0.593	0.264	c	0.637	0.237	c	0.007	0.021
	Payoff - Med.	0.059	0.066		0.511	0.183	c	0.571	0.172	c	0.000	0.000
	Payoff - Low	0.053	0.053		0.427	0.240	c	0.480	0.243	c	0.000	0.000
	Sevin	0.007	0.021		0.107	0.094		0.119	0.108		0.000	0.000
	Diazinon	0.025	0.044		0.083	0.068		0.109	0.109		0.000	0.000
6/12/84	Control	0.027	0.047		0.073	0.101		0.100	0.110		0.007	0.021
	Pounce	0.009	0.021		0.886	0.075	c	0.895	0.069	c	0.009	0.021
	Baythroid - High	0.019	0.041		0.924	0.058	c	0.943	0.058	c	0.000	0.000
	Baythroid - Med	0.059	0.066		0.874	0.135	c	0.933	0.094	c	0.000	0.000
	Baythroid - Low	0.052	0.042		0.748	0.231	c	0.800	0.231	c	0.007	0.021
	Payoff - High	0.022	0.032		0.911	0.063	c	0.933	0.054	c	0.000	0.000
	Payoff - Med	0.045	0.070		0.837	0.141	c	0.881	0.108	c	0.015	0.028
	Payoff - Low	0.053	0.069		0.827	0.141	c	0.880	0.143	c	0.000	0.000
	Sevin	0.029	0.033		0.126	0.115		0.155	0.140		0.015	0.029
	[illegible]	0.033	0.044		0.159	[illegible]		[illegible]	0.197		[illegible]	[illegible]

BAKERSFIELD PLOTS — TREATED [illegible]ULLSPLIT 1983 — P(I) ⇒ 15 LEAVES / TREE [illegible]

DATE	TREATMENT	EGG $\bar{X}$	EGG SD	EGG 5%	MOTILE $\bar{X}$	MOTILE SD	MOTILE 5%	COMBINED $\bar{X}$	COMBINED SD	COMBINED 5%	TOTAL PREDATOR MITES $\bar{X}$	TOTAL PREDATOR MITES SD	TOTAL PREDATOR MITES 5%
7/3/84	Control	0.020	0.032		0.387	0.622		0.400	0.268		0.160	0.151	
	Pounce	0.000	0.000		0.886	0.247	c	0.886	0.247	c	0.333	0.166	f
	Baythroid-High	0.000	0.000		1.000	0.000	c	1.000	0.000	c	0.124	0.115	
	Baythroid-Med.	0.007	0.021		0.985	0.028	c	0.993	0.021	c	0.104	0.064	
	Baythroid-Low	0.000	0.000		0.933	0.144	c	0.933	0.144	c	0.141	0.102	
	Payoff-High	0.000	0.000		0.985	0.042	c	0.985	0.042	c	0.155	0.183	
	Payoff-Med.	0.000	0.000		0.955	0.083	c	0.955	0.083	c	0.259	0.101	f
	Payoff-Low	0.000	0.000		0.960	0.072	c	0.960	0.072	c	0.313	0.201	f
	Sevin	0.000	0.000		0.348	0.198		0.348	0.198		0.163	0.164	
	Diazinon	0.038	0.043		0.362	0.263		0.400	0.241		0.086	0.075	

Footnotes / Material significantly different from ______ by SNK.

a check, [illegible], diazinon, low payoff
b check
c check, sevin, diazinon
d check, sevin
e check, diazinon
f check, baythroid-high, baythroid-med, baythroid-low, payoff-high, sevin, diazinon