

IV. Chemical Control/New Products

EFFICACY OF NEW INSECT GROWTH REGULATORS FOR CONTROL OF SAN JOSE SCALE IN STONE FRUITS

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Field trials to establish efficacy of the insect growth regulator buprofezin (Applaud[®]) for control of San Jose scale in deciduous fruit trees continued in 1997 at the Kearney Agricultural Center, Parlier, CA. Applaud was applied to mature Fantasia nectarines at 1.5 lb a.i./acre as a delayed dormant treatment on February 6, 1997 and against emerging first generation crawlers on April 17, 1997. In addition to the two Applaud treatments, a standard dormant treatment of diazinon plus Volck oil, at 400 gpa, was applied on January 17. An untreated check was also included in this trial. All materials were applied using an Air-O-Fan GB-34 commercial sprayer operated at 1.8 mph. Five replications comprised of nine trees each were used for each treatment, arranged in a Latin square design.

Control efficacy was evaluated by two sticky tapes applied to scaffold limbs of the center tree in each replicate to collect crawlers during the first generation emergence in late April-early May, and second generation crawler emergence in late June-early July (Fig. 1). Tapes were positioned at the same sites on each limb for all crawler collections. Scale infestation was also measured by a green fruit sample on June 4 (40 fruit per replicate) and a mature fruit harvest sample on July 7-8 using 100 fruit per replicate.

The results of this trial (Table 1) showed no statistical difference in control of San Jose scale with the standard diazinon and oil dormant spray compared to the untreated check. The delayed dormant treatment with Applaud and oil applied on February 6 provided a significant reduction in scale control, while the Applaud treatment applied in mid-April reduced the scale population, but not to a level significantly different from the untreated check. The failure of the standard diazinon dormant treatment is believed due to several factors, primarily resistance of the scale population to organophosphate insecticides as a result of over 20 years of organophosphate treatments for control of San Jose scale, oriental fruit moth, and peach twig borer. In addition, the trees in this orchard have been mechanically topped for many years, resulting in large "crow's nest" growth in the tops of the trees which tends to protect scale populations from sprays of any sort, including dormant sprays in winter. The high level of scale present in the orchard at the beginning of the trial also added to control problems, and demonstrates the value of not allowing populations of San Jose scale to reach such high levels before effective controls are applied.

These results indicate that Applaud applied as a dormant or delayed dormant treatment could provide significant improvement in San Jose scale control compared to standard organophosphate treatments currently in use.

Table 1. Efficacy of Applaud® (buprofezin) for control of San Jose scale on Fantasia nectarines. Kearney Agricultural Center, Parlier, CA, 1997.^{1/}

Treatment	Application	Average No. Scale		Percent Infested Fruit	
		Crawlers Per Tape		6/4/97	7/7/97
		1st Gen.	2nd Gen.	Green	Harvest ^{2/}
Check	—	10.2	25.2	5.5	17.4 a b
Diazinon 2.0 lb a.i. plus 6.0 gal oil/acre	1/17/97	20.2	102.1	3.5	20.0 a
Applaud 1.5 lb a.i. plus 6.0 gal oil/acre	2/6/97	1.2	10.4	0.5	6.0 c
Applaud 1.5 lb a.i. plus 6.0 gal oil/acre	4/17/97	10.7	34.0	4.0	11.2 b c

^{1/} Treatments applied on dates shown at 400 gpa with an Air-O-Fan GB-34 sprayer.

^{2/} Means followed by the same letter are not significantly different at $p = 0.05$, Fisher's Protected LSD test.

A field trial to evaluate the efficacy of Esteem® (pyriproxyfen) was also conducted at the Kearney Agricultural Center, Parlier, CA. Insecticides were applied by handgun as delayed dormant treatments on February 3, 1997 to mature Santa Rosa plums using seven single-tree replications per treatment in a randomized complete block design. Approximately three gal of spray material was applied per tree. The trees in this orchard had never been treated with organophosphate insecticides; susceptibility of scale to diazinon was expected to be high compared to orchards treated annually with dormant sprays. Esteem was applied at rates of 30 and 40 g a.i./acre in combination with Volck Supreme spray oil at six gal/acre in both treatments. Also included in this trial were a standard treatment of diazinon at two lb a.i./acre with six gal of Volck Supreme oil, an oil treatment alone at six gal/acre, and an untreated check.

Treatment efficacy was based on collection of San Jose scale crawlers on double-sided sticky tape (two per tree) over two consecutive weeks during emergence of the first generation crawlers, and also for two consecutive weeks during the second generation of crawler emergence. Sticky tapes were applied for first generation crawler emergence on April 24 and were counted on May 1 and May 8, 1997. Tapes for evaluation of crawler densities during the second generation emergence were applied to the trees on June 25 and were counted on July 2 and July 9, 1997.

Fruit samples were also collected twice during this trial. A green fruit sample comprised of 30 fruit per replication was harvested on June 3. A mature fruit sample of 75 fruit per replication was harvested on June 18.

The results of the sticky tape collections in the first generation (Table 2) show that both treatments of Esteem plus oil resulted in zero collections of scale crawlers, while the untreated check averaged 72.7 crawlers per tape over the two-week period. The diazinon plus oil standard dormant treatment averaged 2.3 crawlers per tape; the oil alone averaged 10.7 crawlers per tape (equivalent to approximately 71% reduction in crawler populations using this treatment).

Crawler collections on sticky tape during second generation peak emergence showed an average of 191 crawlers per tape in the untreated checks, with less than three crawlers per tape in the two Esteem treatments (Table 2). Green fruit harvested on June 6 showed an infestation level of 6.2% in the untreated check, while the Volck oil alone, and standard diazinon plus oil dormant treatments had only 0.5% infested fruit. Both of the Esteem treatments had no infested fruit in this sample. The mature harvest fruit sample taken on June 18 showed a slight increase in all treatments with the untreated check having 6.9% infested fruit, the Volck oil and standard diazinon plus oil treatments still with <1% infestation, while the Esteem treatments each had <0.5% infested fruit.

The results of this trial show that Esteem is a very effective insect growth regulator for control of San Jose scale on deciduous fruit trees. Registration of this product for use in stone fruits should be pursued and encouraged. It was also interesting to find that the crawler populations shown in sticky tape counts in the two standard treatments (oil, oil plus diazinon) were not reflected in the infested fruit samples. This is perhaps due to inadequate replication of sticky tapes per tree, resulting in insufficient random sampling of the crawler populations.

Table 2. Efficacy of Esteem® (pyriproxyfen; V-71639) for control of San Jose scale on Santa Rosa plums.^{1/}

Treatment	Average No. Crawlers		Percent Infested Fruit	
	Per Sticky Tape ^{2/}		June 4	June 18
	1st Gen.	2nd Gen.	Green	Harvest ^{3/}
Check	72.7	191.0	6.2	6.9 a
Volck oil	21.4	37.6	0.5	0.6 b
Diazinon + oil	2.3	6.9	0.5	0.4 b
Esteem @ 30 g a.i./acre plus oil	0.0	2.3	0.0	0.2 b
Esteem @ 40 g a.i./acre plus oil	0.0	0.6	0.0	0.4 b

^{1/} Applied February 3, 1997; high-volume handgun spray; seven single-tree replications per treatment. Kearney Agricultural Center, Parlier, CA.

^{2/} 1st and 2nd generation crawler collections on 4/24 – 5/8, and 6/25 – 7/9/97, respectively.

^{3/} Means followed by the same letter are not significantly different at $p = 0.05$, Fisher's protected LSD Test.

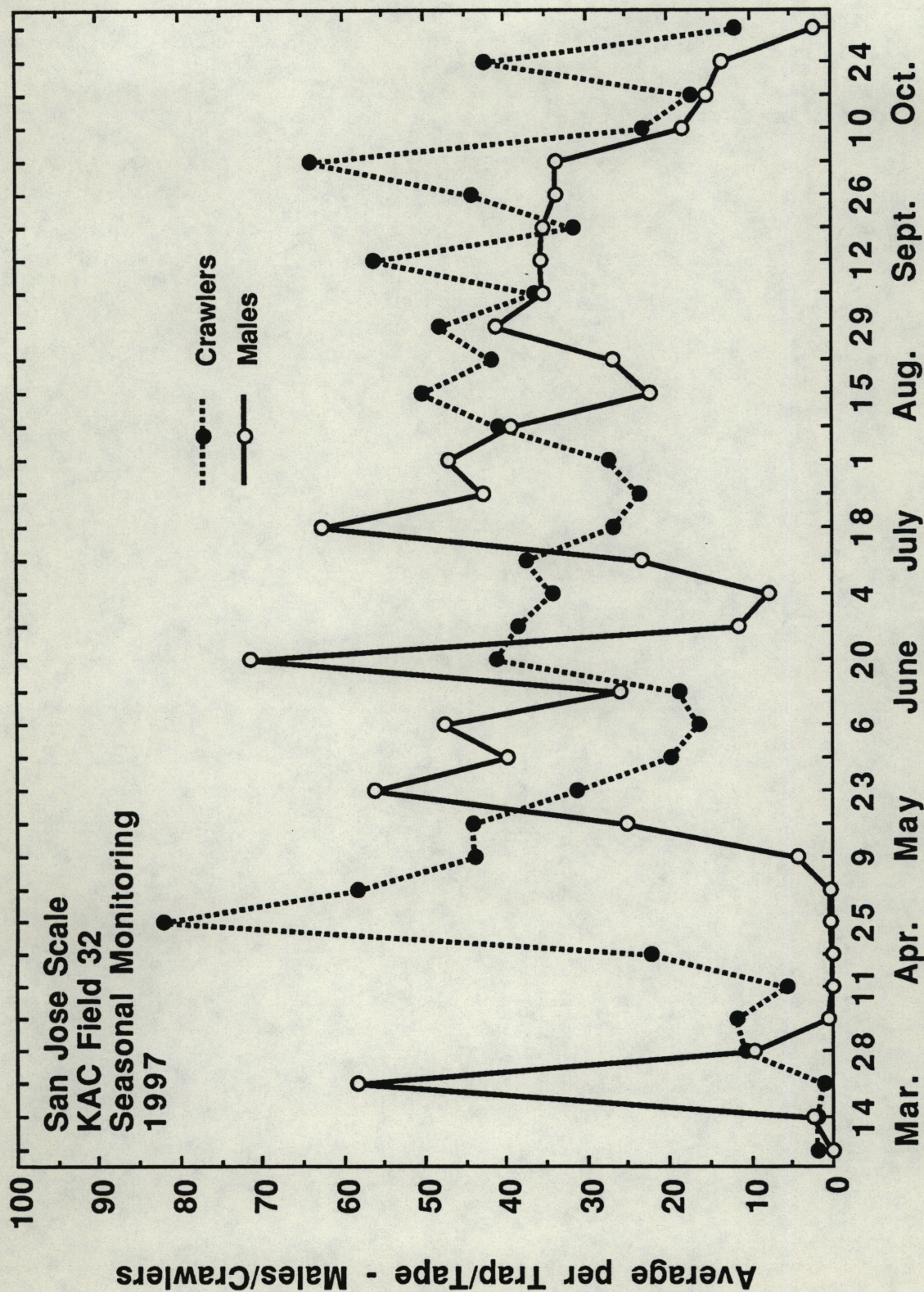


Figure 1. Seasonal monitoring of San Jose scale in pheromone (male scale) and sticky tape traps (crawlers). Parlier, Fresno County, California, 1997.