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In this February issue of the Postings from the Palo Verde I cover several topics.

- **Effect of Selected Insecticides for Whitefly, *Bemisia tabaci* and Leafminer, *Liriomyza* sp. Management on Melons -** Vonny Barlow, University of California, Agricultural and Natural Resources, Blythe, CA
- **Selected Insecticide Performance against Egyptian Alfalfa Weevil Larvae -** Vonny Barlow, Entomology Advisor, UCCE Riverside County, Larry Godfrey, Entomology Extension Specialist, UC-Davis

Regards:

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Effect of Selected Insecticides for Whitefly, *Bemisia tabaci* and Leafminer, *Liriomyza* sp. Management on Melons

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Abstract

The projects completed this past spring sought to evaluate the efficacy of DuPont Cyazypyr®, Nichino America, Inc. NNI-0101, Nichino America, Inc. Vetica SC®, Syngenta Crop Protection, Inc. Agri-mek®, Syngenta Crop Protection, Inc. Agri-flex®, Bayer CropScience Admire Pro®* followed by Movento + Capture, Oberon, Thionex 3EC and Bayer CropScience Admire Pro®** followed by Movento, Capture, Oberon, Thionex 3EC, against the industry standard use of DuPont Coragen® 2" band over the top at planting for the management of the top pests of Southern California lettuce(s); the silverleaf whitefly, *Bemisia argentifolii* Bellows & Perring (Hemiptera: Aleyrodidae) and leafminers, *Liriomyza sativa* Blanchard and *Liriomyza trifolii* (Burgess) (Diptera: Agromyzidae). The lack of differences in treatments and the untreated controls reflects the impact that "light" insect pressure has during the transition from the coolest part of the year to the hottest in the Palo Verde Valley. Adult silverleaf whiteflies populations were found only in low numbers across all treatments including the un-treated control Whitefly pressure remained relatively low throughout the field trial and never exceeded an (± SE) of 0.56 ± 0.04 whiteflies.. Realistically it is difficult to state that the treatments were unsuccessful since pest pressure was relatively light for evaluation of select insecticide formulations.

The Objective:

Assess the efficacy of insecticide use for whitefly and leafminer management on spring grown melons, assess the compatibility of Coragen® as a protectant when applied as a 2" band at planting. Evaluation of Coragen® as an environmental low risk application when applied at planting makes it ideal as part of an IPM system for managing insects like the silverleaf whitelfy in damage sensitive crops.

Materials & Methods

Research plots were established on 4/27/2011 on University of California controlled land for evaluation of select insecticides for management of silverleaf whitefly (Cyazypyr®, NNI-0101, Vetica SC®, Admire Pro®*, Movento + Capture, Oberon, Thionex 3EC, Admire Pro®** followed by Movento, Capture, Oberon, Thionex 3EC) and leafminers (Agri-mek®, Agri-flex®) against the industry standard use of DuPont Coragen® 2" band over the top at planting (**Fig. 1**) against un-treated controls. Experimental plots were established into direct seeded beds of separately planted honeydew melon cv. 'Sweet delight', cantaloupe melon cv. 'Hy-mark', and transplanted watermelon cv. 'Melody'. Watermelon transplants were planted with three cv. 'Melody' for every super-pollinator cv. 'SP4'. Seeds or transplants were planted into raised beds that were 3.33 ft (40") on center and 300 ft. long. After thinning, unplanted beds on either side of the planted rows were split (5/17/2011) and tilled to widen planted beds to 80". Individual treatment rows were bordered by untreated rows to minimize spray interactions between treatments (**Fig. 2**). Treatments in each of the melon varieties used were randomly assigned and blocked by replication (RCBD) with 4 replications used. Individual treatment plots consisted of 13.1 ft. x 6.66 ft. (≈0.0020A). The Coragen treatment was applied as a 2 in. wide band directly over the seed line immediately after seed or transplant placement with a back-pack sprayer fitted with a cone nozzle delivering 0.032 gal. H_2O/52.4 ft./melon variety. Foliar applications were made with a CO_2 pressurized back-pack sprayer using a 3-nozzel hand-held spray boom fitted with TXVS-8 ConeJet nozzles. Foliar applications were made ≈7 d for or upon need (Admire Pro® applications) for a total of 7 applications on May 25, June 1, 8, 15, 22, 29, July 6. End of season damage assessments to determine treatment efficacy was made on July 13 & 14. All marketable melons were harvested in each of the 13.1 ft. plots and processed separately. Melons were sampled destructively to detect insect damage. From each 13.1 ft. plot 10-melons were sampled destructively from the stem end to determine brix using a VEE GEE (Model #ABT-32) refractometer. Data was transformed $_{(\log + 0.5)}$ prior to analyzing using a mixed model analysis of variance (PROC MIXED) followed by a means separation test $_{(P<0.05)}$.

Results & Discussion

Whitefly pressure remained relatively low throughout the field trial and never exceeded an (± SE) of 0.56 ± 0.04 whiteflies (**Table 1**). As a result, comparison of whitefly adult response to treatments across melon varieties tested remained non- significantly different from controls (Crop*Treat P = 0.698). Data analysis of efficacy trials in individual melon varieties showed that treatments against whiteflies were not significantly different than controls in the honeydew melon cv. 'Sweet delight' trials (Treat P = 0.358), cantaloupe melon cv. 'Hy-mark' trials (Treat P = 0.251) and watermelon cv. 'Melody' trials (Treat P = 0.702). Yield and weights of melons was significantly different among treatments when compared to controls in the white fly trial in cantaloupe melon cv. 'Hy-mark' trials (Avg. # of melons, P = 0.049, Avg. weight (Kg) of melons, P = 0.003). Honeydew melon cv. 'Sweet delight' trials (Avg. # of melons, P = 0. 167, Avg. weight (Kg) of melons, P = 0. 120). Watermelon cv. 'Melody' trials (Avg. # of melons, P = 0. 451, Avg. weight (Kg) of melons, P = 0. 624). Whitefly numbers were greatest in the cantaloupe melon variety cv. 'Hy-mark' (**Fig. 3**). Brix (sugar level) was not found significantly different among any of the treatments in any of the melon varieties tested here (**Table 1**).

Leaf miner pressure remained relatively low throughout the field trial and never exceeded an (± SE) of 0.69 ± 0.00 leaf miners (**Table 2**). Data analysis of efficacy trials in individual melon varieties showed that treatments against leaf miners were not significantly different than controls in the honeydew melon cv. 'Sweet delight' trials (Treat P = 0.135), cantaloupe melon cv. 'Hy-mark' trials (Treat P = 0.366) and watermelon cv. 'Melody' trials (Treat P = 0.369). Yield and weights of melons was also not found to be significantly different among treatments when compared to controls in the leafminer trial in honeydew melon cv. 'Sweet delight' trials (Avg. # of melons, P = 0. 302, Avg. weight (Kg) of melons, P = 0. 166) and Watermelon cv. 'Melody' trials (Avg. # of melons, P = 0. 214, Avg. weight (Kg) of melons, P = 0. 337). There were significant differences in the cantaloupe melon cv. 'Hy-mark' trial that showed yield differences (Avg. # of melons, P = 0. 137, Avg. weight (Kg) of melons, P = 0. 019). Brix was not found significantly different among any of the treatments in any of the melon varieties tested here (**Table 2**).

Summary

The lack of differences in treatments and the untreated controls reflects the impact that "light" insect pressure has during the transition from the coolest part of the year to the hottest in the Palo Verde Valley. Realistically it is difficult to state that the treatments were unsuccessful since pest pressure was relatively light for evaluation of the selected insecticide formulations.

Although there were no treatment differences in whitefly management there were yield differences in 'Hy-mark' cantaloupes when treated with either Coragen® (2" band over the seedline at planting) or Cyazypyr®. Both Coragen® (ai. Chlorantraniliprole) and Cyazypyr®

(ai. Cyantraniliprole**)** have different active ingredients but the same mode of action (ryanodine receptor). Even though plantings of Honeydew melons cv. 'Sweet delight' had consistently more whiteflies found in/on the canopy there were no treatment differences observed when compared to honeydew melon cv. 'Sweet delight' and Watermelon cv. 'Melody' melons.

Differences in leafminer numbers was not found different among treatments with Agri-mek or Agri-flex when compared against controls. Larger melons were found in 'Hy-mark' cantaloupes when treated with Agri-mek at 2.5 fl. Oz./A. It is doubtful that this single yield difference is significant when no other agronomic values (average melon weight, brix) were found different.

Fig. 1. Aerial map of 6th Ave. University of California research plot.

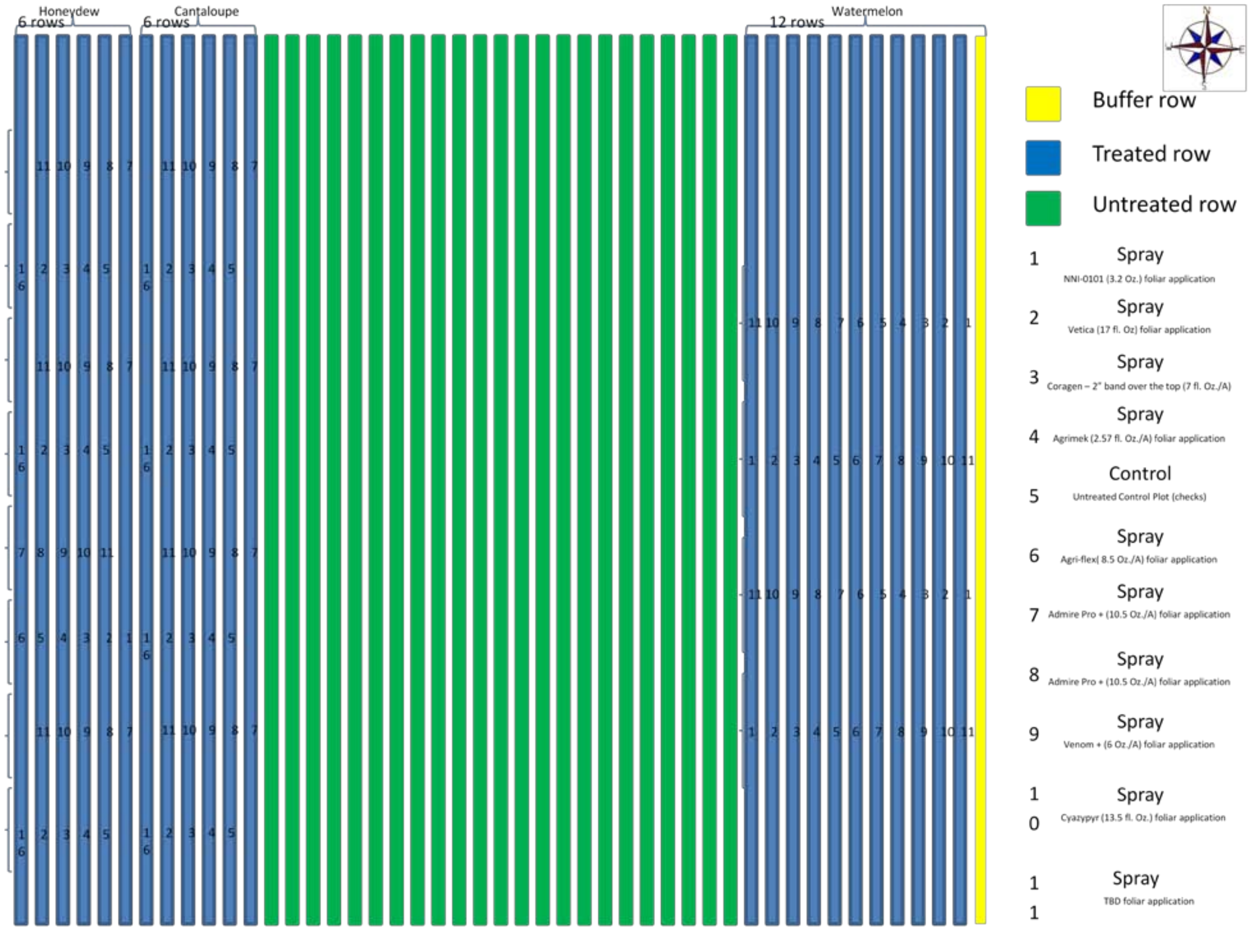

Fig. 2. Plot maps of treated melon plots compared to un-treated controls with plot size of 13.1 ft. x 6.66 ft. (≈0.0020A) in 2011.

Table 1. Whitefly insect counts, melon(s) yield, weights, brix. Blythe CA 2011.

	Mean whitefly counts ± SE		Mean yields (counts) and weights (Kg) ± SE			
Cultivar	**n**	# **Whitefly**	**n**	**# Total yield**	**Total weight**	**Brix (% sugar)**
Sweet delight						
1 – NNI-0101 (3.2 Oz./A)	140	0.33 ± 0.06**a**	4	27.00 ± 5.07**a**	26.60 ± 6.53**a**	8.11 ± 1.38**a**
2 – Vetica (17 fl. Oz./A)	140	0.32 ± 0.06**a**	4	20.00 ± 3.49**a**	23.85 ± 4.02**a**	6.86 ± 0.75**a**
3 – Coragen – 2” (7 fl. Oz./A)	140	0.29 ± 0.06**a**	4	27.00 ± 0.63**a**	32.93 ± 6.46**a**	6.59 ± 1.00**a**
5 – Untreated control	140	0.23 ± 0.07**a**	4	21.25 ± 4.27**a**	23.85 ± 6.25**a**	7.04 ± 1.01**a**
7 – Admire Pro* (10.5 fl. Oz./A)	140	0.21 ± 0.07**a**	4	25.25 ± 7.54**a**	25.08 ± 3.39**a**	6.92 ± 1.11**a**
8 – Admire Pro** (10.5 fl. Oz./A)	140	0.16 ± 0.07**a**	4	28.25 ± 4.13**a**	31.28 ± 5.91**a**	6.65 ± 1.41**a**
9 – Venom (6 Oz./A)	140	0.33 ± 0.06**a**	4	24.75 ± 5.85**a**	33.59 ± 9.63**a**	8.00 ± 2.12**a**
Hy-mark						
1 – NNI-0101 (3.2 Oz./A)	140	0.55 ± 0.04**a**	4	23.75 ± 3.01**ab**	13.93 ± 1.20**ab**	7.09 ± 0.86**a**
2 – Vetica (17 fl. Oz./A)	140	0.56 ± 0.04**a**	4	13.50 ± 2.47**b**	6.76 ± 1.33**b**	6.95 ± 1.08**a**
3 – Coragen – 2” (7 fl. Oz./A)	140	0.44 ± 0.05**a**	4	28.25 ± 0.63**a**	21.35 ± 1.87**a**	7.22 ± 0.97**a**
5 – Untreated control	140	0.46 ± 0.05**a**	4	21.75 ± 1.65**ab**	12.78 ± 0.46**ab**	7.32 ± 1.23**a**
7 – Admire Pro* (10.5 fl. Oz./A)	140	0.50 ± 0.04**a**	4	20.75 ± 7.54**ab**	13.23 ± 5.71**ab**	7.21 ± 1.72**a**
8 – Admire Pro** (10.5 fl. Oz./A)	140	0.54 ± 0.04**a**	4	10.75 ± 2.78**b**	6.38 ± 1.92**b**	7.10 ± 1.23**a**
9 – Venom (6 Oz./A)	140	0.52 ± 0.04**a**	4	21.00 ± 3.37**ab**	16.05 ± 3.21**ab**	7.83 ± 1.34**a**
10 – Cyazypyr (13.5 fl. Oz./A)	140	0.45 ± 0.05**a**	4	26.25 ± 3.82**a**	19.90 ± 2.82**a**	7.31 ± 1.23**a**

Melody						
1 – NNI-0101 (3.2 Oz./A)	140	0.52 ± 0.04**a**	4	3.75 ± 1.55**a**	18.35 ± 5.85**a**	8.52 ± 1.30**a**
2 – Vetica (17 fl. Oz./A)	140	0.53 ± 0.03**a**	4	3.75 ± 0.85**a**	20.69 ± 6.58**a**	8.02 ± 1.30**a**
3 – Coragen – 2” (7 fl. Oz./A)	140	0.49 ± 0.04**a**	4	3.75 ± 1.11**a**	24.15 ± 6.84**a**	8.35 ± 1.19**a**
5 – Untreated control	140	0.47 ± 0.04**a**	4	3.25 ± 0.75**a**	18.43 ± 2.80**a**	7.92 ± 1.34**a**
7 – Admire Pro* (10.5 fl. Oz./A)	140	0.54 ± 0.03**a**	4	5.00 ± 1.68**a**	23.26 ± 7.31**a**	8.06 ± 0.95**a**
8 – Admire Pro** (10.5 fl. Oz./A)	140	0.50 ± 0.04**a**	4	5.67 ± 0.67**a**	29.45 ± 4.42**a**	8.02 ± 1.04**a**
9 – Venom (6 Oz./A)	140	0.55 ± 0.04**a**	4	4.75 ± 1.31**a**	25.10 ± 6.96**a**	7.23 ± 2.00**a**

Table 2. Leafminer mine counts, melon(s) yield, weights, brix. Blythe CA 2011.

	Leafminer mine counts ± SE		Mean yields (counts) and weights (Kg) ± SE			
Cultivar	**n**	**# Mines**	**n**	**# Total yield**	**Total weight**	**Brix (% sugar)**
Sweet delight						
4 – Agri-mek (2.5 fl. Oz./A)	140	0.69 ± 0.00**a**	4	28.75 ± 6.28**a**	33.10 ± 7.21**a**	7.04 ± 1.19**a**
6 – Agri-flex (8.5 fl. Oz./A)	140	0.68 ± 0.01**a**	4	24.75 ± 1.49**a**	27.76 ± 2.96**a**	6.60 ± 0.78**a**
5 – Untreated control	140	0.69 ± 0.00**a**	4	21.25 ± 4.27**a**	23.85 ± 6.25**a**	7.04 ± 1.01**a**
Hy-mark						
4 – Agri-mek (2.5 fl. Oz./A)	140	0.68 ± 0.01**a**	4	27.00 ± 2.68**a**	20.54 ± 0.74**a**	7.38 ± 1.03**a**
6 – Agri-flex (8.5 fl. Oz./A)	140	0.68 ± 0.01**a**	4	18.50 ± 2.33**a**	11.80 ± 2.48**b**	7.58 ± 1.03**a**
5 – Untreated control	140	0.69 ± 0.00**a**	4	21.75 ± 1.65**a**	12.78 ± 0.46**b**	7.32 ± 1.23**a**
Melody						
4 – Agri-mek (2.5 fl. Oz./A)	140	0.69 ± 0.00**a**	4	4.00 ± 0.82**a**	22.23 ± 3.79**a**	7.94 ± 1.05**a**
6 – Agri-flex (8.5 fl. Oz./A)	140	0.69 ± 0.09**a**	4	5.00 ± 0.58**a**	25.02 ± 2.87**a**	7.76 ± 0.80**a**
5 – Untreated control	140	0.69 ± 0.00**a**	4	3.25 ± 0.75**a**	18.43 ± 2.80**a**	7.92 ± 1.34**a**

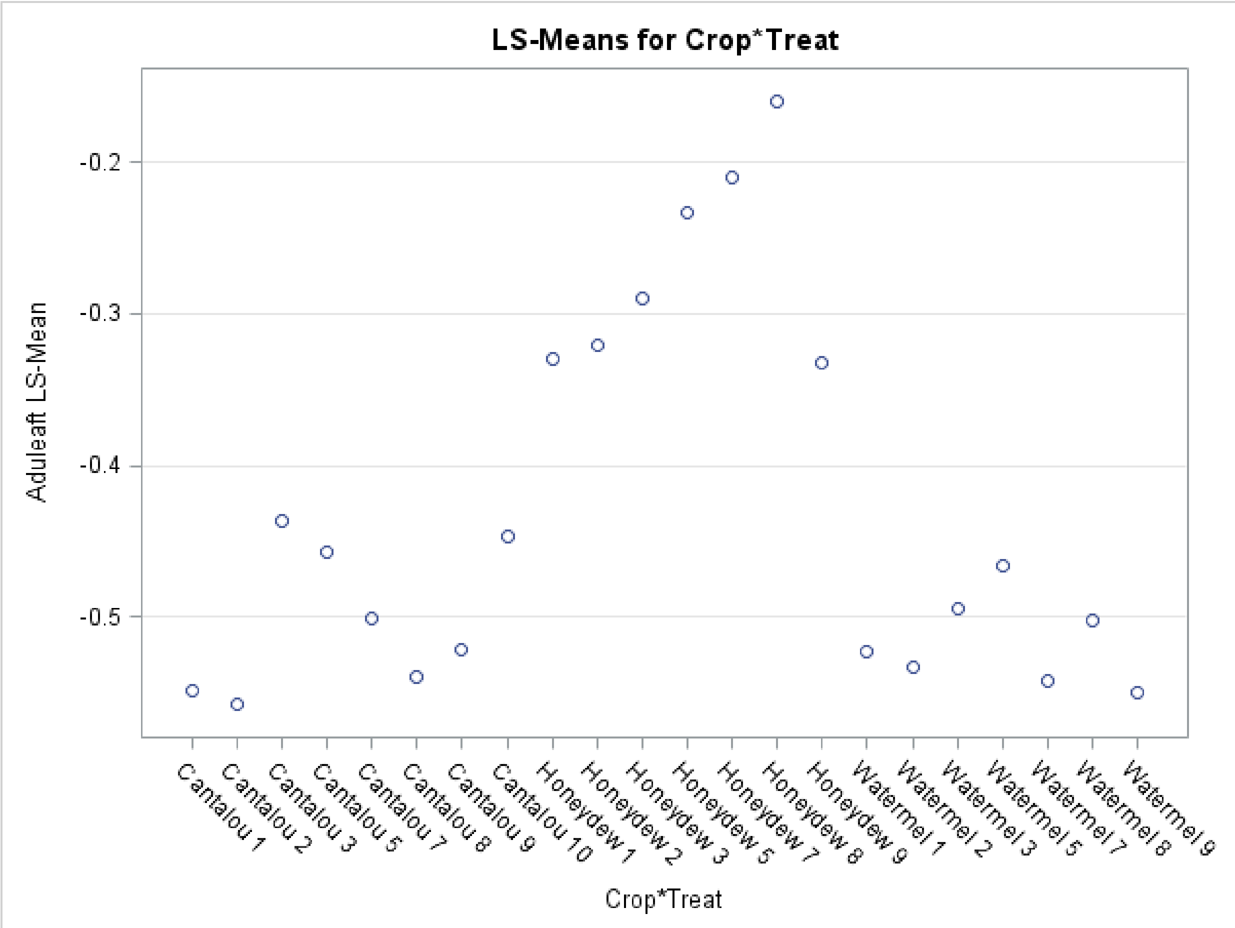

Fig. 3. Whitefly adults found in melon(s) plots (size of 13.1 ft. x 6.66 ft. ≈ 0.0020A) in 2011.

Appendix


Pictures of spring (cv. 'Sweet delight') melon in experimental plots just prior to field evaluation harvest


Pictures of spring (cv. 'Hy-mark') melon in experimental plots just prior to field evaluation harvest

Pictures of spring (cv. 'Melody') watermelon in experimental plots just prior to field evaluation harvest

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Selected Insecticide Performance against Egyptian Alfalfa Weevil Larvae

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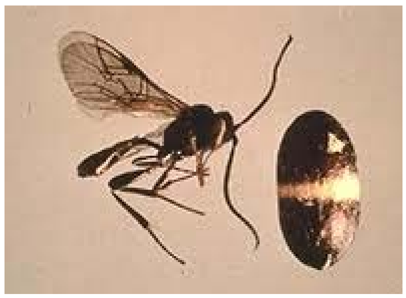
Two identical-looking weevils infest alfalfa in California. They are distinguished by their biology and distribution in the state. The alfalfa weevil is an annual pest in alfalfa districts east of the Sierra Nevada mountains and in the northernmost counties of California. In most other areas of California, it has been displaced by the Egyptian alfalfa weevil, which is a more serious pest.

Alfalfa weevil overwinters as an adult in field trash or other secluded hiding places and emerges in late winter or early spring. Soon after emergence and mating, the adult females begin inserting their eggs into the alfalfa stems, and hatching larvae make their way up the stem to feed on alfalfa terminals and drop to spin a cocoon and pupate by early summer. This species generally has only one generation a year.

Egyptian alfalfa weevils spend the summer as adults under the loose bark of trees, especially eucalyptus, or in any place they can wedge their bodies, such as in rough-barked trees (walnut) or under shake shingles on homes, among debris, leaves, etc. . In late fall or early winter, they emerge and migrate to alfalfa fields. Soon after entering the fields and mating, adult females begin inserting their eggs into the stems of alfalfa, and hatching larvae make their way into the alfalfa terminals. In California's southern desert the Egyptian alfalfa weevil has three to four generations a year and may be found in the field throughout the year, although damage is most serious in spring.



Management of Egyptian alfalfa weevil is usually a problem during the first cutting, although some adults and larvae may persist into the second or third cutting. Alfalfa weevil is attacked by the parasitic wasp *Bathyplectes curculionis*. This wasp is present throughout the range of the alfalfa weevil. *B. curculionis* does not control Egyptian alfalfa weevil. Egyptian alfalfa weevil has spread into most areas of California the occupied niches previously occupied by the alfalfa weevil. *Bathyplectes anurus* is a larval parasite that has been introduced and has become established at low levels in the central valley alfalfa. There is also a fungus disease of weevil larvae that kills the larvae turning them into grayish oozing masses. This disease functions best under moist conditions.

To sample for weevil larvae, divide the field into 4 or more sections and take 5 sweeps in each section. Divide the total number of weevil larvae by the total number of sweeps to get the field average. The treatment threshold is the same for both species of alfalfa weevil, an average of 20 larvae per sweep. The sweep net sample should be from hip across the body ending at the other hip as one walks through the alfalfa. The net should clip the about the upper 4-6 inches of alfalfa. Sweeping when the foliage is dry is recommended. Adult weevils do not cause economic damage, but do signal the end of Egyptian alfalfa weevil larval infestations for the year. Serious damage can sometimes be prevented by "early harvest" - cutting the crop as soon as most of the plants are in the bud stage. On short alfalfa early in the season or on stubble following cutting that cannot be checked with a sweep net, treatment is indicated when growth is retarded because of weevil feeding. More information is available at the UC IPM Pest Management Guidelines for Alfalfa weevil here, http://www.ipm.ucdavis.edu/PMG/r1300511.html.

Recently Larry Godfrey of UC Davis has performed an insecticide efficacy trial against Egyptian alfalfa weevil (EAW) on the UC-Davis Agronomy Farm. Egyptian alfalfa weevil larval populations were measured in each plot with a standard 15-inch diameter insect net consisting of twenty-180^{o} sweeps. Beneficial insects were also counted in the same twenty-180^{o} sweeps.

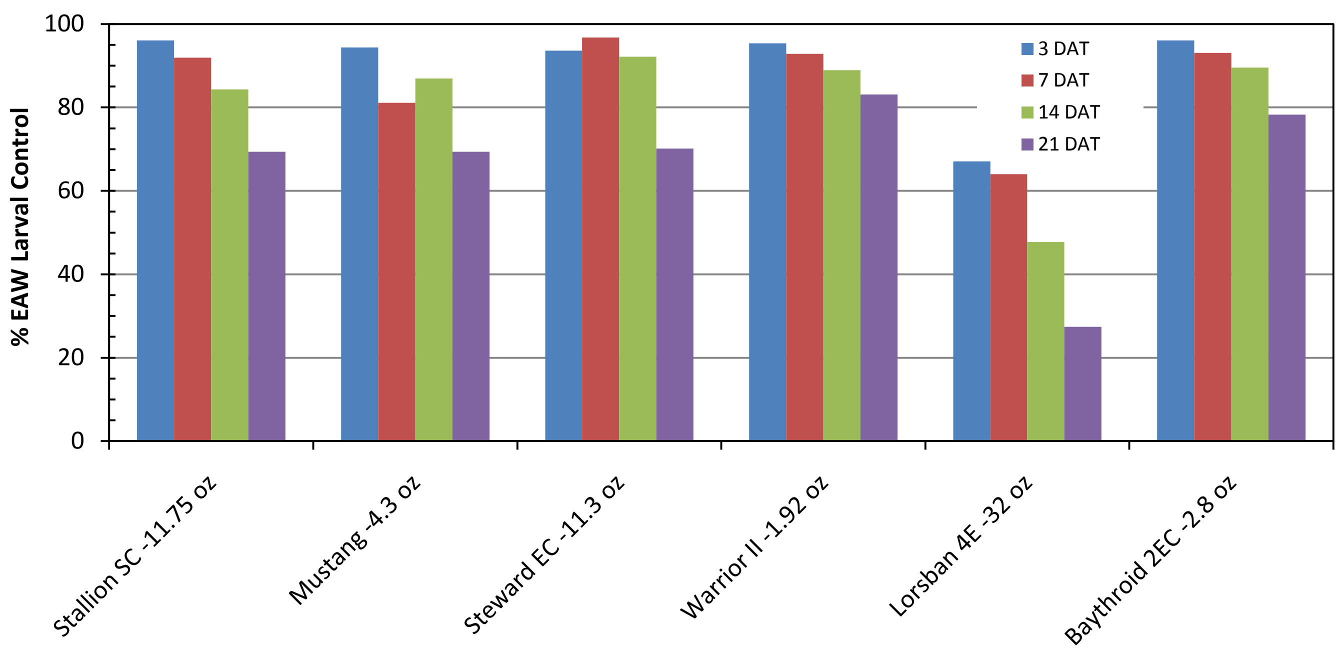


Figure 1. Percentage Egyptian alfalfa weevil larval control with selected insecticides at various days after treatment (DAT), Davis, CA, 2011.

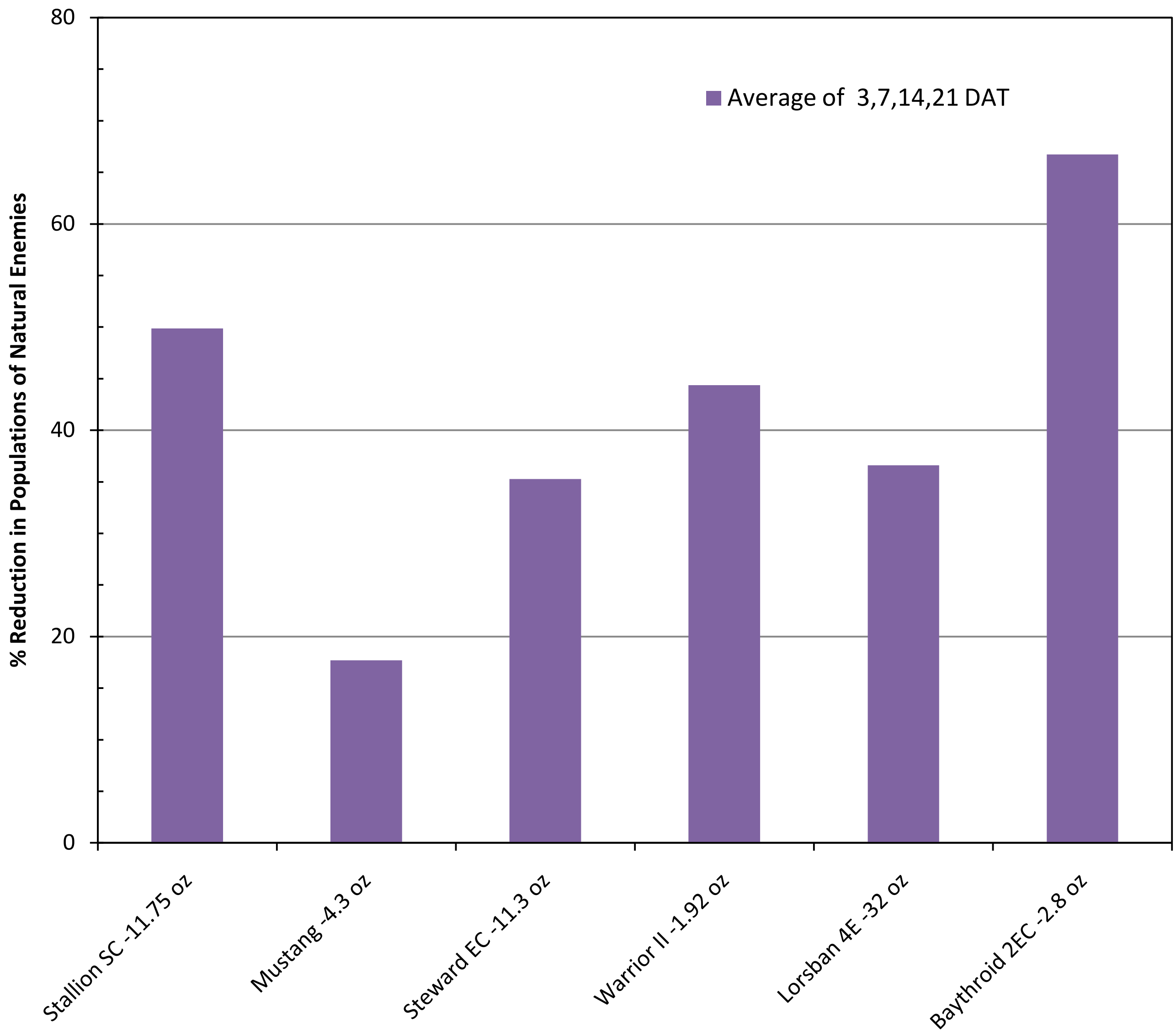


Figure 2. Percentage reduction in populations of natural enemies from selected insecticides targeting Egyptian alfalfa weevil larvae average of 3, 7, 14, and 21 days after treatment (DAT), Davis, CA, 2011.

All materials tested performed well against EAW larvae. Control with Lorsban 4E has been only moderate at this location for the last ~5 years possibly due to resistance (although this has not been documented). The pyrethroid products and Steward have consistently given good EAW control. The new, "reduced-risk" insecticides that have been registered for pests in other cropping systems are not active on EAW larvae, due to their specific modes of action. In the "insect world", this pest is fairly easy to control with insecticides. The challenges are achieving the length of residual control needed to protect the first cutting, controlling EAW when the infestation starts prior to spring alfalfa growth initiation, and controlling EAW while still maintaining populations of natural enemies. These beneficials are important for managing aphids, thrips, and lepidopterious larvae in the second cutting and beyond. This study had a moderate EAW larval population but did not really address any of these other challenges as the infestation really persisted only ~14 days, the alfalfa had good growth at the time of treatment, and this location typically has low aphid populations. Overall, levels of natural enemies were reduced from 18 to 67% over the 21-day period.