Chemical Control Studies for Silverleaf Whitefly Control

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Abstract

Chemical control studies for silverleaf whitefly, Bemisia argentifolii Bellows and Perring, control on cotton showed that fenpropathrin-acephate, fenpropathrin-endosulfan, and endosulfan-bifenthrin mixtures gave adequate control and increased cotton yields were obtained as compared within untreated cottons. Pyriproxyfen, applied biweekly or alternated with fenpropathrin-acephate, Nicotiana, and a fenpropathrin-mycotrol mixture also gave effective control.

Introduction

Silverleaf whiteflies, *Bemisia argentifolii* Bellows and Perring, continue to be a serious problem in California and Arizona cotton production. Although a number of very effective chemicals are being used for control (Chu et al. 1994), the probability of resistance development is high. The only method available, at present, to combat resistance is removal of the selection pressure for a particular type of insecticide chemistry. The continuing need for new chemistry insecticides for use in resistance management schemes prompted us to evaluate several new materials as well as mixtures of currently used insecticides for whitefly control.

Materials and Methods

Seeds of Deltapine 5461 were planted on 13 March and emerged 3 April 1995. The experimental designs were randomized complete blocks with four replicates. Each plot was 40 ft long and four rows wide. Row spacing was 40 inches. There were four skip rows between plots and 30 ft alleys that separated blocks. In experiment 1, a mixture of fenpropathrin and acephate served as a treated control and insecticide-free plots were untreated controls. Other treatments are listed in Table 1. Treatments were initiated on 13 June when the average number of adults per leaf-turn equaled or exceeded 4.1 adults on 12 June. In experiment 2, treatments were rates of endosulfan mixed with fenpropathrin at 0.2 lb AI/ac, endosulfan alone and endosulfan plus bifenthrin and an untreated control (Table 2). Fenpropathrin and endosulfan alone at 0.2 and 1.0 lb AI/ac, respectively, served as a treated control. Treatments were initiated on 21 June when the average adult number counted with leaf-turn method exceeded 4.1 adults/leaf on 20 June. The 4.1 adults/leaf threshold was the damaging threshold we established in the 1993 and 1994 studies. Unless stated otherwise, weekly application of the treatments were made until 1 August for a total of 8 applications in experiment 1 and until 2 August in experiment 2 for a total of 7 applications. The treatments were applied with a ground sprayer equipped with three hollow cone nozzles (#2 disc with #13 core) with one directed to the top and two drop nozzles on each side of cotton rows. Drops extended about 15 inches into the canopy. The sprayer was operated at 3 mph and 105 psi which delivered 22.7 gal/ac. Leaf sampling for adults, eggs and nymphs began from 22 May until 7 August for a total of 12 samples. Ten 5th main stem node leaves were picked each plot each time. Number of adults was counted by leaf-turn and numbers of eggs and nymphs were counted from a 3.8 cm^2 leaf disk each leaf. Insect data were analyzed weekly and seasonal means summarized as shown in Table 1 for experiment 1, and Table 2 for experiment 2.

Results and Discussion

In experiment 1, all treatments, except mycotrol, significantly reduced numbers of silverleaf whitefly eggs and nymphs as compared with untreated plots (Table 1). All treatments significantly reduced numbers of adults/leaf turn. Cotton yields were significantly increased in all insecticide-treated plots as compared to untreated plots. Fenpropathrin alone, mycotrol, and pyriproxyfen alternated with mycotrol-treated plots had significantly lower yields than all other insecticide-treated plots. Similarly, in experiment 2, all insecticide treatments reduced silverleaf whiteflies as compared to untreated plots (Table 2). Cotton lint yields in plots treated with fenpropathrin or endosulfan alone were not significantly different than cotton yields from the untreated control. All other insecticide treatments resulted in increased yields as compared with yield from the untreated control.

References

Chu, C. C., T. J. Henneberry and D. H. Akey. 1994. Cotton: Gossypium hirsutum L. 'Deltapine-5461' sweetpotato whitefly (SPWF), *Bemisia tabaci* (Gennadius), p. 221. *In* A. K. Burdett, Jr. and E. K. Grady (eds.), Arthropod Management Tests: 1994. Entomol. Soc. Am., Lanham, MD.

Table 1. Effects of pyriproxyfen and other insecticides on silverleaf whitefly population densities and cotton yield, Brawley, CA, 1995.

Treatment	Rate (lb AI/acre or %)	No./cm2 of leaf disk		No. adults/ leaf turn	Lint yield (lb/ac)
		Eggs	Nymphs		
	Seasonal means from May 22 to August 7				
Untreated	--	11.68 ac	3.99 a	16.70 a	1795 d
Fenpropathrin	0.20	7.49 cd	2.99 bc	10.74 bcd	2634 c
Fenpropathrin + acephate	0.20 + 0.50	2.09 e	0.60 e	3.14 e	3864 a
Pyriproxyfen biweekly	0.04	6.83 cd	1.15 de	10.07 cd	3768 a
Fenpropathrin + acephate alternated with pyriproxyfen	0.20 + 0.50 0.04	3.01 e	0.52 e	4.25 e	3693 a
Nicotiana[a]	0.2%	5.62 d	1.54 d	9.12 d	3455 ab
Mycotrol + silwet[b]	1.0 + 0.04%	10.38 ab	3.79 ab	13.48 b	2525 c
Fenpropathrin + Mycotrol + silwet	0.2 + 1.0 0.04%	6.78 cd	2.52 c	12.46 bc	3280 ab
Pyriproxyfen alternate with Mycotrol + silwet	0.04 1.0 + 0.04 %	8.49 bc	2.85 bc	12.49 bc	2930 bc

[a] Nicotiana is a synthetic sucrose ester similar to the alkaloid extraction sof *Nicotiana* spp.

[b] Mycotrol is a fungal pathogen *Beauveria bassiana* formulation, containing 2 x 10^3 conidia per pound. Silwet is a silicone-polyether copolymer used as a sufactant.

[c] Means in a column with common letters are not significantly different (Duncan's Multiple Range Test, $P \leq 5\%$).

Table 2. Effects of fenpropathrin-endosulfan and endosulfan-capture mixtures on silverleaf whiteflies and cotton yields, Brawley, CA, 1995.

Treatment	Rate (lb AI/acre)	No./cm2 of leaf disk		No. adults/ leaf turn	Lint yield (lb/ac)
		Eggs	Nymphs		
	Seasonal means from May 23 to August 8				
Untreated	–	13.30 a	4.65 a	16.48 a	579 d
Fenpropathrin + Endosulfan	0.2 + 0.0625	6.93 cd	2.87 bc	9.27 bcd	975 abc
Fenpropathrin + Endosulfan	0.2 + 0.125	8.49 bcd	3.14 abc	8.50 cd	1121 a
Fenpropathrin + Endosulfan	0.2 + 0.25	6.66 cd	2.71 bc	9.93 bcd	952 abc
Fenpropathrin + Endosulfan	0.2 + 0.5	7.48 cd	2.73 bc	9.95 bcd	892 abc
Fenpropathrin + Endosulfan	0.2 + 1.0	5.58 d	2.16 c	7.83 d	1006 ab
Fenpropathrin	0.2	10.67 ab	4.21 ab	11.67 b	716 cd
Endosulfan	1.0	9.32 bc	4.06 ab	11.44 bc	758 bcd
Endosulfan + Bifenthrin	1.0 + 0.08	6.52 cd	2.54 bc	7.94 d	1067 a

[a] Means in a column with different letters differ significantly (Duncan's Multiple Range Test, $P \leq 5\%$).