Effects of Silverleaf Whiteflies on Sticky Cotton and Cotton Yields in Arizona

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Abstract

Silverleaf whitefly, Bemisia argentifolii Bellows and Perring, adults and nymphs were significantly reduced season-long in cotton plots treated with fenpropathrin plus acephate on 3 occasions (15 July, 2 August and 29 August). Thermodetector sticky cotton ratings were significantly reduced in insecticide-treated plots compared with untreated plots. Heavy rains reduced cotton stickiness in all plots.

Introduction

Increasing whitefly populations have resulted in reduced cotton yield as well as increases in the occurrence of sticky cotton in California and Arizona (Chu et al. 1994). The sweetpotato whitefly (SPW), *Bemisia tabaci* (Gennadius) has existed at low population levels on cotton in Arizona and California for many years without developing economic pest status populations (Butler et al. 1986, Henneberry and Butler 1992). Perring et al. (1993) proposed that a new whitefly species has contributed to the current problem. Bellows et al. (1994) described the new species based on expanded host range, biological, morphological, allozyme and genetic characteristics as *Bemisia argentifolii* Bellows and Perring. The urgent need for solutions to the sticky cotton and lint yield loss problem as a result of high populations of the new species prompted us to conduct studies to develop information on whitefly honeydew, cotton lint stickiness and cotton lint yield interactions.

Materials and Methods

Studies were conducted at the University of Arizona, Maricopa Agricultural Center, Maricopa, AZ on untreated cotton plots or plots treated with fenpropathrin plus acephate on 15 July, 2 August and 29 August at rates of 0.16 kg (AI/ha) plus 0.56 kg (AI/ha), 0.20 kg (AI/ha) plus 0.56 kg (AI/ha) and 0.16 kg (AI/ha) plus 0.84 kg (AI/ha), respectively. Adults and nymphs of *B. argentifolii* were sampled weekly in all plots from 27 June to 29 August. Thermodetector sticky cotton ratings were determined for all samples by the methods of Brushwood and Perkins (1993). Seed cotton samples were picked weekly from 9 August to 26 September from open bolls for cotton lint stickiness ratings. Seed cotton was also picked from all open bolls from 4 m of row in all plots on 26 September to determine treatment effects on yield.

Results and Discussion

Accumulated numbers of adults in untreated cotton plots were low through June and early July increasing dramatically thereafter through August (Figure 1). Accumulated nymphs followed a similar trend but lagged about 1 week behind adults (Figure 2). Adults and nymphs were significantly reduced in insecticide-treated plots on all sampling dates following the first fenpropathrin plus acephate applications on 15 July. There were no significant differences between lint stickiness ratings in treated and untreated plots until 29 August. On 29 August, thermodetector ratings in untreated plots

increased dramatically as compared to insecticide-treated plots. Following a 5.1 cm rain on 4 September, lint stickiness ratings decreased in all plots. The average cotton lint yield for untreated control plots was 1210 kg/ha and for insecticide treated plots 1697 kg/ha.

Cotton lint stickiness has increased in severity with rapidly expanding honeydew producing insect problems in many parts of the world (Hector and Hodkinson 1989). Plant sugars may be present on cotton lint but generally do not result in stickiness because they are uniformly distributed as opposed to the highly concentrated aggregates of honeydew deposits (Miller et al. 1994).

The adverse effect of *B. argentifolii* on DPL 5415 cotton yield corroborates the results reported by Chu et al. (1994) that *B. argentifolii* infestations dramatically reduced cotton yields in the Imperial Valley, CA. The reason(s) for reduced yields may be a direct effect of *B. argentifolii* feeding on phloem tissue and a general weakening of the plant; however, our results do not rule out the possibility that a plant toxin and/or other more subtle *B. argentifolii*/cotton plant interaction may have adversely affected plant growth, development and yield.

References

Bellows, T. S., Jr., T. M. Perring, R. J. Gill, and D. H. Headrick. 1994. Description of a species of *Bemisia* (Homoptera: Aleyrodidae). Ann. Entomol. Soc. Am. 87: 195-206.

Brushwood, D. E., and H. H. Perkins. 1993. Cotton stickiness potential as determined by minicard, thermodetector, and chemical methods, pp. 1132-1135. *In* D. J. Herber and D. Richter [eds.], Proceedings of the 1983 Beltwide Cotton Prod. Res. Conf., National Cotton Council Am., Memphis, TN.

Butler, G. D., Jr., T. J. Henneberry, and W. D. Hutchison. 1986. Biology, sampling and population dynamics of *Bemisia tabaci*, pp. 167-195. *In* G. E. Russel [ed.], Agricultural Zoology Reviews Intercept, Ponteland, Newcastle Upon Tyne, England.

Chu, C. C., T. J. Henneberry, D. H. Akey, and N. Prabhaker. 1994. A study on control action thresholds for *Bemisia tabaci* (Gennadius) on cotton, pp. 1239-1241. *In* D. J. Herber, and D. A. Richter [eds.], Proceedings of the 1994 Beltwide Cotton Prod. Res. Conf., National Cotton Council Am., Memphis, TN.

Hector, D. J., and I. D. Hodkinson. 1989. Stickiness in cotton. C.A.B. International, Oxon, UK.

Henneberry, T. J., and G. D. Butler, Jr. 1992. Whiteflies as a factor in cotton production with specific reference to *Bemisia tabaci* (Gennadius), pp. 674-683. *In* D. J. Herber, and D. A. Richter [eds.], Proceedings of the 1992 Beltwide Cotton Prod. Conf., National Cotton Council Am, Memphis, TN.

Miller, W. B., E. Peralta, D. R. Ellis, and H. H. Perkins, Jr. 1994. Stickiness potential of individual insect honeydew carbohydrates on cotton lint. Test. Res. J. 64: 344-350.

Perring, T. M., A. D. Cooper, R. J. Rodriguez, C. A. Farrar, and T. S. Bellows. 1993. Identification of a whitefly species by genomic and behavioral studies. Science 259: 74-77.

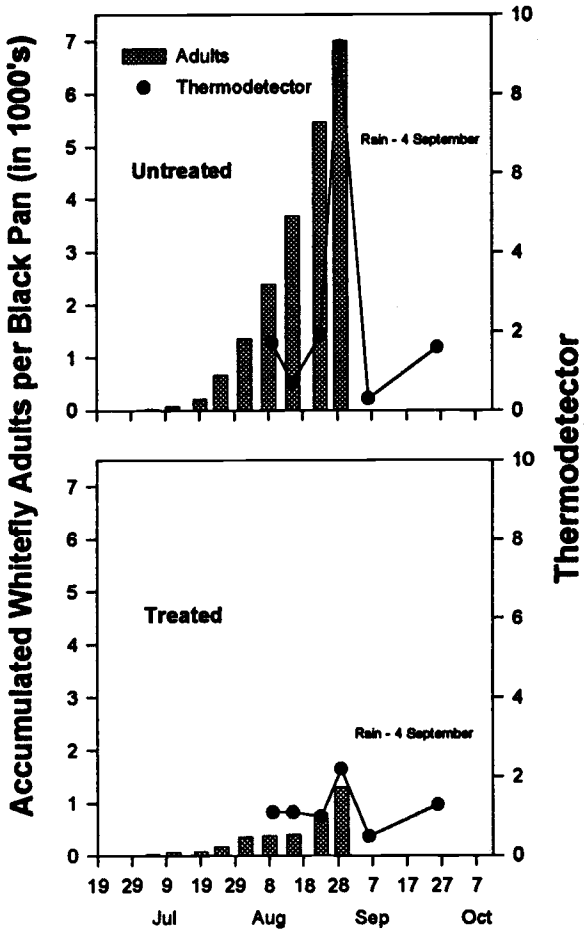

Fig. 1. Mean numbers of accumulated adult whiteflies per black pan sample per week and thermodetector sticky cotton ratings in untreated and insecticide-treated cotton plots in 1994.

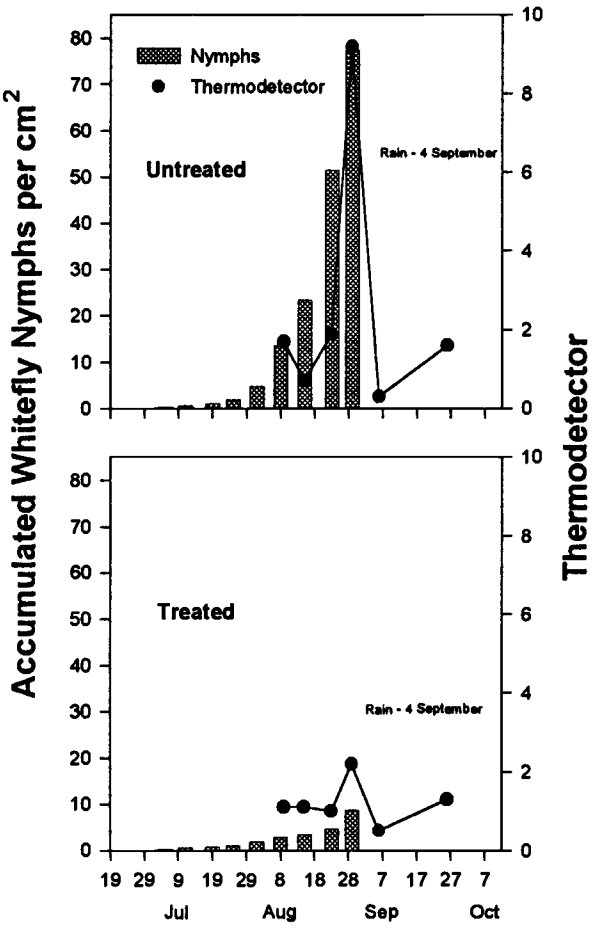

Fig. 2. Mean numbers of accumulated nymphs per cm^2 of leaf area and thermodetector sticky cotton ratings in untreated and insecticide-treated cotton plots in 1994.