SILVERLEAF WHITEFLY POPULATIONS AND TRICHOME DENSITIES ON UPLAND COTTONS

C. C. Chu, E. T. Natwick, T. J. Henneberry, D. R. Nelson, J. S. Buckner and T. P. Freeman
USDA, ARS, WCRL
Phoenix, AZ

Abstract

We studied relationships between leaf trichome and silverleaf whitefly (SLW), *Bemisia argentifolii* Bellows and Perring, densities on abaxial leaf surface of nine upland cotton, *Gossypium hirsutum* L., cultivars. The hairy leaf cultivar Stoneville 474 had the highest and the smooth leaf cultivar E1028 had the lowest numbers of SLW eggs, nymphs and adults. Among the eight smooth leaf cultivars, the four okra leaf cultivars as a group had fewer SLW eggs, nymphs and adults compared with the four normal leaf cultivars. The top young leaves on main stem terminals had fewer numbers of SLW eggs, nymphs and adults, but had higher numbers of trichomes compared with older leaves.

Introduction

The silverleaf whitefly (SLW) *Bemisia argentifolii* Bellows and Perring has been an important economic pest of cotton since 1991. We studied SLW colonization on upland cottons to identify cultivars that are less susceptible to SLW attack (Chu et al. 1997). Smooth leaf cotton cultivars has been reported to have fewer whiteflies compared with hairy leaf cultivars (Norman and Sparks 1997). This report presents results of the studies in 2000 to compare SLW colonization on nine upland cotton cultivars at Maricopa, AZ.

Materials and Methods

The study was conducted in a randomized complete block design with four replicates. Each plot was eight rows wide and 12.2 m long with rows spaced 1 m apart. There were four unplanted rows between plots and 3 m wide alleys between blocks. Treatments were five normal-leaf cotton cultivars (Deltapine [DPL] 20B, DPL 50 B, DPL 90B, NuCOTN 33B, and Stoneville [ST] 474) and four okra-leaf cultivars (E0223, E0798, E1028, and Siokra L-23). All entries were smooth leaf cultivars except for the hairy-leaf ST 474. Seeds were pre-treated with a mixture of insecticides and fungicides by seed companies and were planted on 10 April 1999. Plants emerged two weeks later. Irrigation was at 10-20 day intervals and no pesticides were applied during the growing season.

Silverleaf whitefly populations were determined on 8 weekly dates from 10 July to 5 September. On each sampling date, leaves were picked from six main stem leaf nodes #1, #2, #3, #4, #5, and #7 from apical terminals of each of five plants from each plot. A 1.43 cm^2 of leaf disk was taken from the second leaf sector of each leaf and numbers of silverleaf whitefly eggs and nymphs (Naranjo and Flint 1994) and trichomes were counted on abaxial leaf surfaces with the aid of a stereoscope. Leaves at node #1 were $\geq$ 2.5 cm between the two largest leaf lobes. Adults per leaf-turn were counted on each of the six node position (Naranjo and Flint 1995). Data were analyzed using ANOVA (Anonymous 1989) for a randomized complete block design.

Results and Discussion

Numbers of SLW adults were significantly higher on hairy-leaf ST 474 compared with the eight smooth-leaf cotton cultivars (Table 1). These results confirmed our earlier reports (Chu et al. 1987) and that of Norman and Sparks (1997) that hairy leaf cotton cultivars were more susceptible to silverleaf whitefly colonization compared with smooth leaf cultivars. Stonville 474 also had higher numbers of SLW eggs and nymphs compared to the other cultivars and the highest number of trichomes per cm^2 of leaf disk.

In contrast, leaves on leaf node #1 had the highest number of trichomes but the lowest numbers of eggs, nymphs and adults compared with five other older leaves (Table 1).

It has been well documented that hairy leaf cotton cultivars have higher *Bemisia* densities compared with smooth leaf cultivars (Chu et al. 1997, Norman and Sparks 1997). Results of this study comparing whiteflies on leaf position on the main stem nodes appears to reveal a complex of trichome-whitefly density relationships. Leaves on node #1 have not been exposed to adult oviposition as long as older leaves which confounds the differences observed in the numbers of adults, eggs and nymphs. However, our results of recent studies in greenhouses with short time exposures to whitefly ovipositions showed that the top young leaves below main stem terminals had fewer SLW compared with older leaves (unpublished data).

In addition to higher trichome density, the top young cotton leaves also had thinner leaf laminae and were a yellowish green leaf color that appears more attractive to adults and resulting in higher eggs and nymphs (Chu et al. 2000a and 2000b.) Therefore, the whitefly-trichome relationships are more complex than previously thought.

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Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 2:871-872 (2001)
National Cotton Council, Memphis TN

Table 1. Mean numbers of silverleaf whiteflies on leaves of cotton cultivars from different main stem leaf nodes below the terminals on nine upland cotton cultivars, Maricopa, AZ, 2000.

Variable	Adults/leaf	Eggs/cm^2	Nymphs/cm^2	Trichomes/cm^2
Cultivar				
DPL 20B	5.2b[a]	12.2bc	4.5bc	0.1b
DPL 50B	6.2b	15.4b	6.0b	0.7b
DPL 90B	5.7b	10.1bc	3.8bc	0.1b
NC 33B	5.9b	14.0b	4.9bc	0.2b
ST 474	12.9a	36.0a	13.3a	71.3a
E0223	6.0b	7.3bc	3.4bc	0.8b
E0798	5.1b	7.8bc	4.2bc	0.3b
E1028	1.5c	2.3c	0.6d	0.0b
Siokra L-23	2.8bc	5.4bc	1.9cd	0.0b
Leaf node				
1	3.3c	7.8c	0.8e	15.0a
2	3.7c	12.3b	2.3d	10.5b
3	5.6b	15.2a	5.0c	7.8c
4	7.6a	15.6a	6.6b	6.3d
5	8.2a	14.0ab	7.6a	5.4e
7	6.0b	8.9c	6.1b	3.9f

[a]Means in a column not follow by the same letters are significantly different (Student-Neuman-Keul's MRT, P =0.05).