SUSCEPTIBILITY OF NORMAL-LEAF AND OKRA-LEAF SHAPE COTTONS TO SILVERLEAF WHITELIES AND RELATIONSHIPS TO TRICHOME DENSITIES

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Abstract

Stoneville 474 supported higher numbers of silverleaf whitefly eggs, nymphs and adults and also had higher numbers of trichomes on underleaf surfaces of leaves compared with the nine other upland cotton cultivars tested. The five smooth, okra-leaf cotton cultivars as a group had similar numbers of whitefly eggs and nymphs compared with the four smooth, normal-leaf cotton cultivars. The top young leaf on the main stem terminals had significantly higher numbers of trichomes compared with older leaves. However, the top young leaf had fewer whitefly numbers compared with older leaves.

Introduction

The silverleaf whitefly, *Bemisia argentifolii* Bellows and Perring, has caused cotton yield loss and reduced lint qualities since its outbreaks in 1991. Studies were conducted to identify cotton cultivars that are less susceptible to silverleaf whitefly colonization (Chu et al., 1998). Results of ours and other investigations suggest that smooth leaf cotton cultivars are less susceptible to silverleaf whitefly colonization compared with hairy cotton cultivars (Norman and Sparks 1997). Results also indicates that okra-leaf upland cotton cultivars have fewer whiteflies compared with normal-leaf cultivars (Chu et al. 1999). This report presents results of the 1999 study to compare silverleaf whitefly infestations on different cotton cultivars at Maricopa, AZ.

Materials and Methods

The study was conducted at the University of Arizona Agricultural Research Center, at Maricopa, AZ in 1999. A randomized complete block design with four replicates was used for the study. Each plot was eight rows wide and 12.2-m long with rows spaced at 1-m apart. There were two unplanted rows between plots and 3-m alleys between blocks. Treatments were normal-leaf cottons (Deltapine [DPL] no. 20B, 50B, 90B, NuCOTN 33B, and Stoneville [ST] 474) and five okra-leaf cottons (Fiber Max [FM] no. 819 and 832, Siokra [SIO] no. L-23, I-4/649 and 89013-114). All entries were smooth leaf cultivars except for the hairy-leaf ST 474. Seeds were planted on 19 April 1999 and emerged about two weeks later. All plots were treated with diflubenzuron for salt marsh caterpillers on 13 August. No other pesticides were applied during the growing season. Numbers of branched trichomes were counted on 9 June on leaves from main stem leaf nodes no. 1, 3, 5 and 7 down from terminals. The location of trichomes on leaves was recorded as on the veins (main, primary, secondary or tertiary) or between veins. Leaves were picked from plants in the plots on 11 weekly dates from 21 July to 6 October for egg and nymph counts. On each occasion, 1.96 cm^2 leaf disks were taken from each of three leaves from each of the four leaf nodes of each plant. Adults per leaf-turn were counted on three 5th main stem node leaves on the same sampling dates. Data for trichome numbers and seasonal mean numbers of eggs, nymphs and adults were analyzed using ANOVA for a randomized complete block design. Correlation analyses were conducted to examine potential leaf trichome and whitefly relationships.

Results and Discussion

Numbers of silverleaf whitefly eggs and nymphs/cm^2 of leaf disk were highest on leaves of ST 474, followed by DPL 50B. Differences among the other eight cultivars were small. On a seasonal basis, the five smooth, okra-leaf cultivars as a group did not have lower whitefly infestations compared to the four smooth, normal-leaf cultivars. These results were in contrast to our earlier studies conducted in Imperial Valley, California (Chu et al. 1999).

Almost all branched long cell trichomes were found on main and primary leaf veins (Table 1). The exception was ST 474 where trichomes were also found on secondary and tertiary veins. Total numbers of trichomes were the highest for ST 474 (262/cm^2 leaf disk) and this is in agreement with earlier reports (Norman et al. 1997). Numbers of trichomes for the nine other cultivars ranged from 8.1 (DPL 90B) to 84.7 (SIO 89013-114) per cm^2 of leaf disk. Correlations between numbers of trichomes (all leaves combined for each cultivar) and numbers of whitefly eggs, nymphs, and adults were high (0.91, 0.91 and 0.67, respectively) when the ten cultivars were compared. However, when leaves on different main stem leaf nodes were compared (all cultivars combined for leaves on each leaf node), correlations between numbers of trichomes and numbers of eggs and nymphs were not significant. Mean numbers of total trichomes per cm^2 leaf disk were 173.9, 28.3, 26.3 and 21.8 for leaves on leaf nodes no. 1 (youngest leaf), 3, 5 and 7 (oldest leaf), respectively, indicating that few changes occurred in numbers of trichome during leaf expansion. Mean numbers of eggs for the leaves on nodes 1, 3, 5, 7 were 22.6, 80.9, 38.0 and 17.0/cm^2 of leaf disks, respectively, and mean numbers of nymphs were 0.6, 13.6, 25.6, and 16.9/cm2 of leaf disks, respectively. Thus, hairy leaf cotton cultivars had higher numbers of silverleaf whiteflies compared with smooth leaf cotton cultivars, but

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young hairy leaves on tops of plants had fewer numbers of silverleaf whiteflies compared to older leaves.

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Table 1. Mean numbers of branched trichomes on leaves taken from different main stem leaf nodes located sequentially below the terminals on ten upland cotton cultivars, Maricopa, AZ, 1999.

	No. trichomes/cm^2 leaf area				
	On vein type				Between vein
Variable	Main	Primary	Secondary	Tertiary	
Cultivar					
DPL 20B	28.2 bc[a]	3.0 b	0.2 b	0.0 b	0.0 b
DPL 50B	56.7 ab	13.2 b	2.4 b	0.0 b	0.0 b
DPL 90B	7.3 c	0.7 b	0.0 b	0.1 b	0.1 b
NC 33B	10.0 c	0.6 b	0.0 b	0.0 b	0.0 b
ST 474	85.4 a	80.5 a	60.5 a	27.0 a	8.4 a
Fiber Max 819	45.0 abc	10.0 b	0.1 b	0.0 b	0.1 b
Fiber Max 832	34.5 bc	6.6 b	0.0 b	0.0 b	0.0 b
Siokra L-23	24.5 bc	10.4 b	1.3 b	0.0 b	0.0 b
Siokra I-4/649	39.7 bc	8.5 b	0.0 b	0.0 b	0.0 b
89013-114	64.3 ab	19.2 b	1.0 b	0.0 b	0.1 b
Leaf node					
1	104.5 a	45.6 a	13.57 a	7.73 a	2.54 a
3	19.8 b	4.7 b	3.77 b	0.03 b	0.00 b
5	19.0 b	4.6 b	2.60 b	0.09 b	0.06 b
7	18.7 b	3.0 b	0.23 b	0.00 b	0.01 b

[a] Means in column of a variable not followed by the same letters are significantly different (Protected LSD, $P = 0.05$).