RENIFORM NEMATODE AND SILVERLEAF WHITEFLY INFLUENCE ON LINT YIELD, FIBER QUALITY AND SEED QUALITY OF COTTON

C.G. Cook and A.F. Robinson
USDA, ARS
Weslaco and College Station, TX
D.A. Wolfenbarger
D2 Consulting
Brownsville, TX

Abstract

Information concerning the interaction of reniform nematodes and silverleaf whiteflies on cotton is very limited, but could be of great concern to cotton growers and cottonseed producers in the Lower Rio Grande Valley (LRGV) of Texas. Studies were conducted to ascertain the singular and combined effects of the reniform nematode and silverleaf whitefly on lint yield, fiber quality, and seed quality. In the 1995-1996 yield and fiber quality field studies, reniform nematodes were observed to reduce lint yield by 29.5%, whereas silverleaf whiteflies caused yield losses of 21.9%. The greatest effect on fiber quality was a reduced micronaire in the whitefly-infested plots. Additional studies indicated that seed quality could be severely reduced by a high whitefly-infestation year. Reniform nematodes appeared to reduce seed quality to a lesser extent. Results show the significant yield losses that can be expected from these pests and the problems that could be encountered in both producing lint and seed under reniform nematode and whitefly pressure.

Introduction

The reniform nematode (*Rotylenchulus reniformis* Linford & Oliveira) and silverleaf whitefly (*Bemisia argentifolii* Bellows & Perring) can be serious pests of cotton (*Gossypium hirsutum* L.) in the LRGV. Cotton parasitized by reniform nematodes may show stunted, unhealthy appearing plants, and reduced lint yields (Birchfield, 1961; Jones *et al.*, 1959). Silverleaf whitefly damage may result in stunting, defoliation, and reduced yields (Toscano *et al.*, 1994). In general, these pests are found separately. However, cotton production in the LRGV may be subject to simultaneous attack of both pests. The objective of this study was to determine the single and combined effects of the reniform nematode and silverleaf whitefly on lint yield, fiber quality, and seed quality.

Materials and Methods

In 1995-1996, field studies were conducted at the USDA North Farm, Weslaco, TX with cultivar 'DES 119'. Experimental design was a split-plot, with five replications. Main plots were the reniform nematodes treatments, Telone II (TL) [1,3-dichloropropene] and untreated control (RN). Subplots were the two whitefly treatments, imidacloprid (IM) and an untreated control (WF). In the winter prior to planting, TL was applied at 20.5 and 18.5 gal/acre in 1994 and 1995, respectively. In January of 1995 and 1996, 60 lb N/acre was applied. An additional sidedress application of 30 lb N/acre was applied in 1995. Pendimethalin was applied at 1.25 qt formulation/acre as a preemergence weed control. Within each nematode treatment, IM was applied as needed to one-half of the plots for controlling whiteflies. The experimental plots were four rows, 30 ft long and spaced 3.3 ft apart. Planting date was 22 March 1995 and 12 March 1996. Harvest dates were 20 July and 3 August 1995 and 11 July, 24 July, and 7 August 1996. The last two harvest dates of the 1996 study were combined as reported as the second date.

Seeds for the seed quality studies were obtained from each of the four treatments, TL+IM, TL+WF, RN+IM, and RN+WF, in each respective year. In 1997, 100 seeds of each treatment for each year, were planted at two dates in a randomized complete block design with six replications. Plots were single-rows, 30 ft long and spaced 3.3 ft apart. Planting dates for the studies were 24 April and 8 May 1997. Seedling emergence was counted at seven-day intervals, with final stands being recorded at 35 days after planting (DAP).

Results

Effects on Yield and Fiber Quality

Across the 2-yr study, reniform nematodes reduced the first, second, and total harvests by 29.7, 29.3 and 29.5%, respectively, by the reniform nematode. First, second, and total harvest were reduced from 344 to 242 lb/acre, 246 to 174 lb/acre and 590 to 416 lb/acre, respectively. When comparing the whitefly-treated versus whitefly-infested plots, the second and total harvests were reduced 39.0 and 21.9%, respectively. The first harvest was not significantly affected by whiteflies. Second harvest and total lint yield were reduced from 262 to 159 lb/acre and 565 to 441 lb/acre by whitefly feeding.

Minor reductions in fiber quality were observed across the two years. Fiber elongation was reduced from 6.8% in the Telone II-treated plots to 6.6% in the reniform nematode-infested plots. Averaged across the two years, micronaire value was reduced by from 4.6 to 4.1, or 10.9%, when whiteflies were not controlled.

Effects on Seed Quality

Variability existed between the different seed lots for seedling emergence. With seed collected from the 1995 yield test, the best emergence at seven days after planting (DAP) was obtained with seedlots produced where whitefly control was practiced. With seed obtained from the 1996 yield tests, the lowest emergence resulted from the seed lot produced under both reniform nematode and silverleaf whitefly

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 1:171-172 (1998)
National Cotton Council, Memphis TN

infestation. Averaged across the seed lots from both 1995 and 1996, the highest emergence was obtained with seed produced under whitefly controlled conditions. A similar trend was observed for final stand. The lowest stand from the 1995 seed lots was observed where whitefly control was not practiced, whereas, the lowest stand was obtained from the 1996 seed occurred with seed produced under infestation by both whiteflies and reniform nematodes. Across seed lots from both years, the highest stands were observed when both pests were controlled, whereas the lowest stands were measured with seed produced under the infestation of both pests.

Summary

Individually, reniform nematodes and silverleaf whiteflies have both been reported to reduce yields in cotton. Preliminary research has indicated that some reniform nematode x silverleaf whitefly interaction may occur when these two pests simultaneously attack cotton. Results of this study indicate that silverleaf whiteflies and reniform nematodes have the potential to reduce lint yield production and seed quality. Reniform nematodes appeared to reduce yield potential throughout the growing season, whereas silverleaf whiteflies appeared to have their most deleterious effects in the latter part of the growing season. Seed quality was shown to be reduced by both pests, especially the silverleaf whitefly. Growers who save their own seed and commercial cottonseed producers should be aware that the seed quality produced under these stresses may be reduced and could cause reduced poor stands, less seedling vigor, and lower yields.

References

Birchfield, W. 1961. Distribution of the reniform nematode in relation to crop failure of cotton in Louisiana. Plant Dis. Rep. 45:671-673.

Jones, J. E., L. D. Newsom, and E. L. Finley. 1959. Effect of the reniform nematode on yield, plant characteristics, and fiber properties of upland cotton. Agron. J. 51:353-356.

Toscano, N. C., T. Henneberry, T. M. Perring, and C. Giorgio. 1994. Identification, management and status of the silverleaf whitefly, *Bemisia argentifolii* in California. Proc., Beltwide Cotton Conf., p. 152.