ROOT-KNOT NEMATODE RESISTANCE IN COMMERCIAL AND PUBLIC COTTON CULTIVARS

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Introduction

Host plant resistance is overall the most economical, practical, and environmentally sound method to provide crop protection against root-knot nematodes (RKN). Despite the widespread occurrence of RKN in most cotton production areas in the Southeast and that genetic resistance to RKN has existed since 1974 (Shepherd, 1974), private cultivar developers have exhibited minor interest in fulfilling this need.

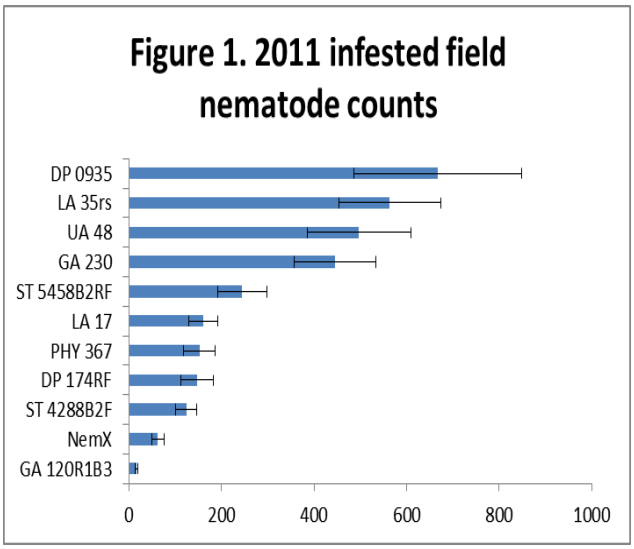
However, now that it was announced in August, 2010 that the registered use of Temik is scheduled to be phased out by 2018 (High Plains Journal, 2010), RKN control in cotton has lost an important tool. Temik has been the most widely used nematicide in US cotton production and works well in controlling RKN, but it is already becoming difficult to find. Previously, RKN resistance in commercial cotton cultivars has been garnered only through direct utilization by the commercial cotton breeding companies of cultivars developed by public cotton breeders. These include the RKN-resistant CPCSD Acala NemX and the tolerant ST LA887 and PM H1560 that have been distributed by commercial cotton seed companies; none of which were particularly developed for cotton production in the Southeast. There are now four other cultivars that are directly touted in the websites of the three major commercial cotton breeders in the United States. Unbiased testing regarding the strength of the resistance offered to the cotton grower and the improvement of yield from this trait is needed to determine the value of RKN resistant cultivars in the Southeast. Additional testing of several newly released public cultivars is also needed to determine if any RKN resistance is available from these new public genetic resources. Altogether this will benefit United States producers by providing an evaluation of these cultivars for yield and decreased production costs.

Materials and Methods

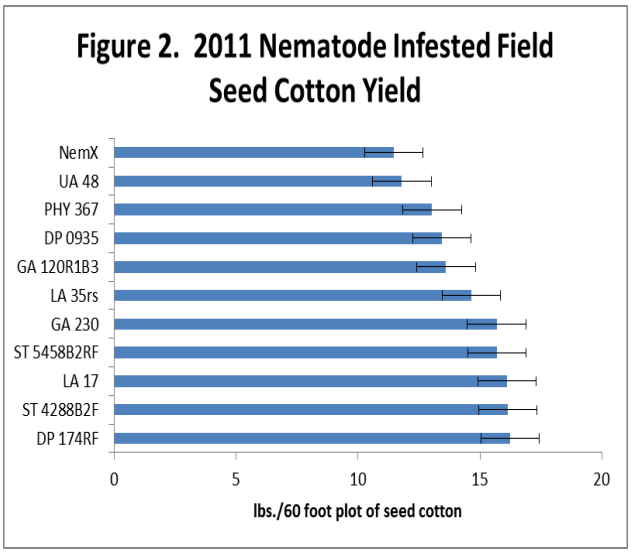
Parallel yield tests of the four RKN tolerant commercial cultivars (PhytoGen PHY 367 WRF, Bayer CropScience ST 4288B2F and ST 5458B2RF, and Monsanto DP 174 RF) and four newly released public conventional cultivars (University of Georgia's GA 230, University of Arkansas' UA 48, and Louisiana State University's LA 17 and LA 35rs were planted with three checks (University of Georgia's GA 120R1B3, a resistant check; Acala NemX, a resistant check; and Monsanto's DP 0935 B2RF, a susceptible check) in soils with and without high populations of root-knot nematodes over a two year span at

the Gibbs Farm of the University of Georgia-Tifton Campus. The tests use standard cotton agronomic practices utilized by the farm personnel and promulgated by the UGA Extension Cotton Team. The test in the infested field had 8 replications to cover an expected biological variability of the RKN infestation of the cotton roots. The test without high nematode populations had 4 replications and used granular, gypsum-based Temik insecticide banded in at planting at 5 pounds/acre which is generally considered a nematicidal rate. The seed was treated with Baytan, Thiram, and Allegiance for fungal control as labeled. We have found no nematicidal effects reported by others using this seed treatment. Besides harvesting for yield, we will also checking the lint percentage and fiber quality for any unexpected changes.

Results and Discussion

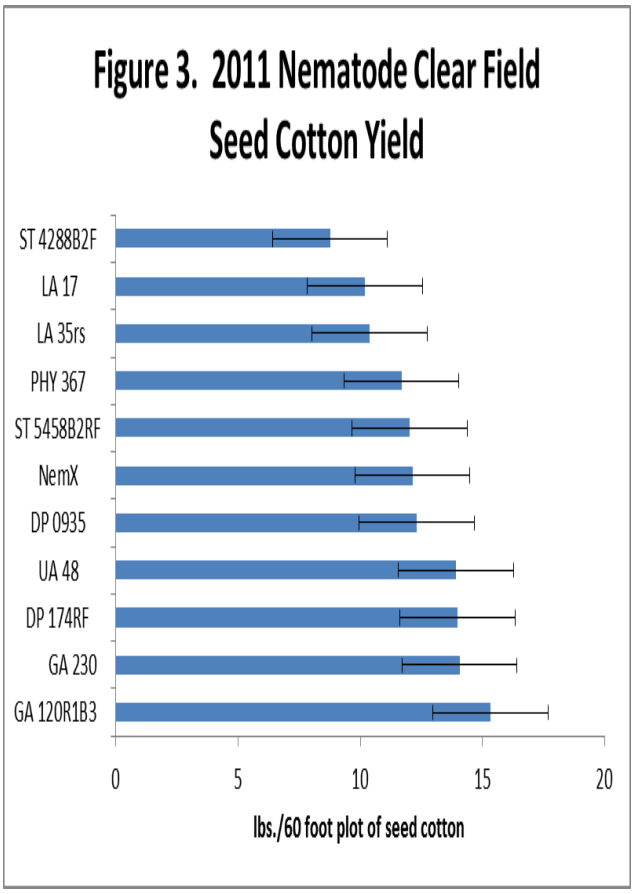


The first year data of the nematode counts indicate that the four touted commercial cultivars are definitely not extremely susceptible to RKN, but nothing is as resistant as the two resistant checks, GA 120R1B3 and NemX (Fig. 1). In comparing the resistant checks, GA 120R1B3 is significantly better than NemX or any other cultivar. One conventional cultivar LA 17 appears to have a level of RKN resistance that is essentially equivalent with the commercial cultivars. All of the commercial cultivars along with LA 17 seem to cluster between the resistant checks and the susceptible check. The other conventional cultivars cluster with the susceptible check as would be expected if they are indeed susceptible.



The best seed cotton yielder in the RKN infested field was DP 174RF followed by two commercial cultivars and two public cultivars that were not significantly different (Fig. 2). The lowest ranking cultivar was the resistant cultivar NemX. The rankings of the cultivars for seed cotton yield do not match the ranking of the cultivars for the nematode counts. This was not unexpected since the background genetics for the agronomic performance of the cultivars is unlikely to

be correlated with the RKN resistance trait. For example, NemX is an Acala cotton that is not adapted to the Southeast. The high RKN resistance of NemX cannot completely compensate for the fact that NemX is not adapted to the Southeast. The resistant check GA 120R1B3 yielded better than the NemX because it was developed in and for the Southeast and has two major genes of an elite RKN resistance.



The top yielders in the nematode clear field, GA 120R1B3 and GA 230, were the two cultivars developed in and for the Southeast (Fig. 3). Another putative susceptible cultivar UA 48 with the susceptible check DP 0935 B2RF also did better in the clear field vs. the infested field. Neither of these occurrences is unexpected. However, the interactions between the yields of the infested field and the clear field are not completely evident. DP 174RF ranked high in both fields, but ST 4288B2F was on opposite ends. One also would expect that the RKN resistant cultivar that was developed for Georgia conditions GA 120R1B3 would rank high in both fields. Further research is needed to determine the nature of the interaction between the RKN resistance and the traits required for adapted cultivars. We will be looking at these issues particularly for the Southeast in the second year of this research project, 2012.

References Cited

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