ACCOMPLISHMENTS OF A 10-YEAR INITIATIVE TO DEVELOP HOST PLANT RESISTANCE TO ROOT-KNOT AND RENIFORM NEMATODES IN COTTON

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Abstract

In 2003 Cotton Incorporated initiated a Beltwide research program to develop host plant resistance against root-knot (*Meloidogyne incognita*) and reniform (*Rotylenchulus reniformis*) nematodes. Objectives formulated at a coordinating meeting in 2003 that included participants from public institutions and private industry were to identify, characterize, and locate resistance genes, and transfer germplasm and markers to commercial planting seed companies to enable them to develop commercial cotton (*Gossypium hirsutum)* cultivars with high-levels of resistance to these nematodes. At that time, a high level of resistance to root-knot nematode (RKN) was available in a source developed by R. L. Shepherd at Auburn, AL and released by USDA-ARS. However this source was under-utilized in commercial breeding because phenotyping required time consuming bioassays and individually counting microscopic nematodes and/or root galls. No *G. hirsutum* sources of resistance were available to reniform nematode, although resistance had been observed in the diploid cottons *G. arboreum, G. aridum, G. herbaceum,* and *G. longicalyx* and in certain *G. barbadense* accessions. Cotton Incorporated directly supported projects in AL, GA, MS, TX, and CA. Complementary research was conducted by USDA-ARS researchers in MS. Beltwide communication and planning meetings were sponsored by Cotton Incorporated in 2003, 2005, 2007, and 2012.

Considerable progress has been achieved. Several individuals and groups have made outstanding findings. Overall, the research in CA, GA, MS, NM, and TX has demonstrated that RKN resistance is a two-gene system synergized by an epistatic interaction. SSR markers have been identified and published for RKN resistance on chromosomes 11 and 14. In separate efforts, resistance to reniform nematode has been introgressed into *G. hirsutum* from *G. aridum* and from *G. longicalyx* via tri-hybrid crosses. In addition, releases of reniform nematode resistant lines derived from *G. barbadense* '713' have been made by USDA-ARS, Cotton Incorporated, and cooperating state experiment stations in MS and TX. The respective resistance traits were mapped with SSRs and rendered amenable to MAS. In 2014, commercial cultivars with high levels of RKN resistance, developed in part by employing basic information

published by this public research effort, are anticipated from Monsanto - Delta and Pine Land (D&PL), and Dow AgroSciences (Phytogen).