Non-Transgenic Host Plant Resistance to
Root-Knot and Reniform Nematodes in Cotton

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Cotton (*Gossypium hirsutum*) cultivars with high levels of resistance to root-knot (*Meloidogyne incognita*) and reniform (*Rotylenchulus reniformis*) nematodes should reduce losses from these pests. Resistance to root-knot nematode (RKN) was developed in cotton by USDA-ARS over 30 years ago (Shepherd 1974a, 1974b). But the resistance has not been widely used, and the level of expression in the RKN resistant commercial cultivars has not been equal to that of the original release, 'Auburn 623 RNR.' The variability in nematode reaction among plants and the labor required to assess the phenotype of the crosses have been stated as the principal impediment to more general use of RKN resistance. In contrast, no high-level of resistance to reniform nematode has been identified in Upland cotton (Weaver et al. 2007). However, recent work by USDA-ARS, Texas A&M University, Auburn University, the University of California at Riverside, Mississippi State University, New Mexico State University, and the University of Georgia, with support and coordination from Cotton Incorporated, has resulted in breakthroughs in identification and *de novo* development of nematode resistance sources and genetic markers closely linked to the resistance genes. Releases of germplasm with resistance to each of these nematode pests are planned.

Root-Knot Nematode

Dr. Roy Creech of Mississippi State University, working with the USDA-ARS laboratory at Starkville, began a program to develop advanced cotton germplasm with high levels of RKN nematode resistance using the Shepard source. This work has culminated in the planned release of six lines (Jenkins et al. – release document in review.) Concurrently, laboratories at the University of California at Riverside, the University of Georgia, Texas A&M University, and USDA-ARS at Starkville have developed and characterized *G. hirsutum x G. hirsutum* and *G. hirsutum* x *G. barbadense* populations using different lines as the source of the root-knot nematode resistance. Recent publications have identified markers closely linked to the major gene associated with RKN resistance (Wang et al. 2006a, 2006b and Wang & Roberts 2006a and 2006b, and Shen et al, 2006, Ynturi et al. 2006). One codominant SSR marker has excellent potential for MAS and an AFLP marker has been further developed as a CAPS marker (Wang & Roberts, 2006b) to facilitate its use**. Thus we may shortly expect release of advanced root-knot resistant Upland cotton germplasm and published genetic markers that may serve to facilitate breeding.**

Reniform Nematode

Virtual immunity to reniform nematode found in the wild, diploid (2n=26) cotton relative, (*Gossypium longicalyx*), has been introgressed to tetraploid (2n=52) Upland cotton lines by backcrossing germplasm from two synthesized triple-species hybrids, HLA = (*G. hirsutum* x *G. longicalyx*)^2 x *G. armourianum*) and HHL = (*G. hirsutum* x *G. herbaceum*)^2 x *G. longicalyx*). Inheritance of the resistance suggests control by single dominant gene. Closely linked genetic markers have been identified (Dighe et al. in preparation). **We anticipate that Upland cotton germplasm with reniform nematode resistance will be released for use by public and private breeders in 2007, accompanied by access to published genetic markers very closely linked to a dominant resistance gene.**

Citations:

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Jenkins, J. and cooperators. 2006. Notice of release of six root-knot nematode resistant Upland cotton germplasm lines. (Approved by Mississippi Agricultural and Forestry Experiment Station and Cotton Incorporated. USDA-ARS approval is pending.)

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Weaver, D.B., K.S. Lawrence, and E. van Santen. 2007. Reniform nematode resistance in Upland cotton germplasm. (Crop Sci. in press.)

Ynturi, P., J.N. Jenkins, J.C. McCarty, Jr., O.A. Gutierrez, and S. Saha. Association of root knot nematode resistance genes with SSR markers on two chromosomes in cotton. (Accepted by Crop Sci. Nov.-Dec. issue.)