BREEDING FOR HIGH LEVELS OF ROOT KNOT NEMATODE RESISTANCE IN A COMMERCIAL BREEDING PROGRAM

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Abstract

Root knot nematode (RKN) continues to be among the primary nematode pests of cultivated cotton (*Gossypium hirsutum*) in the U.S. More than 500K bales were estimated lost in 2011 due to RKN infestation alone (according to the 2012 Cotton Disease Loss Estimate Committee). Sources of RKN resistance in *G. hirsutum* have been available to breeders for several years. Development of RKN resistance in commercial varieties has been limited, primarily due to difficulties associated with phenotyping for selection purposes. Recent development of markers associated with the RKN traits has enabled breeders to effectively develop resistance in commercial germplasm. Monsanto has been actively integrating RKN resistance into commercial germplasm. As an essential part of the discovery and breeding efforts, precise phenotyping protocols were developed for field and lab screenings. These protocols have been utilized in QTL mapping, validation, fine mapping and gene efficacy studies. SNP markers have been utilized in mapping QTLs associated with RKN resistance. The SNP haplotypes for RKN QTLs on A11 (RKN1) and A07 (RKN2) were identified using a bi-parental mapping population. These SNP haplotypes were validated in a different recombinant inbred line (RIL) population and in various genetic backgrounds. Eggs/g root at 45 DAP (RKNER) and juveniles/500cc soil at harvest (RKNJh) are the two measures utilized to determine the nematode reduction due to the RKN resistance traits. In 2012, five resistant lines and five susceptible cultivars were evaluated for RKNER & RKNJh. Data analysis indicated that resistant group had 50% less RKNER and 63% less RKNJh compared to the susceptible group across all locations. Analysis for individual locations showed 34-63% reduction in RKNER and 49-70% reduction in RKNJh compared to the susceptible group. In a gene efficacy experiment grown in 2011, the RKN1/RKN2 genotypes had a 44% reduction in RKNER and a 35% reduction RKNJh over genotypes with RKN1 only. An equivalency study involving RILs under non-nematode conditions indicated no significant differences in yield were associated with the RKN QTLs. Preliminary 2012 data indicate a significant 10+% yield advantage of RKN resistant candidate lines over that of susceptible commercial checks.