NEMATODE RESISTANCE AND AGRONOMIC PERFORMANCE OF LONREN AND NEMSTACK LINES

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Abstract

LONREN lines have resistance to reniform nematodes, which was obtained from *Gossypium longicalyx*. The NEMSTACK lines have the same resistance recombined with the *rkn-1* gene for resistance to root-knot nematode from 'Acala NemX.' Different LONREN lines vary depending on the backcross-1 plant from which they were derived (family), whether the resistance gene was introgressed into the long arm of chromosome 11 or 21 and in the size and makeup of the introgressed chromosome segment. In 2006, 2007 and 2008 a total of 41 LONREN lines and eight NEMSTACK lines were evaluated for resistance to reniform nematodes in the greenhouse and in the field at College Station, Texas, and St. Joseph, Louisiana. The lines were also grown in a field free of nematodes in College Station. Comparisons were made between progeny rows from BC_7S_1-BC_9S_1 sibs that were putatively homozygous resistant or susceptible to reniform and/or root-knot nematode. The codominant markers BNL 3279_114 and CIR 316_202 were used as indicators of resistance to reniform (Rr^{lon}) and root-knot (*rkn-1*) nematodes, respectively. In the absence of BNL 3279_114, the codominant green fuzz (Fzg^{lon}) marker and the repulsion marker BNL 1231 were used to indicate homozygous resistance and susceptibility. All LONREN and NEMSTACK lines suppressed reniform populations to less than 5% of those on susceptible sibs in controlled environments (28°C, 13-hr days, and 22°C, 11-hr nights). They also suppressed levels in the field by 50 to 90% and always to levels below those present at planting by fall. Seven of the eight NEMSTACK lines also inhibited egg production by root-knot nematode in the greenhouse by 90 to 95%. The BNL 1231 marker was a perfect indicator of reniform resistance over more than 30,000 progeny. At College Station, in all 3 years, yields of resistant lines were 10% greater than susceptible lines and greater than most non-transgenic commercial lines. Gin turnout was reduced by 2 to 3%. The *G. longicalyx* segment caused a decrease in micronaire and length and an increase in uniformity and strength. Overall, its effects on fiber quality were desireable. At all locations, other than College Station, resistant progeny rows were severely stunted, delayed in development, and suffered large yield losses compared to susceptible progeny rows. Caparol or cotoran were used as pre-emergence herbicides in all of these fields but not at College Station. In controlled experiments, these herbicides were more toxic (4 to 10X) to homozygous than to heterozygous or susceptible sibs, which accounts for severe reactions in the fields. In controlled environments, resistant progeny planted in soils heavily infested with reniform nematode showed significant stunting at the 1- to 3-leaf stage. However, resistant plants caught up in height compared to susceptible plants by the 5- to 6-leaf stage and had significantly higher yields. Both LONREN and NEMSTACK lines have the potential to control nematodes and increase fiber yield and quality providing that pre-emergence herbicides (type PS II) that inhibit photosynthesis, such as caparol and cotoran, are not used with them.