A STUDY ON THE EFFECTS OF COMBINING GENES FROM LONREN AND BARBREN ON RENIFORM RESISTANCE Amanda Gaudin Ted P. Wallace Mississippi State University Starkville, MS Jodi Scheffler Sally Stetina USDA-ARS

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<u>Abstract</u>

For several years, two new sources of resistance to reniform nematode (Rotylenchulus reniformis) in two Upland cotton (Gossypium hirsutum) germplasm lines derived from G. barbadense (genes Ren^{barb1} and Ren^{barb2}) and G. longicalyx (gene Ren^{ton}) have been available to breeding programs. Germplasm line BARBREN-713 contains the Ren^{barb1} and Ren^{barb2} genes, and the LONREN-1 germplasm line contains the Ren^{lon} gene. Genes from the two sources reduce reniform nematode reproduction on cotton roots, however breeders and nematologists utilizing the LONREN source of resistance observed significant plant stunting and yield loss under reniform nematode pressure. The BARBREN-713 source was not found to cause stunting. The stunting in LONREN is thought to either be caused by the resistance mechanism or linkage drag. To investigate the potential of LONREN germplasm as a useful source of reniform resistance in breeding programs, a study was undertaken to develop lines with different combinations of genes from both the LONREN (Ren^{lon}) and BARBREN-713 (Ren^{barb1} and Ren^{barb2}) germplasm lines. Marker assisted selection (MAS) within five different F3 and one F4 populations derived from crosses with pedigrees including both LONREN and BARBREN-713 was conducted to identify plants with the following gene combinations for each population 1) Ren^{barb1} +Ren^{bar2} 2) Ren^{barb1} + Ren^{bar2} + Ren^{lon} 3) Ren^{barb2} + Ren^{lon} 4) Ren^{barb2} 5) Ren^{barb1} 6) Ren^{barb1}+Ren^{lon} 7) Ren^{lon}, and 8) S, a susceptible genotype. In 2015, two populations with all 8 genotypes were identified. Seed was increased and genotypes confirmed by markers prior to evaluation in a growth chamber study in 2016 to quantify resistance. Genotypes were inoculated with either 0 or 5000 reniform nematodes and arranged in RCB design with three replicates. Seedlings were harvested at 90 days to collect shoot and root measurements and to extract eggs and soil reniform nematodes. Dry weights of roots and shoots were determined and nematode reproduction factor (R) was calculated. The susceptible and Ren^{barb1} genotypes had significantly higher nematode reproduction (R) than all other gene combinations. No significant differences in genotypes were observed for root and shoot measurements, and there was no indication of stunting. Two larger growth chamber trials will be conducted in 2017, which may reveal more about gene interactions and stunting, and possibly help determine if combining the two different sources of resistance is beneficial.