## A STUDY ON THE EFFECTS OF COMBINING GENES FROM LONREN AND BARBREN ON RENIFORM RESISTANCE, FIBER QUALITY, AND YIELD A. Gaudin T. Wallace Mississippi State University Mississippi State, MS J. Scheffler S. Stetina USDA-ARS Crop Genetics Research Unit Stoneville, MS

## Abstract

New sources of resistance to reniform nematode (Rotylenchulus reniformis) in two Upland cotton (Gossypium hirsutum) germplasm lines derived from G. barbadense accession GB713 (genes Ren<sup>barb1</sup> and Ren<sup>barb2</sup>) and G. longicalyx (gene Renlon) have been available to breeding programs for several years. Upland germplasm line BARBREN-713 utilizes resistance from G. barbadense while LONREN-1 utilizes resistance from G. longicalvx. While gene(s) for resistance from each germplasm line can greatly reduce reniform nematode reproduction, breeders utilizing the LONREN germplasm as a source of reniform resistance in development of advanced breeding lines observed significant stunting and reduced yield of plants when grown in fields infested with reniform nematodes. Breeding lines developed from BARBREN-713 germplasm, however, do not suffer from stunting when grown in reniform infested soils. It has been suggested that stunting in the LONREN source of resistance may be due to genetic drag (G. longicalyx linkage block), the mechanism of resistance, or an in increased susceptibility to seedling pathogens. To investigate the potential of LONREN germplasm as a useful source of reniform resistance in applied breeding programs, a study was undertaken to develop lines with different combinations of genes from both the LONREN (Ren<sup>lon</sup>) and BARBREN-713 (Ren<sup>barb1</sup> and Ren<sup>barb2</sup>) germplasm lines. Marker assisted selection within six different F3 populations derived from crosses with pedigrees including both LONREN and BARBREN-713 was employed to identify plants with the following gene combinations for each population 1) Ren<sup>barb1</sup> +Ren<sup>bar2</sup> 2)  $\operatorname{Ren}^{barb1}$  +  $\operatorname{Ren}^{bar2}$  +  $\operatorname{Ren}^{lon}$  3)  $\operatorname{Ren}^{barb2}$  +  $\operatorname{Ren}^{lon}$  4)  $\operatorname{Ren}^{barb2}$  5)  $\operatorname{Ren}^{lon}$ , and 6) S, a susceptible genotype. Genotypes of plants harvested during the 2014 growing season will be confirmed in the spring via marker analysis from root-tip tissue of several seed per plant. Following confirmation with markers, genotypes derived from each population will be planted for seed increase to provide a set of lines representing six different genotypes for each population. Ultimately, genotypes selected (F5) within each population will be evaluated in controlled conditions to determine the effect of different gene combinations on reniform nematode reproduction, as well as agronomic performance (yield, fiber quality, stunting) in replicated yield trials. Results of the evaluation may provide clues regarding the association of stunting and mechanisms resistance, and possibly identify genotypes with favorable combinations of both Ren<sup>barb</sup> and Ren<sup>lon</sup> genes for use in developing reniform resistant germplasm with novel gene combinations.