

Learning from Using Wild Relatives to Incorporate Nematode Resistance in Peanut

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Peanut is an allotetraploid species characterized by a very low genetic diversity and is extremely susceptible to peanut root-knot nematode (PRKN) *Meloidogyne arenaria*. Near-immunity has been found in the peanut wild relative *A. stenosperma*, and the two new loci (A02 and A09) providing strong resistance, have been mapped and validated in a tetraploid background using F₂ and backcross populations. These chromosome segments were incorporated in elite breeding lines through marker-assisted backcrossing approach. In 2020, progeny (BC₃F₂s) of 251 genotypically characterized third backcrossed lines were field tested, advanced and selected in Midville, GA. These lines are on average 90.7% elite genetics, with wild segments across the genome, including the two loci for PRKN resistance from *A. stenosperma*. During the field experiment, phenotypic information for plant architecture, plant size, disease resistance (LLS and TSWV) and overall performance was recorded. Additionally, genome-wide genotyping of 80 high performing BC₃F₂ lines was completed and correlated with the phenotypic information. BC₃F₃ progeny was phenotyped for pod weight per plant, constriction, reticulation, total number of pods, percentage of double pods and 100-seed weight. Overall, many lines performed as well as the cultivar controls, with outstanding yield and great pod and seed characteristics. Although, the lines were selected for the PRKN resistance alleles, other wild introgressions were unintentionally inherited and are controlling other important traits, such as resistance to LLS and we also observed resistance to TSWV on a heavily infested field. Finally, a greenhouse bioassay allowed us to successfully validate PRKN resistance from *A. stenosperma* in a set of BC₃F₃ lines. In the future, field selections and advancement will be taking place for germplasm release. This present work represents an important step towards the development of new high-yielding peanut cultivars harboring new and strong resistances.