

Progress report for Georgia Peanut Commission Project Feb 8, 2023
Precision breeding for multiple disease resistance
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A major quantitative trait locus (QTL) associated with TSWV resistance has been identified on chromosome A01 in a population derived from resistant NC94022, a progeny of TSWV resistant SSD6 (PI 576638) (Khera et al. 2016). To evaluate this genetic resistance and further incorporate TSWV resistance into advanced cultivars, a recombinant inbred line, RIL_F155, from a Tifrunner x SSD6 population was selected for further evaluation and population advancement. RIL_F155 served as the male parent for crossing with eight elite cultivars and advanced breeding lines in 2021. F₂ individuals harvested from the resulting hybrids underwent marker-assisted selection in 2022 to identify two QTL regions of interest related to resistance. 1691 individuals were identified across the eight populations to contain at least one region of the QTL, a resistance gene. Seventy-five percent of these also contained the second region of interest, an insertion region containing other predicted resistance related genes. Selected F₂ individuals were transplanted at the Gibbs Farm in late April at a 1m spacing to increase potential virus pressure. High TSWV incidence was observed throughout the field during the growing season.

Individual plants were scored for TSWV symptoms on a zero to five scale, with zero indicating no symptoms and five being severe symptoms (Figure 1). Individuals with low TSWV scores and favorable agronomic traits were selected for population advancement. 661 individuals were selected for harvest as F₃ seed. Several individuals with high TSWV scores were included among those harvested for use in future validation studies.



Figure 1. TSWV field scoring for F₂ individuals. No to minimal symptoms (left). Minimal to severe (right).

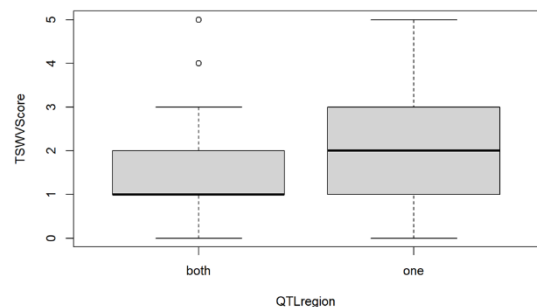


Figure 2. TSWV scores for F₂ individuals with one or both QTL regions. Includes all individuals evaluated. ANOVA p-value = 1.36e-13

Individuals containing both QTL regions from the resistant parent have a significantly lower TSWV score than individuals with only part of the QTL (Figure 2), indicating the QTL's potential influence on TSWV resistance in this population. Continued evaluation of advanced lines will provide further clarification of this association and opportunities for continued selection of favorable lines for cultivar development.

Harvested F₃ seed will be planted in 2023 for continued evaluation of TSWV resistance. A select group of 80 individuals are being advanced to the F₄ generation in a Puerto Rico winter nursery for use in a replicated plot study in 2023. Individuals will also be screened with markers for other favorable traits (high oleic acid, late leaf spot and nematode resistance) to further characterize the populations.