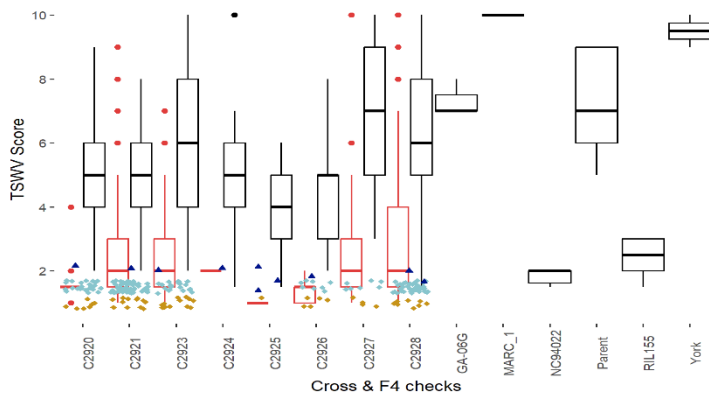


## Breeding for multiple disease resistance using field and genetic tools

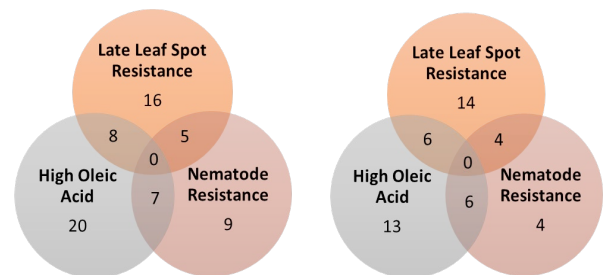
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Tomato spotted wilt virus (TSWV) is a major problem for peanut production, causing significant loss in both yield and value each season in Georgia. Genetic resistance is important for the success of peanut under TSWV pressure and PI 576638 (SSD6), along with its progeny NC94022, provide a new source for this resistance. Eight populations were developed from a recombinant inbred line, RIL\_155, obtained from a cross of SSD6 x Tifrunner. This line carries a quantitative trait locus (QTL) on chromosome A01 linked to TSWV resistance. Maternal parents of these crosses were elite cultivars or breeding lines selected for TSWV resistance and other traits of interest. Individuals from these populations were evaluated in 2022 at the F<sub>2</sub> generation and advanced based on TSWV resistance and agronomic traits.

In 2023, 457 lines across the populations were evaluated at the F<sub>3</sub> generation and 80 lines at the F<sub>4</sub> generation, having been advanced in a winter nursery. F<sub>3</sub> lines were planted in early April in 5-foot plots and F<sub>4</sub> lines planted in June in replicated 10-foot plots, all at Gibbs farm in Tifton, GA. F<sub>4</sub> lines were planted alongside their female parents, RIL\_155, NC94022, MarcI, York, and Georgia-06G as checks. All plots were evaluated for TSWV resistance, with scores (1-10) given based on percent plot coverage of TSWV symptoms, and agronomic traits, such as growth habit and yield. TSWV pressure was much higher in June planted plots than April, resulting in the differences observed between generations in figure 1; no steps were taken to mitigate natural thrips or TSWV pressure in either field. Lines within each population presented a range of TSWV symptoms with a significant difference between individual lines that allowed for selection of the best lines to advance in the breeding program. The F<sub>4</sub> lines also showed a significant difference between their parents and checks (figure 1), indicating an opportunity for improved resistance from these populations, though there is still more resistance to be obtained from NC94022.



**Figure 1.** TSWV Scores for 2023 field studies. F<sub>3</sub> small plot study – red bars; F<sub>4</sub> replicated study – black bars. Blue dots – F<sub>3</sub> lines comparable to RIL155 TSWV score; gold dots – F<sub>3</sub> lines better than RIL155. Triangles – F<sub>4</sub> lines comparable to RIL155 TSWV & GA-06G agronomic traits.



**Figure 2.** Lines containing molecular markers for non-TSWV traits of interest. Left - All lines with markers, includes 30 F<sub>3</sub> & 35 F<sub>4</sub> lines; Right - Lines with at least one marker and TSWV resistance, includes 30 F<sub>3</sub> & 18 F<sub>4</sub> lines

A subset of 120 lines, 40 F<sub>3</sub> and 60 F<sub>4</sub>, were screened using molecular markers for late leaf spot resistance, nematode resistance, and high oleic acid. Only six of the eight female parents contain at least one of these traits. Of the lines screened, 37.5% contained markers for one trait and 16.7% contained markers for two traits in combination (figure 2, left). Further, 39.2% of the total lines tested had markers for at least one non-TSWV trait of interest and showed TSWV resistance in the field during the 2022 and 2023 seasons (figure 2, right).

Together the results obtained during 2023 indicate that the eight populations developed not only present an opportunity for good TSWV resistance, but also presence of other traits of interest based on genetic analysis. While further screening and field studies are necessary for all traits evaluated, these attributes can offer a great benefit to the breeding program and producers in the years to come.