

**Marker assisted selection for nematode resistant and high O/L traits in peanut**  
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Tomato spotted wilt virus, nematodes and fungi cause millions of dollars in losses annually in the South Georgia peanut growing area. On the other hand, quality traits such as high oleic:linoleic acid (O/L) in peanut seeds is in high demand by the peanut industry because it results in oil stability and has marketable health benefits. Normal O/L peanut has an O/L ratio ranging from 1.0 to 4.0, but it can reach 35 to 40 in high O/L mutant lines. Most recently, cultivar Tifguard with high resistance to both TSWV and root-knot nematode was released. However, the oil composition of Tifguard is within the normal O/L range. Pyramiding the disease resistant traits of Tifguard and high O/L trait using marker-assisted selection (MAS) is our current goal for breeding.

Since the near-immunity for nematode in Tifguard was introgressed from a wild diploid species (*A. cardenasii*) through the cultivar NemaTAM, we developed two PCR-based dominant resistance markers and one dominant susceptibility marker based on AFLP polymorphisms detected in an F<sub>2:3</sub> population of NemaTAM X GP-NC WS-14. Mapping these markers in a second population (Gregory x Tifguard), together with our previously published nematode resistance marker (909/197) and along with other DNA markers mapped in Steve Knapp's lab, demonstrated recombination suppression in the introgressed genomic segment conferring nematode resistance. Therefore, marker 909/197 can be used effectively for nematode resistance screening in crosses between elite lines.

For the high O/L trait, a spontaneous high O/L peanut mutant F435 was previously discovered and its genetic mutations were identified as 1) a G448A transitional mutation in the *ahFAD2A* gene and 2) a nonsense frame-shift induced by an A<sup>442</sup> insertion in the coding region of the *ahFAD2B* gene. Other cultivars have been released as independently induced mutations including C458 (ethylmethanesulfonate mutagenesis), Georgia-02C, and Georgia Hi-O/L ( $\gamma$ -irradiation mutagenesis). A miniature inverted-repeat transposable element (MITE) insertion in the *ahFAD2B* gene was confirmed to be responsible for the high O/L trait in C458; however, the genetic mutations in cultivars derived from  $\gamma$ -irradiation treatment had not been determined. We designed a cleaved amplified polymorphic sequence (CAPS) marker targeting the site of the A<sup>442</sup> insertion in *ahFAD2B*. Based on CAPS marker and sequence data from Georgia-02C and Georgia Hi-O/L, the genetic mutations for the high O/L trait are the same as that of the spontaneous mutant line F435. Our data clearly show that only two *ahFAD2B* alleles are present in the US high O/L cultivars.

These molecular markers for nematode resistance and high O/L are being used to accelerate trait stacking. Two crosses (C1804: Tifguard x GA02C and C1805: Tifguard x Florida 07) yielded 28 and 17 F<sub>1</sub> seeds, respectively. Molecular marker screening of 17 F<sub>1</sub> plants to date resulted in identification of 3 selfed progeny and their removal from the backcross project. According to the marker data, the success rate for crossing was 82%, but previous data has shown that it can be much lower. Currently, we are harvesting F<sub>2</sub> seeds from these confirmed F<sub>1</sub> plants along with using them for the first backcross. The remaining F<sub>1</sub> seeds were planted in the winter nursery and tissue has been collected for MAS. It is possible that by utilizing MAS, high O/L Tifguard will be developed within three years.