Title of Project: Introgression and utilization of pest and disease resistance genes in wild species for sustainable peanut improvement

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Brief Summary:

Wild species are relatives of modern crops, they are not domesticated and usually exhibit poor performance. However, they harbor many desirable traits to adapt to climate change including resistance against pests and diseases and tolerance to abiotic stresses. However, it is challenging to directly utilize the favorable traits in wild peanuts as most wild species are diploid in contrast to tetraploid cultivated peanut, and the hybrids between diploid wilds and cultivated peanut are sterile. **The goals of this project are to 1) create new tetraploid wild peanuts, 2) introduce disease and pest resistance genes from wild species into cultivated peanut and 3) provide new resources including germplasm, genetic populations and molecular markers for peanut community**.

This project was initially funded by GPC in 2016, we have developed four new synthetic tetraploid wild peanuts and made crosses/backcrosses between the synthetic wilds and cultivated peanuts in 2017-2018. The major results in 2019 are summarized below:

1) We treated 437 cuttings of five unique diploid wild hybrids and new synthetic tetraploid wilds are expected to generate.

2) We planted 249 potential hybrid seeds and identified 32 real hybrid plants using morphological traits (flower color, plant growth habit and pod sizes and shapes) and molecular markers. We harvested 4,080 pods from these hybrids which will be used to map the disease and resistance traits in the wilds.

3) We made two backcrosses and obtained 146 pods which will be planted and tested in 2020.

4) We planted 624 F2 plants from the cross between the synthetic tetraploid wild Valste and an elite peanut cultivar TifNV High O/L on the experimental field, in Midville, GA. We selected two F2 plants which showed good disease resistance and compact growth habit. We also selected three plants which plant architectures were similar to that of wild peanut, but there were very vigorous and showed good package disease resistance.

Overall, our efforts will provide new germplasm for developing disease and pest resistance cultivars. Our project will also identify molecular markers associated with the desirable traits in wild peanuts and improve the efficiency of introgression of favorable traits from wild peanuts.