

Identification of Peanut Lines with Superior Traits for Resistance to Drought and Heat (root & leaf characteristics, calcium absorption)

a new proposal that builds on past efforts

For consideration by the Georgia Peanut Commission for FY 2016-17

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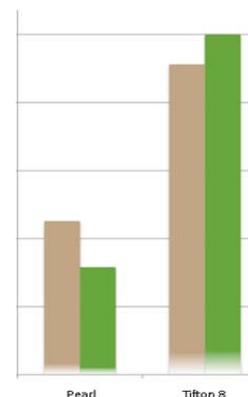
Layman's Summary: Identifying peanut lines with superior root, leaf and pod growth characteristics, and learning more about the genetics associated these traits will lead to varieties that are better at gathering water and nutrients from the soil, more resistant to stresses, and higher yielding. Current and soon-to-be-released peanut varieties along with lines from the peanut germplasm core collection will be studied.

Objective: To identify peanut lines with superior root, leaf and calcium absorption characteristics for use in peanut variety development and to aid development of molecular makers for these traits.

Rational & economic significance of project

Root growth is closely linked to shoot growth, and varieties with superior root growth are better able to explore the soil for water and nutrients and yield more. Superior root growth benefits irrigated and non-irrigated growers as it improves both nutrient and water use efficiencies.

Many studies have documented genetic differences in peanut root growth. For example, the chart to the right highlights a 2 to 3 fold difference in the root growth of peanut varieties Pearl (left bars) and Tifton 8 (right bars) in two soil types (brown & green bars). Yet, the number and control of the genes responsible for these root characteristics is not well understood (references 1-9).



The same is true for leaf characteristics and calcium absorption. Peanut lines that close stomates faster, and that have pod and seed characteristics that aid calcium absorption when pod-zone moisture is low, may result in improved yield when water is limiting. Our goal with this project is to study root, leaf and pod characteristics using a portion of the selected genetic population of peanut lines mentioned in the Ozias-Akins led “High Resolution Phenotyping of Diverse Peanut Lines” project along with peanut lines known for superior root development and poor root development. We believe these lines will help breeders and molecular biologists better define the number and location of the genes that control root, leaf and pod characteristics, and expedite variety development with improved rooting characteristics.



Procedures:

Traditional techniques for the field study of root growth usually require extensive monitoring devices and a large labor force. We have developed a simple field technique to study root growth and uptake of water from different soil depths using the carotene-inhibiting herbicide, fluridone. By placing underground bands of the herbicide at different depths (7”, 14”, and 21” below the surface) we

know when peanut roots reach those depths because the leaves will bleach out. By using this method, we have identified several promising peanut lines with 32% better overall root growth than most varieties and 14% better than those with known drought tolerance. This year we plan to expand the number of peanut lines we analyze for root growth to help us better define the heritability of this trait.

Along with root growth, we will analyze these peanut lines for leaf and pod characteristics that may aid the plant when drought occurs. Traits measured will include stomatal closure and leaf wilting, pod development period, hull thickness and volume, seed size, and calcium content.

2016 Budget

<i>Personnel:</i>	\$8,500
<i>Materials and Supplies:</i>	\$2,000
<i>Travel:</i>	\$ 500
<i>Total Request</i>	\$11,000

Budget Justification: *Personnel support* requested includes partial personnel support (\$4,545 in salary and \$1,455 in benefits @ actual) and student workers (\$2,500 – wages & SS). These people will aid the project by preparing the land, hand planting, caring for and taking measurements on the plants. *Materials and Supplies* include field, greenhouse and laboratory supplies including pesticides, fertilizers, seeds, tubing and fuel, minor equipment and vehicle repair, and potting media. *Travel* requested is to partially support one person to a meeting relevant to this project.

References

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