National Peanut Board 2010
Peanut Breeding
March 15, 2011
Final Report Summary

Title: **Increase and Selection of High-Yielding, Early-Maturing Peanut Lines**

Personnel: Mark D. Burow[1,2], Charles E. Simpson[3], and Michael R. Baring[4]
Agencies:
[1] Texas AgriLife Research, Texas A&M System, 1102 East FM 1294, Lubbock, TX 79403, Phone: (806)-746-6101, FAX: (806)-746-6528, Email: mburow@tamu.edu;
[2] Dept. of Plant and Soil Science, Texas Tech University, Lubbock, TX 79409.
[3] Texas AgriLife Research, Texas A&M System, Stephenville, TX 76401.
[4] Texas AgriLife Research, Texas A&M System, College Station, TX 77843.

Summary
Three hundred runner or Virginia selections were sent to the Puerto Rico winter nursery; 250 selections were planted for evaluation in the summer of 2010 for evaluation. Increases of two each of runner, Spanish, and Valencia materials expected to be released as cultivars were performed in the field. High-oleic plants were selected for further increase in the greenhouse and field to assure varietal purity for this trait.

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PROBLEM AND NEED

Development of high-yielding, early-maturing, disease-resistant peanuts are priority objectives of the Texas peanut breeding program. Growers need high yield for profitability, and benefits of reducing days to maturity are enhanced edible seed quality, greater flexibility in planting to escape pests, unpredictable rainfall patterns, or cold, as well as cost savings from fewer irrigations, fewer fungicide applications, and fewer days for weeds to grow. Incorporating resistance to TSWV and Sclerotinia blight is an important part of this program.

RESULTS

(a) Winter increase in Puerto Rico.

- We made single plant selections from advanced, early-maturing, high oleic runner lines from crosses made to add disease resistance to our early-maturing materials. High-oleic seeds were selected from the best accessions (segregating for the high-oleic trait) and were sent to Puerto Rico overwinter for increase and received back.

(b) Summer 2010 field increases.

- $ Two candidate Spanish and Valencia varieties were selected for initial field increase. Five hundred seeds of each were planted, with chips taken pre-planting from each seed for oil analysis. This was done because initial selection for the high oleic trait was done by NIR, which is rapid and inexpensive compared to gas chromatography, but is not as accurate as GC, and because occasional outcrossing occurs in the field due to bee activity. Oil analyses have been run, and these materials have been harvested.
- $ Two early-maturing runner candidate varieties were also planted both as ¼ acre increases, and also as 500 seed increases in case any low oleic seeds were found in the lot. Oil analyses have been run, and these materials have been harvested.

(c) Field Evaluation.

- $ We planted the advanced runner materials increased from Puerto Rico at multiple locations in West, South, and Central Texas. The goal was evaluation for yield, maturity, shelling, and disease resistance.
- $ We entered the candidate Spanish and Valencia varieties in the Spanish/Valencia UPPT test. We hope to use these field data for making a selection, and also obtain additional edible seed quality data that is needed for release.
- $ We also performed field evaluation on a Virginia population being developed.

175
TX-55
920
210

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Objectives.

Our immediate goals were increase of materials in preparation for is release of a high-yielding, high-oleic runner peanut cultivar maturing one or two weeks earlier than current varieties. Following this, we hope to release a high-oleic Spanish cultivar with maturity as good as or earlier than Tamspan 90, and a high-oleic Valencia cultivar. Subsequently, we would like to release a runner cultivar with higher yield, and with resistance to Sclerotinia and TSWV and that is two weeks earlier than current checks.

Results

(a) Winter Increase in Puerto Rico and in the Greenhouse. Three hundred runner or Virginia selections were sent to the Puerto Rico winter nursery over the winter of 2009/2010. These were selected on the basis of agronomic traits and NIR analysis for the high oleic trait.

Of these, 100 runner and 150 Virginia lines were planted in the field at the J. Leek farm in 2010, for evaluation as single plant rows, with two replications.

(b) Summer 2010 field increases.

In anticipation of release, runner, Spanish, and Valencia increases were planted as follows:

Runner Increase. Single plants of two proposed runner lines were planted for increase, and selection for the high oleic trait. Earlier lines had been tested by NIR reflectance, and were selected for the high oleic trait; however, NIR analyses were considered to be about 90% accurate, and it was desired to improve on the purity of the materials.

Due to time constraints, these were planted before these could be tested for purity for the high oleic trait, and were and were planted in 24 groups of 20 plants. These were harvested as such, and gas chromatographic analysis was performed on the materials. It was expected that most groups would have mean O/L ratios > 20:1. However, the materials were all found to be less than this, and single seed analysis demonstrated that groups were still segregating. Many of the seeds tested found to be high oleic with an O/L ratio of >20:1, but a not insignificant number had

O/L ratios were < 8:1, and were considered to be low oleic. Some seeds were found also with O/L ratios between 12:1 and 16:1, and it was considered that the might be high oleic genetically, but lower because of environmental variation. Alternatively, there could be modifier genes present, and so selection was made for single seeds with O/L ratios >16:1. Previously, we considered a ratio of >8:1 to be satisfactory; however, after the March 2011 meeting with peanut shellers, we are using a cutoff of 16:1 to be consistent in the changed requirements of major purchasers.

Approx. 160 to 240 high oleic (O/L ratios >16:1) seeds were planted in the greenhouse of each of these two plus an additional two release candidates late in the fall of 2010 for increase, and to be harvested for field increase in 2011 once a final release selection was made.

We do not know why there was the high proportion of low oleic seeds. We are going back to look at remnant seed of earlier increases to determine whether there was a contamination problem in one field year, or whether this was the fault of use of NIR to make the initial high oleic selections. NIR is considered to be about 90% accurate in selecting high oleic seeds, and is very useful for screening large numbers of seeds rapidly; but greater care may be needed in subsequent propagation. Tentatively, we concluded that NIR analysis was useful in early selection stages, but additional testing is needed by gas chromatography prior to release, or additional cycles of selection by NIR are needed to assure a varietal release with high purity for the high oleic trait.

After additional analysis of data, it was decided to release TxL061816 as a runner variety, and release documents were to be written up the following year. will be submitted to the Plant Release Committee in the summer of 2011. This line was selected for release because of the following reasons:
(a) This line is our first generation of early maturing runner-type peanuts with a maturity of 10-14 days earlier than Florunner,
(b) It has yield and grade potential similar to Tamrun OL02,
(c) TxL061816 has disease resistance similar to Flavor Runner 458.

Spanish increase. Single seeds of two potential Spanish releases were planted in the same manner as for the runner materials. Testing demonstrated a much lower incidence of seeds with O/L ratios <12:1, but the overall O/L ratio averaged approx. 16:1 to 18:1; somewhat lower than the values obtained previously for OLin. It is not known whether this was the result of environmental conditions in 2010, or whether this might be the result of minor modifier genes for the high oleic trait.

Approx. 160 high oleic seeds (O/L ratio >16:1) of two accessions (TxL054520-34 and TxL054520-35) were planted in the greenhouse in the fall of 2010 for increase, and subsequent increase in the field in the summer of 2011. These were chosen for the following reasons:
(a) This line is a high oleic, Spanish-type peanut with seed size similar to Olin,
(b) Improved yield potentials, approx. 500 lbs/a better than OLin in our multiple location testing program,
(c) TxL054520 has averaged 2%-3% higher TSMK than Olin,

(d) Resistance equal to OLin for Sclerotinia,
(e) Maturity ratings equal to Tamspan 90 and earlier than OLin.

Valencia Increase. Two Valencia breeding lines were increased in a manner similar to the Spanish and runner materials. Unlike the Spanish and runners, the O/L values for the Valencias were consistently >20:1, and so further purification was not deemed to be necessary. However, pooled statistical analysis of data will be needed to make a selection for release.

(c) Field Evaluation of runner plots.

Replicated early runner plots were evaluated at multiple locations in West, South, and Central Texas. Results were not available in time for this report, and will be reported in the future.