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NPB Summary Report on 2010 Research

Subject: Peanut Breeding **March 29, 2012**

Title: Testing for Interactions between Leafspot Resistance, O/L Ratios, Yield Potential, TSWV Resistance, and Sclerotinia Resistance

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This study was conducted to determine the relationships between Leafspot resistance, O/L ratios, yield potential, grade potential, Tomato spotted wilt virus resistance, and Sclerotinia resistance in terms of the breeding program's ability to simultaneously select for all of these traits in a single line.

Replicated yield trials consisting of 92 F_{2:5} breeding lines derived from the cross (Tamrun OL07/Tx964117) and 8 check varieties for a total of 100 entries were planted at nurseries in Brownfield, Yoakum, and Stephenville, Texas during the 2010 growing season. The Brownfield site was considered disease-free and used to determine adaptability of the lines in the West Texas environment as well as the yield and grade potential of each line in a disease-free area. The test was planted on April 30th and harvested on October 18th. The Yoakum site was planted on May 25th and harvested on October 21st. The nursery was planted in a field with a history of both early and late leafspot. The final test was planted at the Stephenville nursery which was inoculated with *Sclerotinia minor* for screening purposes. The test was planted on June 20th and harvested on November 19th.

Entries were evaluated for yield, grade, leafspot resistance, and *Sclerotinia* resistance. All of the plots at the Yoakum location were rated for leafspot two weeks prior to harvest and the day of harvest using the Florida scale (0-10). Visual ratings were assessed at the Stephenville location by assigning a score based on the amount of infection in each plot using a scale of (0-10) with 0=no *Sclerotinia* incidence and 10= all of the plants exhibiting *Sclerotinia* symptoms. All of the entries were analyzed for O/L ratios in the F₂ generation to determine whether they were high oleic.

The data confirmed that we will have difficulty selecting for leafspot resistance while maintaining high grades, and values/a due to the genes associated with this trait. The positive correlation between leafspot resistance and *Sclerotinia* resistance suggest that it should be relatively easy to combine the two resistances into individual lines. The lack of positive correlations indicate that while it is possible to combine all of the traits measured in this study, the difficulty will lie in identifying one or more lines that will provide optimum performance for every trait simultaneously. We have identified several lines in this study with various combinations of traits such as high yielding, high grading, and good resistance to leafspot, but they may be low oleic or have no resistance to *Sclerotinia*. We have selected individual lines from this study with several of the desired traits that were measured and we are in the process of intercrossing these selections with the intent of combining all of the desired genes.

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NPB Final Report

Subject: Peanut Breeding **June 24, 2011**

Title: Testing for Interactions between Leafspot Resistance, O/L Ratios, Yield Potential, TSWV Resistance, and Sclerotinia Resistance

Personnel: M.R. Baring, Soil and Crop Sciences Dept., 2474 TAMU, College Station, Tx. 77843-2474. Ph#979-220-2656 m-baring@tamu.edu

Materials and Methods:

Replicated yield trials consisting of 92 F_{2.5} breeding lines derived from the cross (Tamrun OL07/Tx964117) and 8 check varieties for a total of 100 entries were planted at nurseries in Brownfield, Yoakum, and Stephenville, Texas during the 2010 growing season. The Brownfield site was considered disease-free and used to determine adaptability of the lines in the West Texas environment as well as the yield and grade potential of each line in a disease-free area. The test was planted on April 30th and harvested on October 18th. The Yoakum site was planted on May 25th and harvested on October 21st. The nursery was planted in a field with a history of both early and late leafspot. The final test was planted at the Stephenville nursery which was inoculated with *Sclerotinia minor* for screening purposes. The test was planted on June 20th and harvested on November 19th.

Entries were evaluated for yield, grade, leafspot resistance, and *Sclerotinia* resistance. All of the plots at the Yoakum location were rated for leafspot two weeks prior to harvest and the day of harvest using the Florida scale (0-10). Visual ratings were assessed at the Stephenville location by assigning a score based on the amount of infection in each plot using a scale of (0-10) with 0=no *Sclerotinia* incidence and 10= all of the plants exhibiting *Sclerotinia* symptoms. All of the entries were analyzed for O/L ratios in the F₂ generation to determine whether they were high oleic.

Results and Discussion:

The original cross was developed by crossing Tamrun OL07 (TSWV resistant, *Sclerotinia* resistant, high oleic, good yield and grade potential) with breeding line Tx964117 (good resistance to early leafspot, low oleic, medium yield and grade potential). The main focus of this study is the transfer of leafspot resistance from Tx964117 and how this might have an effect on yield, grade, TSWV resistance, and *Sclerotinia* resistance.

Leafspot Resistance

The Yoakum location had good leafspot pressure during 2010 and the analysis of our ratings revealed a wide range of resistance to early leafspot. Ratings ranged from a low incidence of 2.67a for line Tx097505 to a high incidence of leafspot with a rating of 7.00j for line Tx097555 ($p \leq 0.0001$). The mean rating for the test was 4.69. The resistant parent Tx964117 had a rating of 4.33c-f while Tamrun OL07 performed at the bottom of the test with a rating of 6.80ij. All but ten of the lines performed superior to Tamrun OL07 for resistance to early leafspot. Thirty-five lines had numerical ratings

equal to or better than the resistant check. Three lines; Tx097529, Tx097532, and Tx097505 performed superior to the resistant check for resistance to early leafspot with ratings of 3.00ab, 3.00ab, and 2.67a respectively. The F₂ generation O/L screening indicated that line Tx097532 was also high oleic. There are 3 additional lines out of the 35 mentioned above that are high oleic and 5 that are segregating for the high oleic trait.

Sclerotinia Resistance

Environmental conditions at the Stephenville location in 2010 were not conducive to the development of *Sclerotinia* blight. Disease incidence only ranged from a low of 0.33a to a high of 4.67i with the test mean being 2.59 on a scale of 0-10 ($p \leq 0.0001$). Even though disease incidence was low, we had uniform infection due to the fact that each plot was hand-inoculated with the disease and we were able to detect differences in levels of resistance through our analysis. The leafspot resistant parent Tx964117 performed below the test mean with a rating of 3.0d-i while the *Sclerotinia* resistant parent Tamrun OL07 performed in the top statistical grouping with a rating of 1.47a-d. Thirty-one lines performed in the top statistical grouping with Tamrun OL07 for *Sclerotinia* ratings. While none of these lines performed statistically better than Tamrun OL07 there were eleven lines with numerically better ratings for *Sclerotinia* resistance. Original F₂ screenings for O/L detected 3 high oleic and 8 intermediate or segregating lines out of the 31 breeding lines that performed in the top grouping for *Sclerotinia* resistance.

Yield Potential

Yields and grades were evaluated at all three test sites to determine the potentials under disease-free, leafspot infested, and *Sclerotinia* infested conditions. However, for the purpose of this study we were concerned with the potential yield of each individual line under optimum growing conditions in the absence of disease. So the focus of our yield and grade potential came from the Brownfield location in West Texas.

Three lines (Tx097559, Tx097576, and Tx097510) yielded significantly higher than the check variety Tamrun OL07 with yields of 4434a, 4251ab, 4190a-c, and 3661d-s respectively ($p \leq 0.0001$). All three lines performed equal to the resistant check Tx964117 for leafspot with Tx097559 having a better numerical rating of 3.67a-d as compared to 4.33c-f for the check variety ($p \leq 0.0001$). Tx097576 and Tx097510 performed equal to the resistant check Tamrun OL07 for *Sclerotinia* resistance with ratings of 2.33b-g, 3.33c-i, and 1.47a-d respectively ($p \leq 0.0001$). Unfortunately, all three of these higher yielding lines are low oleic. The positive is that while yields for the entire test ranged from 4434 lbs/a down to 2302 lbs/a with a mean of 3484 lbs/a there were 67 breeding lines that yielded in the same statistical grouping as Tamrun OL07.

Grade Potential

Tamrun OL07 had the highest numerical grade in the test at 75.1a% ($p \leq 0.0001$). The grades ranged from 75.1a% down to 56.3n% with an average of 66.0% for the test. Five breeding lines graded in the same statistical grouping as Tamrun OL07 including the second highest yielding line Tx097576 which had a grade of 72.9%a-d. Three of these lines are low oleic and two are segregating for the high oleic trait. One of these segregating lines is Tx097553 which also had better numerical leafspot ratings than the check Tx964117 with ratings of 3.67a-d and 4.33c-f respectively and better numerical *Sclerotinia* ratings than the resistant check Tamrun OL07 with ratings of 1.33a-d and 1.47a-d.

Value/acre Potential

Value/a was based on loan values and was not used as a mean to express actual dollar per acre amounts, but was used to convey the relative combined values of yield and grade as it pertained to the entries in this test. The top three valued lines were the same three lines with the highest yield potential mentioned above. There were 9 breeding lines that performed in the top statistical grouping for value/a including the check variety Tamrun OL07. One of these nine lines (Tx097542) is high oleic, had a better numerical leafspot rating than the resistant check with scores of 3.67a-d and 4.33c-f respectively and performed equal to Tamrun OL07 for *Sclerotinia* resistance with scores of 3.0d-i and 1.47a-d.

Correlations for Interactions

We ran Pearson Correlations for the major traits including yield, grade, value/a, leafspot resistance, *Sclerotinia* resistance, and O/L ratios. As expected, yield, grade and value/a all had a positive correlation ranging from 0.31 to 0.92 with p-values at $p \leq 0.0001$. The correlations for leafspot resistance were positive for grade (0.33), and value/a (0.20) ($p \leq 0.0001$), but it should be noted that the computer program views a large number as a positive. The Florida leafspot scale and the scale used to rate *Sclerotinia* resistance is based on a 0-10 number scale with the large number representing more disease or less resistance. So, a positive correlation between grade, and value/a with leafspot resistance actually means that as the grades, and values/a of the breeding lines increase, the leafspot rating increased which meant that the level of resistance to leafspot decreases. There was no significant correlation between leafspot resistance and yield. There was no correlation between *Sclerotinia* resistance and yield or value, but we did see significant correlations (0.17) between grades and *Sclerotinia* resistance ($p \leq 0.0052$). As grades increased for the breeding lines, the level of resistance to *Sclerotinia* decreased. We also saw a positive correlation (0.25) between leafspot resistance and *Sclerotinia* resistance ($p \leq 0.0001$) meaning that it was relatively easy to find breeding lines with resistance to both diseases. We analyzed O/L comparisons and found that there were positive correlations between O/L ratios and yield (0.26) and between O/L ratios and value/a (0.23) $p \leq 0.0001$. There were no correlations between O/L ratios and grades, leafspot resistance, or *Sclerotinia* resistance.

Conclusions:

The data confirms that we will have difficulty selecting for leafspot resistance while maintaining high grades, and values/a due to the genes associated with this trait. The positive correlation between leafspot resistance and *Sclerotinia* resistance suggest that it should be relatively easy to combine the two resistances into individual lines. The lack of positive correlations indicate that while it is possible to combine all of the traits measured in this study, the difficulty will lie in identifying one or more lines that will provide optimum performance for every trait simultaneously. We have identified several lines in this study with various combinations of traits such as high yielding, high grading, and good resistance to leafspot, but they may be low oleic or have no resistance to *Sclerotinia*. The next step in this project is to select individual lines from this study with several of the desired traits that were measured and intercross them with the intent of combining all of the desired genes.