

Progress Report for 2016 National Peanut Board funding.

Subject area: Molecular Genetics & Breeding

Project Title: Molecular and Conventional Breeding to Increase Peanut Yields and Production Efficiency by Developing Breeding Lines with Improved Drought and Heat Tolerance combined with Multiple Disease Resistance

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Results for 3rd Quarter

We have been crossing and screening elite breeding lines with select germplasm lines from the U.S. mini-core collection which have been determined to be drought tolerant. While these selections and screenings will be ongoing for several years, initial selections for drought tolerance were yield tested in South Texas under full irrigation during the 2016 growing. These tests were conducted in an effort to: 1) determine the adaptability of the lines from the West Texas environment to the South Texas environment, 2) make a high quality seed increase of these lines for future testing, and 3) determine the yield potential of these lines under full irrigation.

We conducted three replicated yield trials; **Drought #1, Drought #2, and Drought #3**. The trials were located three miles north of Dilley, Texas on cooperators land. Trials 1 & 2 consisted of 28 entries plus the drought parent ICGS-76 and a commercial check, Tamrun OL11. Trial #3 consisted of 31 lines and Tamrun OL11. Results of the three trials are shown in Tables 1, 2, and 3 on the following pages.

Table 1. Drought #1 Yield Trial at Dilley, Texas in 2016

Entry	Yield (lbs/A)	TSMK %	Value (\$/A)
TxL100212-03-13	4420a	70.3a	765a
TxL100212-03-01	4008ab	68.3a-c	677ab
TxL100212-03-08	3946a-c	68.4a-c	661ab
TxL100212-05-01	3931a-c	66.9a-e	651a-c
TxL100212-04-07	3925a-c	64.8c-h	633b-d
TxL100212-03-11	3735a-d	68.6a-c	631b-d
TxL100212-02-06	3714a-d	63.5e-h	586b-g
TxL100212-05-02	3619b-e	68.7a-c	611b-e
TxL100212-03-10	3607b-e	68.1a-d	604b-f
TxL100212-02-05	3497b-f	64.3d-h	554b-h
TxL100212-05-03	3391b-g	65.8b-g	554b-h
TxL100212-03-03	3339b-g	65.1c-g	529c-i
Tamrun OL11	3338b-g	69.1ab	576b-g
TxL100212-02-07	3332b-g	63.5e-h	515d-i
TxL100212-02-03	3306b-g	62.4f-i	511d-i
TxL100212-02-04	3250c-g	58.9i-k	481f-i
TxL100212-02-10	3195d-g	57.8k	464g-k
TxL100212-03-09	3185d-g	63.4e-h	503e-j
TxL100212-02-09	3127d-g	57.4k	445h-l
TxL100212-03-12	3025d-h	69.5ab	516d-i
TxL100212-02-08	2959e-i	63.6e-h	438h-l
TxL100212-02-01	2932e-j	57.4k	417i-l
TxL100212-02-02	2920e-j	61.1h-k	439h-l
TxL100212-05-06	2815f-k	64.2d-h	443h-l
TxL100212-03-06	2761g-l	66.2b-f	419i-l
TxL100212-03-05	2395h-l	64.9c-h	382j-m
TxL100212-04-02R	2272i-l	59.1i-k	337lm
TxL100212-04-03	2216j-l	62.1g-j	344k-m
ICGS-76	2176lk	58.3jk	273m
TxL100212-04-02B	2078l	63.1e-h	356k-m
p-value	≤0.0001	≤0.0001	≤0.0001

Means followed by the same letter are not significantly different using Fisher's LSD at ($p \leq 0.05$).

Twelve lines had numerically higher yields than the commercial check Tamrun OL11 and one line TxL100212-03-13 had a significantly higher yield at 4420 lbs/a compared to 3338 lbs/a for Tamrun OL11 (**Table 1**). This breeding line also had the highest grade at 70.3% although none of the grades at this location were very high. We believe that the cooperators dug this location early due to the number of acres he had to harvest and as a result grades were lower than typically seen at this location. TxL100212-03-13 also had the highest value per acre at \$765/A which was significantly higher than Tamrun OL11 at \$576/A. It should be noted that value per acre was calculated using loan values strictly for the purpose of determining the effects of combining yield and grade.

Table 2. Drought #2 Yield Trial at Dilley, Texas in 2016

Entry	Yield (lbs/A)	TSMK %	Value (\$/A)
TxL100212-05-09	4415a	70.7a-c	773a
TxL100225-03-07	4249ab	65.4c-h	692ab
TxL100225-03-02	4217ab	66.3b-g	702ab
TxL100225-03-04	4181ab	68.3a-e	715ab
TxL100212-07-07	4121ab	65.9b-g	673ab
TxL100212-07-09	4078ab	66.5b-g	673ab
TxL100225-03-11	4075ab	64.8c-h	660a-c
TxL100212-07-12	4014ab	66.3b-g	662a-c
TxL100212-07-05	3965ab	67.7a-f	664a-c
TxL100225-03-05	3915a-c	64.7d-h	633a-d
TxL100212-07-08	3870a-c	64.7d-h	627a-d
ICGS-76	3846a-c	71.5ab	681ab
TxL100225-03-12	3839a-c	67.7a-f	641a-c
TxL100225-03-06	3829a-c	65.5c-g	628a-d
TxL100225-03-09	3805a-c	65.8b-g	628a-d
TxL100212-07-02	3736a-c	68.6a-e	635a-c
TxL100212-05-10	3704a-c	66.7b-f	612a-d
TxL100225-03-13	3672a-d	67.0a-f	615a-d
TxL100225-03-08	3595a-e	62.1f-h	581a-e
TxL100225-03-03	3585a-e	61.2gh	558b-f
TxL100212-07-03	3573a-e	67.8a-f	604a-d
TxL100225-03-10	3557a-e	68.2a-e	609a-d
Tamrun OL11	3537a-f	72.7a	636a-c
TxL100212-07-06	3519a-f	69.0a-d	604a-d
TxL100212-05-08	3295b-g	67.7a-f	559b-f
TxL100212-06-04	2901c-g	62.7e-h	465c-f
TxL100212-06-02	2639d-g	59.5h	393ef
TxL100212-06-07	2604e-g	65.4c-h	433d-f
TxL100212-07-01	2502g	61.5gh	379f
TxL100212-06-06	2286g	63.6d-h	361f
p-value	≤0.0051	≤0.0163	≤0.0101

Means followed by the same letter are not significantly different using Fisher's LSD at ($p \leq 0.05$).

Twenty-one lines had numerically higher yields than the commercial check cultivar Tamrun OL11 (**Table 2**). TxL100212-05-09 had the highest yield at 4415 lbs/A, and it had the third highest grade at 70.7%. Overall, grades were again low in this test just as in the Drought #1 trial. What is promising is the fact that so many lines performed equal to the commercial check for yield. There were several lines with higher numerical yields than the checks, but that performed significantly lower than the checks for %TSMK. TxL100225-03-07 and TxL100225-03-11 were in the top statistical grouping for yield, but performed lower than the checks for %TSMK with grades of 65.4% and 64.8% respectively.

Table 3. Drought #3 Yield Trial at Dilley, Texas in 2016

Entry	Yield (lbs/A)	TSMK %	Value (\$/A)
Tamrun OL11	4162a	71.3a	737ns
TxL100225-05-09	4123ab	59.7f-j	612
TxL100225-06-04	4094a-c	67.4a-c	677
TxL100225-05-10	3951a-d	62.9b-i	585
TxL100225-05-08	3939a-d	63.7b-h	631
TxL100225-05-04	3867a-d	60.2e-i	576
TxL100225-06-06	3842a-e	62.9b-i	601
TxL100212-07-04	3727a-e	67.6ab	621
TxL100225-05-07	3721a-e	58.8h-j	540
TxL100225-06-10	3712a-e	62.3b-i	572
TxL100225-06-02	3641a-e	66.3a-e	595
TxL100225-06-12	3620a-e	66.6a-e	602
TxL100225-06-07	3596a-e	60.6d-i	515
TxL100225-06-08	3542a-e	67.2a-c	592
TxL100225-05-01	3513a-e	62.6b-i	550
TxL100225-05-11	3508a-e	60.3e-i	520
TxL100225-05-02	3430a-e	59.3g-j	501
TxL100225-06-11	3368a-e	61.5b-i	505
TxL100225-06-03	3290a-f	63.0b-i	509
TxL100225-06-05	3282a-f	60.9c-i	497
TxL100225-06-09	3264a-f	60.5e-i	490
TxL100212-06-05	3243a-f	56.6ij	470
TxL100225-06-13	3221a-f	67.1a-d	533
TxL100212-04-05	3124b-f	62.4b-i	474
TxL100212-03-14	3124b-f	65.7a-f	504
TxL100212-04-04	3108b-f	66.2a-f	495
TxL100225-06-15	3072c-f	61.3b-i	478
TxL100225-05-03	3000d-f	58.5h-j	447
TxL100212-06-08	2957d-f	57.3h-j	430
TxL100225-06-01	2826ef	61.0c-i	431
TxL100212-06-10	2318e	53.3j	320
TxL100225-06-16	2279e	63.0b-i	362de
p-value	≤0.05	≤0.0004	≤0.0938

Means followed by the same letter are not significantly different using Fisher's LSD at ($p \leq 0.05$).

Tamrun OL11 had the highest yield at 4162 lbs/A and the highest grade at 71.3% in the Drought #3 test (Table 3). Value/A for the test was not significant with $p \leq 0.09$. Twenty-two breeding lines performed in the top statistical grouping for yield, but only six of these performed in the top grouping for %TSMK. TxL100225-06-04, TxL100212-07-04, TxL100225-06-02, TxL100225-06-12, TxL100225-06-08, and TxL225-06-13 performed in the top grouping for yield and grade. Again, grades were not high replicating what was seen in the Drought #1 and Drought #2 studies.

Preliminary Conclusions

Eighty-seven lines selected for different levels of drought tolerance at the Texas AgriLife Research and Extension Center in Lubbock, Texas were tested in South Texas under full irrigation during 2016. Seventy-two of the lines performed equal to the commercial check Tamrun OL11 for yield. Twenty-six of these 72 lines also performed equal to Tamrun OL11 for

%TSMK. We are optimistic that there are so many lines performing equal to the check, but this was only the first year of yield trials in South Texas under full irrigation. These same lines will be retested under full irrigation in South Texas and under limited irrigation in West Texas during the 2017 growing season. We anticipate higher grades in the 2017 growing season based on historical data from nurseries at this site.