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Final Report/NPB **Peanut Breeding**
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Title: **Breeding for Early-Maturing Peanuts**
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Problem and Need

Edible seed quality is a major need for West Texas. Problems of off-flavor are associated with immaturity and high drying temperatures. Additional benefits of reducing the days to maturity are greater flexibility in planting and harvesting as well as cost savings from fewer irrigations, fungicide applications for disease control, and fewer days for weeds to grow.

Objective.

The ultimate goal is release of new varieties that are early-maturing and high-oleic. Our emphasis currently is on developing runner and Spanish varieties.

Current Results

(a) Evaluation of F2:6 populations for yield and maturity. These lines were developed from Spanish x runner high-O/L crosses, and are segregating runner, bunch, and Spanish plant types. We evaluated these populations at the Western Peanut Growers Research Farm at Denver City (Table 1), and on Doug Sims farm at Earth (Table 2) where Spanish peanuts were grown. Additional sites (Wellington, Stephenville, and Pearsall) were planted using funds from the National Peanut Board and these results are presented in that report.)

Among the runners, several lines with promising combinations of yield and maturity were identified. An example is Line 21, with a yield equal to Florunner, but significantly earlier. Lines 9 and 12 are similar, except with lower shelling rates. These lines are segregating for pod shape and O/L ratio. We will select the best-shaped pods and seeds with high-O/L for increase and crossing to high-O/L runner varieties. We will also repeat the evaluation of the best lines in 2005 to gather additional data on yield and disease resistance.

Table 1. Data from the F2:6 Runner test at the WPGRF (Denver City). Abbreviations are ValAc (value in $ per acre), LbPodAc (lb. pods per acre), PctBlkBr (maturity, percent black and brown pods determined by the hull scrape method), G100SMK (seed size in grams per 100 sound mature kernels), PctTSMK (shelling in percent total sound mature kernels), LSD (least significant difference), and CV (coefficient of variability).

Entry	ValAc	LbPodAc	PctBlkBr	G100SMK	PctTSMK
NC7	868 a	4677 a	68.00 c-e	76.19 a	71.38 a-d
Florunner	796 ab	4329 ab	46.67 fg	56.56 f-l	74.79 a
21	772 a-c	4402 a	69.33 c-e	63.65 b-g	71.38 a-d
TX966205	755 a-d	4270 a-c	30.67 hi	58.65 e-k	72.85 a-c
TX972505	737 a-d	4133 a-c	19.33 i	54.76 h-l	73.20 ab
9	688 b-e	4165 a-c	70.00 c-e	64.45 b-f	67.23 a-f
10	648 b-f	4172 a-c	45.33 f-h	59.17 e-k	62.13 d-f
TX977235	635 c-g	4001 a-d	20.44 i	54.36 i-l	62.19 d-f
12	626 c-h	3856 a-e	81.10 a-d	63.90 b-g	66.26 a-f
7	609 d-h	3797 a-e	64.69 e	42.84 mn	62.46 d-f
17	603 d-h	3564 c-g	36.00 gh	62.51 b-h	67.30 a-f
13	577 e-i	3637 b-f	66.67 de	69.36 a-c	67.12 a-f
20	562 e-j	3564 c-g	67.33 de	60.70 d-j	63.01 c-f
8	548 e-k	3730 a-f	76.15 a-e	42.22 mn	54.78 f
25	544 e-k	3669 b-f	62.67 e	56.21 g-l	59.82 ef
18	537 e-k	3190 e-i	73.33 b-e	55.23 h-l	68.94 a-e
31	515 f-k	3198 e-i	40.33 gh	69.42 ab	66.39 a-f
24	510 f-l	3205 e-i	82.67 a-c	53.47 j-l	64.60 b-f
23	504 f-l	3318 d-i	37.33 gh	58.57 e-k	62.33 d-f
11	486 g-m	3416 d-h	69.33 c-e	64.59 b-e	59.32 ef
19	474 h-m	3027 f-j	94.58 a	41.37 n	60.37 ef
14	429 i-m	2963 f-j	74.67 b-e	64.47 b-e	64.89 a-f
15	419 j-m	2705 h-j	59.95 ef	58.34 e-k	63.38 b-f
27	404 k-m	2636 ij	73.33 b-e	57.91 e-k	65.84 a-f
28	385 k-m	2653 ij	64.48 e	61.44 d-i	66.17 a-f
26	376 k-m	2672 f-j	44.42 f-h	68.03 a-d	64.36 a-f
30	364 k-m	2460 jk	65.33 e	63.96 b-g	68.08 a-f
16	332 k-n	2881 f-j	33.33 g-i	69.63 ab	55.79 f
22	201 n	1762 kl	64.29 e	51.97 k-m	55.31 f
BSS56	189 n	1323 l	88.00 ab	49.87 lm	64.70 b-f
LSD =	156	713	14.86	7.89	9.93
CV =	17.7%	12.9%	15.5%	8.1%	9.3%

At Earth, the experiment was very immature - even BSS56, which is more mature than Tamspan90, was only 50% mature. Those entries with good combinations of yield and maturity at Denver City were very immature at Earth. There were several entries (12, 19, 21, 24, 27, and 28) that were more mature and did have acceptable seed size, but had lower yields. These entries were also the most-mature at Denver City. We will select the best lines from these (and other) sites for further testing and crossing. Because of the immaturity of all materials at this location, the test is useful for identifying the most-mature lines, but may not be as useful for selecting varieties that can

be grown in a climate conducive to development of runner varieties.

Table 2. Data from the F2:6 runner test, grown at Earth in 2004.

Entry	ValAc	LbPodAc	PctBlkBr	G100SMK	PctELK	PctTSMK
NC7	933.20 a	5077 a	18.67 b-d	82.23 a	40.91 a	70.54 b-g
Florunner	832.66 ab	4561 ab	0.51 d	60.47 d-f	24.16 b-e	74.34 a-c
31	827.37 ab	4398 a-c	0.59 d	59.67 d-g	26.17 bc	76.40 a-d
32	741.34 a-c	4010 a-f	0.00 d	54.73 fg	20.20 b-i	74.91 ab
7	738.09 a-c	4268 a-d	12.90 cd	42.37 h	0.39 m	68.27 d-j
20	733.12 a-c	4302 a-d	14.00 cd	64.77 b-e	18.02 c-j	68.74 c-j
4	730.37 a-c	4238 a-e	0.67 d	57.17 e-g	9.03 j-m	69.39 b-h
18	723.88 a-d	4082 a-e	14.67 cd	56.63 e-g	12.55 h-l	69.99 b-g
6	722.31 a-e	4124 a-e	8.00 d	54.70 fg	15.86 e-k	70.50 b-g
12	706.14 b-f	4266 a-d	32.37 a-c	62.47 c-f	24.16 b-e	67.69 d-l
24	701.23 b-f	3888 b-h	37.59 ab	58.30 d-g	21.90 b-g	72.74 a-d
27	691.73 b-g	3967 a-g	37.33 ab	58.97 d-g	11.73 i-l	71.97 a-f
17	680.70 b-h	3922 a-g	1.33 d	64.53 b-e	15.41 e-k	70.99 a-g
16	672.56 b-h	4313 a-d	0.00 d	64.77 b-e	14.70 f-l	62.07 lm
14	672.03 b-h	3948 a-g	8.67 d	64.77 b-e	9.17 j-m	68.92 c-i
28	658.13 b-h	3724 b-h	26.59 b-d	57.53 e-g	12.76 h-l	71.75 a-f
5	648.41 b-h	3875 b-h	1.33 d	58.17 d-g	16.46 d-k	68.71 c-j
9	634.88 b-h	3831 b-h	5.99 d	68.93 bc	26.30 bc	67.90 d-k
21	628.11 b-h	3913 a-h	28.98 a-d	63.64 b-f	23.60 b-f	68.95 b-i
23	577.66 c-h	3671 b-h	2.98 d	59.13 d-g	13.06 g-l	63.23 i-m
25	564.52 c-h	3231 c-h	19.59 b-d	56.69 d-g	13.41 f-l	70.96 a-g
29	524.16 d-h	3108 e-h	12.86 d	71.91 b	24.16 b-d	68.83 d-i
19	523.91 c-h	3715 b-h	58.98 a	54.80 fg	9.80 j-l	64.04 h-m
22	517.22 c-h	3088 e-h	8.51 d	55.17 fg	6.06 lm	66.41 f-m
30	501.80 d-h	2853 f-h	8.00 d	58.80 d-g	21.46 b-h	72.21 a-e
10	496.67 e-h	3297 c-h	7.90 d	65.87 b-d	21.66 b-h	61.02 m
11	492.31 f-h	3658 b-h	9.51 d	71.47 b-e	23.52 b-f	62.31 k-m
13	491.48 f-h	3165 d-h	21.33 b-d	71.30 b-f	28.95 b-d	66.98 e-l
BSS56	470.43 gh	2734 h	56.00 a	51.50 g	7.75 k-m	71.02 a-g
15	460.28 h	2806 gh	22.67 b-d	64.77 b-e	17.93 c-j	65.68 g-m
LSD =	226.20	1170	19.10	8.21	9.13	5.74
CV =	21.6%	18.9%	74.3%	8.2%	31.3%	5.1%

Among the bunch types (Tables 3 and 4), there are also a few outstanding lines for further development. Among these are Entries 10 and 13. The former has a yield equal to Florunner, but is earlier and has larger seeds. Line 13 yields a little less, but is also early. The earliest entries (6 -8) has seed sizes similar to Spanish lines and are not useful. Lines 13 and 20 are also among the earlier lines at Earth, and 10 is similar in yield to Florunner.

Table 3. F2:6 Bunch Trial at the WPGRF (Denver City) in 2004.

Entry	Valac	LbPodAc	PctBlkBr	G100SMK	PctELK	PctTSMK
Florunner	743 a	4220 a	31.33 d-f	56.23 d	11.30 e-g	70.91 a
10	681 ab	4022 ab	57.33 bc	66.13 bc	34.37 b	69.86 a
Ts90	607 a-c	3902 a-c	71.67 ab	41.83 fg	0.95 h	58.71 a-c
NC7	579 b-d	3654 a-c	43.33 cd	90.87 a	46.04 a	68.84 a
13	524 b-e	3271 c-e	61.81 bc	37.06 gh	0.06 h	62.22 a-c
Spanco	516 c-e	3513 b-d	84.00 a	45.73 ef	4.47 h	67.45 ab
20	501 c-f	2805 e-g	38.67 de	49.80 e	3.03 h	71.43 a
17	460 c-f	3039 d-f	34.67 d-f	61.37 cd	13.40 ef	66.51 a-c
18	452 d-f	2872 ef	31.33 d-f	69.50 b	21.22 cd	69.61 a
19	412 e-g	2417 fg	44.67 cd	69.80 b	22.79 c	72.55 a
6	385 e-g	2315 fg	83.33 a	38.23 gh	0.93 h	68.52 a
9	357 e-g	2405 e-g	67.81 ab	47.66 ef	4.34 f-h	67.63 ab
16	354 e-g	3296 b-e	67.12 a-c	69.79 b	19.51 c-e	58.53 a-d
12	317 f-h	2269 fg	24.67 ef	64.63 bc	17.03 c-e	66.67 a-c
8	291 gh	2139 gh	75.33 ab	34.83 h	0.28 h	62.69 a-c
15	291 f-i	2183 f-h	53.12 b-d	68.79 bc	13.49 d-f	61.19 a-c
14	286 g-i	2197 g	20.00 fg	42.60 fg	1.46 h	56.58 b-d
7	269 g-j	2235 g	82.00 a	34.00 h	0.09 h	57.06 b-d
BSS56	220 h-j	1497 hi	81.33 a	46.63 ef	3.49 h	64.24 a-c
21	156 ij	1342 i	10.80 g	41.94 fg	1.25 h	45.51 d
LSD =	152	609	16.89	5.34	6.26	10.15
CV =	23.0%	13.9%	21.2%	6.2%	38.2%	9.8%

Table 4. F2:6 Bunch Test at Earth, 2004.

Entry	ValAc	LbPodAc	PctBlkBr	G100MK	PctELK	PctTSMK
NC7	1000 a	5539 a	18.28 de	75.58 b	34.91 b	68.90 d
Florunner	948 ab	5075 ab	0.00 e	57.77 cd	23.58 c	76.01 a
Spanco	894 a-c	4930 ab	64.96 a	46.97 de	4.20 d	74.40 ab
19	877 a-d	5088 ab	4.67 e	68.70 bc	22.60 c	69.25 cd
18	847 a-d	4921 ab	4.67 e	73.23 b	26.80 bc	67.34 de
Ts90	832 a-e	4620 a-c	56.67 ab	46.80 de	2.97 d	73.88 a-c
12	819 a-e	4607 a-c	8.67 e	70.47 bc	21.81 c	69.49 b-d
10	765 b-e	4409 b-d	16.00 de	65.37 bc	30.07 bc	68.77 d
20	747 b-f	4313 b-d	31.33 cd	51.87 de	4.68 d	68.25 d
14	679 c-f	4048 b-e	12.01 de	46.90 de	1.19 d	62.54 ef
NC12	664 d-f	3752 c-e	9.83 e	89.00 a	46.85 a	68.66 d
BSS56	606 ef	3451 de	59.26 ab	47.63 de	5.30 d	72.01 a-d
13	596 ef	3730 c-e	20.00 de	50.33 de	8.51 d	55.33 g
7	546 f	3624 c-e	52.00 a-c	43.40 e	4.66 d	60.40 f
6	545 f	3171 e	57.70 ab	41.00 e	2.07 d	67.11 de
8	531 f	3363 de	42.67 bc	38.90 e	3.00 d	62.78 ef
LSD =	217	1121	21.01	13.14	9.63	4.99
CV =	17.4%	15.7%	44.3%	13.7%	37.0%	4.4%

We also evaluated Spanish lines at both locations, but no entry was superior in yield or maturity to the parents, so data are not presented here.

(b) Evaluate F_2 single plants from new crosses, to begin the process of developing new varieties for the future. We planted 10 populations of space-planted F2 single plants at the Texas Tech Farm in Lubbock. Each population consisted of 300 F2 plants, plus parents. We took extensive notes on flowering and pegging during the year, with the intent of determining the relationship between dates of first flowering, pegging, and maturity. We are in the process of measuring yield, maturity, and seed weight for each plant. Selections from several populations will be grown as space-planted rows in 2005. We expect that the better of these crosses will be used extensively in future years.

(c) Backcross selected early-maturing progeny by selected varieties. We crossed early-maturing, high-yielding selections evaluated in previous years by high-oleic lines to introduce the high-oleic trait into these populations. We will begin field testing of progeny in 2005.

In addition, we have evaluated a backcross progeny derived from Valencia x Spanish O/L crosses (Table 5). The goal is to develop early-maturing Spanish and/or Valencia varieties. The 2004 results are part of the thesis work of Amade Muitia, who is expected to graduate this spring. Selections were grown at 3 locations in 2004, and the following data are from the TAES Etter Experiment Station, chosen to put severe stress for maturity on this material.

Table 5. Valencia x Spanish Population results, grown on station at Etter, 2004.

Entry	LbPodAc	PcTBlkBr	G100SMK	PctTSMK	Pct3&4Sd
Spanco	2153 a	59.33 a-e	47.56 bc	67.47 a-c	3.33 hi
1	2016 ab	71.33 a-c	41.13 e-k	67.08 a-d	48.00 a-d
Tamspan90	1997 a-c	54.00 b-f	45.30 b-e	68.81 ab	13.33 g-i
23	1820 a-d	62.00 a-d	41.33 e-j	68.29 a-c	46.66 a-d
13	1754 b-e	64.66 a-d	38.56 h-k	62.85 c-i	13.33 g-i
11	1749 b-e	66.66 a-d	45.30 b-e	66.66 a-e	24.66 e-g
8	1649 b-e	47.33 def	41.33 e-j	58.40 hi	33.33 c-f
12	1643 c-e	52.66 c-f	39.73 g-k	64.62 a-g	18.66 f-h
7	1619 d-f	53.33 b-f	45.30 b-e	66.00 a-f	48.00 a-d
25	1613 d-f	74.00 ab	42.66 e-h	66.43 a-e	60.66 a
22	1592 d-f	57.33 a-f	39.93 g-k	60.71 f-i	31.33 d-f
16	1564 d-f	66.41 a-d	42.23 e-i	58.33 hi	3.28 hi
19	1540 d-f	51.33 c-f	47.13 b-d	63.78 a-h	40.00 b-e
NMValC	1521 d-g	72.88 a-c	44.63 b-e	69.05 a	52.64 a-c
24	1506 d-g	52.00 c-f	54.50 a	63.68 a-h	6.66 hi
18	1483 d-g	60.00 a-d	48.03 b	65.11 a-g	47.33 a-d
5	1478 d-g	61.33 a-d	42.83 e-h	67.71 a-c	55.33 ab
21	1472 d-g	64.00 a-d	43.00 d-g	60.05 g-i	45.33 a-d
14	1472 d-g	62.00 a-d	43.63 c-g	64.13 a-g	8.00 g-i
OLin	1451 e-h	18.00 g	43.36 c-g	66.06 a-f	0.00 i
6	1449 e-h	38.66 e-g	41.16 e-k	57.98 i	16.00 f-i
3	1446 e-h	57.33 a-f	42.33 e-h	63.27 b-i	53.33 ab
17	1440 e-h	76.00 a	44.33 b-f	61.14 e-i	34.66 c-f
X-101	1385 e-h	62.66 a-d	43.33 c-g	66.77 a-d	59.33 a
2	1374 e-h	62.65 a-d	41.60 e-i	64.18 a-g	15.87 f-i
9	1263 f-h	62.00 a-d	38.00 i-k	61.83 d-i	2.66 hi
10	1252 f-h	65.33 a-d	40.33 f-k	59.59 g-i	13.33 g-i
4	1169 gh	76.66 a	36.90 k	67.83 a-c	12.66 g-i
15	1154 gh	58.66 a-f	39.63 g-k	64.64 a-g	47.33 a-d
20	1086 h	38.00 fg	37.10 jk	64.83 a-g	10.00 g-i
LSD	368	20.68	4.27	5.54	17.5
CV (%)	14.62	21.51	6.12	5.27	37.24

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