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**Final report to the
National Peanut Board
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Title of Project:

Peanut quality evaluations of Texas Peanut Breeding lines (in developing new Varieties with Early Maturity and/or Resistance to Root-knot Nematode, Sclerotinia blight, Southern blight, Leafspot, and Tomato Spotted Wild Virus and with High O/L.)

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The objective of our project is to conduct quality analyses on breeding materials in earlier generations so we are able to eliminate undesirable materials at an earlier stage, thus conserving resources to concentrate on those lines which are truly more promising to become released varieties that will serve the peanut industry, and ultimately the consumers, better.

We conducted analyses on three sets of samples in 2004. The first of these analyses was run on samples from the Advanced Lines Runner tests conducted at the Otis Johnson farm in south Gaines County. These data are shown in Table 1, below. These data are not normalized (adjusted) for moisture content, so the percent fat and the percent sugar is slightly lower than the figures shown. As expected, Tamrun OL01 had a sugar content much higher than all but one of the breeding lines. We can say that Breeding lines 7 and 16 are candidates to be discarded from further testing, with sugar contents at 5 and 6.1%, respectively. Generally, a flavor ranking above 5 is desired, but Southwest peanuts are not always that high. Five of the breeding lines in these analyses scored 5 or more in flavor.

Because these samples all originated in West Texas, it was surprising that four of the samples showed some presence of aflatoxin. These four included Flavor Runner 458. We are at a loss to explain this occurrence.

Table 1. Quality analyses for 2004, South Gaines County tests.

Line Identification	Aflatoxin	Flavor rk	% Fat	% H2O	% Sugar
Breeding line 1	0	4.8	45.6	4.5	4.2
Breeding line 2	0	4.8	45.9	5.2	4.9
Flavor Runner 458	0.6	5.0	45.7	4.9	4.5
Breeding line 3	0	5.0	46.6	5.0	4.7
Breeding line 4	0.1	5.0	46.3	4.8	4.2
Breeding line 5	0	4.8	45.8	5.0	4.9
Florunner	0	5.0	46.5	4.7	4.3
Breeding line 6	0	5.5	47.1	4.5	4.5
Breeding line 7	0	5.0	46.8	5.7	5.0
Breeding line 8	0	4.8	48.0	5.2	4.6
Breeding line 9	0	4.5	48.2	4.6	4.9
Breeding line 10	1.8	4.0	47.2	4.7	4.4
Tamrun 96	0	4.5	46.2	5.1	4.8
Tamrun OL01	0	4.5	46.2	5.7	5.5
Tamrun OL02	0	5.0	47.9	4.9	4.8
Breeding line 11	0.3	5.3	45.8	4.9	4.6
Breeding line 12	0	4.8	48.2	5.0	4.6
Breeding line 13	0	4.8	49.4	4.0	3.9
Breeding line 14	0	4.8	47.0	4.7	4.6
Breeding line 15	0	4.8	49.9	3.7	3.5
Breeding line 16	0	4.5	46.5	6.2	6.1

The Second group of samples was put together from two locations and consisted of both runner and Spanish lines. The data are shown in Table 2 below. In these analyses, again the only line that was higher than Tamrun OL02 in sugar content was Breeding line 16. Numerous of these breeding lines were 5 or higher in flavor score, but six of the 5-and-above were Spanish lines, which usually rate higher in flavor score because of maturity. Again, Flavor Runner 458 showed the presence of aflatoxin, so the toxin was present in both locations tested from Gaines County in this variety.

The purpose of a third set of data was to conduct an experiment to have quality analyses performed on a subset of a population that was evaluated for yield and maturity over multiple years and locations. The subset analyzed was limited by funds, but consisted of 4 varieties, 2 locations, and 3 digging dates. The varieties selected were Langley (early-maturing runner released in 1985), Tamrun 96, Flavor Runner 458, and Tamrun OL01. The locations were the Western Peanut Growers Research Farm at Denver City, TX, and the Helms Farm at the Texas Agricultural Experiment Station at Halfway. The latter location was chosen because of its cooler climate and was expected to result in a high degree of immaturity of pods. Three target harvest dates were selected – 135, 150, and 165 days after planting (DAP). Materials at Denver City were planted on May 12, 2003, with digging dates of 9/17/03 (139 DAP), 9/30/03 (152 DAP), and 10/18/03 (170 DAP). Materials at Halfway were planted later (June 6th, 2003) with digging dates of 10/31/03 (143 DAP), 11/11/03 (154 DAP), and 11/21/03 (164 DAP) as we were forced to select this site at a late date by unexpected circumstances. Weather conditions at WPGRF on the digging dates was generally warm and dry, with average daily temperatures in the middle to lower seventies, and humidity levels below 50 percent. Weather conditions at Halfway were cooler than WPGRF because of the later digging dates. Daily average temperatures were in the upper 50's to lower 60's and humidity levels were between 50 and 60 percent. Irrigation at Denver City was by spray nozzle on a center pivot, but at Halfway it was by surface drip. The expected results were that Tamrun OL01 would show the greatest degree of off-flavors, because of its late maturity, relative to other entries, and that Langley would have the least off-flavors. We expected, also, that the relative immaturity of materials grown at Halfway would result in more off-flavors from that location.

Statistical data are presented below, using the four varieties for which quality data are available. There was no difference in yield (LbPodAc) or maturity (PctBlkBr) (See Table 3) among the four varieties, although yield and maturity were greater at WPGRF than at Halfway, as was expected. These measures were greater in the third digging date than in the first. Similar differences were observed for shelling percentages.

Quality data fell into two categories. Firstly, for chemical composition, there were significant differences between varieties and location for fat, moisture, and sugar (Table 3). Sugar was higher at Halfway, where maturity was less. There were also differences among varieties, with Tamrun OL01 having a sugar content of 5.7%. Somewhat surprisingly, sugar content increased with later digging dates, even though maturity also increased. Secondly, for flavor itself, the only significant difference was for the fruity-fermented trait, with the greater off-flavor at the Denver City site. This was surprising, as there were almost no mature pods at the Halfway site (Table 3). No significant differences were observed between varieties, although the reduction expected for Langley relative to Tamrun OL01 did not occur, contrary to expectation.

Acknowledgement

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Table 3. Statistical Analyses of the Quality Data Location X Digging Date X Variety.

Source	df	Flavor	Fruity	Earthy	Fat	H ₂ O	Sugar	LbPodAc	%BlkBr	%SMK
Location	1	2.71 ns	12.47*	0.04 ns	8.38 ns	64.47 **	245.04***	14.57**	56.13**	4.27*
Dig date	2	0.39 ns	1.79 ns	1.55 ns	0.96 ns	0.75 ns	6.91 **	3.52 *	11.73 **	8.92 **
Genotype	3	1.63 ns	2.28 ns	1.92 ns	8.84 **	23.19 **	123.12***	0.77 ns	0.89 ns	7.91 **
Loc X Geno	3	1.49 ns	1.97 ns	0.23 ns	0.47 ns	0.10 ns	1.20 ns	0.42 ns	1.01 ns	2.63 ns
error	36									
Means		4.453	0.531	0.305	47.92	3.73	5.04	4020	22.8%	70.8%
Denver City		4.38 nsd	0.947 a	0.284 ns	48.51 a	3.24 b	4.68 b	4489 a	40.5 a	71.9% a
Halfway		4.52	0.115 b	0.327 ns	47.32 b	4.22 a	5.40 a	3552 b	5.18 b	69.6% b
Dig 1		4.42 nsd	0.26 nsd	0.56 nsd	47.92 nsd	3.82 nsd	4.94 b	3679 b	7.68 b	68.4 b
Dig 2		4.51	0.54	0.26	47.56	3.71	5.04 ab	3934 ab	26.7 a	70.1 b
Dig 3		4.43	0.79	0.10	48.27	3.65	5.14 a	4448 a	34.1 a	73.9 a
Flav.Ru. 458		4.57 nsd	0.17 nsd	0.12 nsd	49.05 a	3.57 b	5.03 b	4299 nsd	24.4 nsd	73.2 a
Langley		4.41	0.89	0.00	48.90 a	3.03 c	4.92 d	3819	26.8	70.8 a
Tamrun 96		4.32	0.30	0.43	46.81 b	3.88 b	4.90 c	3920	16.4	66.3 b
Tamrun OL01		4.52	0.76	0.67	46.90 b	4.43 a	5.74 a	4043	23.6	72.8 a