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Title: **Breeding for Early-Maturing Peanuts**Personnel: M.D. Burow<sup>1</sup>, C.E. Simpson<sup>2</sup>, M.R. Baring<sup>3</sup>, Y. Lopez<sup>1</sup>Agencies: <sup>1</sup>Texas Agric. Exp. Station, Texas A&M Univ., Lubbock, TX  
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### Problem and Need

Development of earlier-maturing peanut varieties is an important goal. Benefits of quicker development include a higher-quality (more mature) crop, cost savings from fewer irrigations and chemical applications, and fewer days for weeds to grow. Maturity is especially important in West Texas, where the growing season is shorter than in the south of the state, and immaturity is associated with poor flavor characteristics.

### Results

(a) **Field evaluation of crosses.** We selected the earliest 10% of the Spanish and runner  $F_{2.4}$  low-oleic lines grown last year, and have planted these lines as replicated trials at the West Texas Peanut Growers' Farm and at Sudan. These materials are based on crosses involving PI 161317 (which is the PI parent of 'Starr') crossed with TxAG-1 and TxAG2, PI161317 x the old Spanish landrace 'Spantex', and Florunner X PI 109839. We also selected 10% of the  $F_2$  single plants that were generated from crosses involving high O/L runner breeding lines and the early African bunch type accession BSS56. The were selected last year for earliness and high oleic:linoleic (O/L) ratio, and we are evaluating these as  $F_{2.4}$  single plants at the same two locations.

#### $F_{2.5}$ lines.

These were evaluated for yield, maturity(% black + brown hulls after scraping), 100 seed weight, % TSMK, and other traits at the WTPGF and at Haldon Messamore's farm at Sudan. Runners and Spanish lines were evaluated separately. Among the runners, produced from a cross between Florunner and PI109839, it was possible to combine two of these three traits: high yield, early maturity, and proper seed size. There were several examples of lines with high yield and maturity as good as runners, but with small seed size. However, there was one line (Tx017746) that appeared to be promising. It was in the top yield category at both locations, had seed size between 60 and 70 g/100, and was earlier than Florunner and FlavorRunner, but not as mature as some of the other lines. Two additional lines (Tx017727 and Tx017748) did well at one location, but poorly at the other.

## F2:5 Runner Trial, WTPGF 2002

Genotype	Type	Yield	%BlkBm		Wgt/100Sd		TSMK		Vel/ac
Florunner	Runner	5869	a	f	68.7	b	77.5	a	1110
TX017727	Runner	5496	ab	cde	57.3	c	68.3	def	920
TX017746	Runner	5388	ab	abcde	73.1	a	69.5	def	913
TX017740	Runner	5320	abc	bcd	55.2	cde	69.4	def	902
TX017723	Runner	5263	abcd	def	58.6	c	66.7	efg	868
TX017722	Runner	5185	abcd	abcde	51.8	def	67.9	def	875
TX017753	Runner	4909	bcde	abc	45.3	h	70.0	cdef	836
TX017701	Runner	4878	bcde	ef	58.2	c	69.3	def	834
FlavorR458	Runner	4516	cdef	f	68.1	b	75.9	ab	813
TX017752	Runner	4422	def	abc	49.8	fg	70.1	cdef	754
TX017751	Runner	4252	efg	a	46.5	gh	72.4	abcd	748
TX017711	Runner	4229	efg	abc	49.1	fgh	61.2	h	639
TX017748	Runner	4202	efg	ab	48.5	fgh	70.9	bcde	720
Tamrun96	Runner	3985	fg	f	67.9	b	75.0	abc	739
TX017754	Runner	3944	fg	a	50.4	fg	69.0	def	641
TX017744	Runner	3858	fg	abc	51.3	ef	62.6	gh	595
R22	Spanish	3830	fg	abc	38.6	i	68.9	def	644
Tamspan90	Spanish	3512	g	abc	46.4	gh	65.7	fgh	573
TX017742	Runner	2440	h	abc	37.3	i	50.2	i	282
PI109839	Runner	2438	h	abcd	38.1	i	47.5	i	157
PI161317	Spanish	1933	h	a	55.9	cd	70.7	cdef	309
Isd =		857		35.5		4.4		5.2	173
CV =		12.1%		29.6%		5.0%		4.6%	12.6%

Data from Sudan were generally in agreement with the data from the WTPGF, although grading has not been completed and so value data are not available. However, Tx017746 was later in maturity in Sudan. This suggests that this line is intermediate in maturity.

## F2:5 Runner Trial, Sudan 2002

Genotype	Yield	Genotype	%BlkBm	Genotype	Wgt/100Sd	Genotype	%TSMK
TX017746	5651	TX017746	43.3	TX017746	59.7	TX017746	61.8
R22	5414	R22	74.0	R22	42.3	R22	56.6
TX017754	5341	TX017754	85.2	TX017754	41.2	TX017754	61.9
TX017748	5340	TX017748	95.3	TX017748	45.4	TX017748	70.3
TX017722	5272	TX017722	34.0	TX017722	50.8	TX017722	65.1
TX017753	5254	TX017753	99.3	TX017753	44.2	TX017753	55.5
TX017751	5209	TX017751	67.3	TX017751	41.5	TX017751	71.4
TX017740	5204	TX017740	50.0	TX017740	45.1	TX017740	59.2
TX017752	5152	TX017752	97.3	TX017752	49.1	TX017752	69.5
FlavorR458	5124	FlavorR458	32.4	FlavorR458	59.4	FlavorR458	68.3
TX017701	5097	TX017701	50.7	TX017701	60.6	TX017701	62.8
TX017744	5018	TX017744	16.0	TX017744	46.7	TX017744	58.0
Florunner	5016	Florunner	6.6	Florunner	65.9	Florunner	73.7
PI109839	4994	PI109839	2.2	PI109839	63.8	PI109839	67.4
TX017723	4769	TX017723	48.7	TX017723	55.1	TX017723	58.9
TX017727	4689	TX017727	21.3	TX017727	49.2	TX017727	58.9
TX017711	4596	TX017711	9.2	TX017711	46.8	TX017711	57.2
PI161317	3241	PI161317	82.2	PI161317	46.1	PI161317	58.3
TX017742	3172	TX017742	90.0	TX017742	38.2	TX017742	56.7
Isd =	881	Isd =	31.7	Isd =	12.3	Isd =	12.1
CV =	10.8%	CV =	36.0%	CV =	14.9%	CV =	11.6%

The best lines are being planted currently to be backcrossed with Florunner (yield, seed size) or TamrunOL02 (yield, seed size, high O/L). Because of the tendency of early-maturing runners to have small seed sizes, we have re-selected two 2001 lines for seed weights of 53 and 57 g/100 and slightly-less earliness. These are currently growing in the Puerto Rico winter nursery, and will be evaluated in the field in 2003.

Spanish lines derived from this and other crosses were evaluated also, but few differences were observed among the lines grown. Three lines, however, have been selected for backcrossing.

F<sub>2:4</sub> single plants. Selections from three populations of F<sub>2</sub> single plants selected last year were planted at the WTPGF and at Sudan also. These were made between several high O/L breeding lines and BSS56 (an early-maturing Spanish line from Africa.) Approximately 1000 plants were grown at each location and notes taken. We are still taking data on these materials, although several selections were made in the field based on plant appearance, pod appearance and distribution, and yield. These materials had maturities of 56-65% black and brown hulls, and 100 seed weights of 66 - 86g. O/L content will be determined also. These and selections yet to be made will be planted for backcrossing, and will be evaluated also as single rows in the field in 2003. About 4000 plants of two additional crosses were grown without selection and additional data taken for marker analysis. This will appear in that report.

- (2) **Expand the breeding program by introducing additional early-maturing material as parents.** We have made new crosses, involving the earliest germplasm in the U.S. Plant Introduction System. Crosses were made to TamRunOL01 and OLin to combine early maturity and high O/L traits. We also made use of a few Valencia lines as donors for early maturity, and also began working to determine the feasibility of an early high O/L Virginia line.
- (3) **Make crosses among early x early lines to begin a recurrent selection program** to develop germplasm for early maturity. These began with part (2) above, but the project will be distinguished in the future by multiple cycles of intercrossing and evaluation.
- (4) **Evaluate additional germplasm for earliness and relatedness.** We are increasing and simultaneously. We grew out 50 plant introductions and varieties, for increase and to test these for maturity and potential as parents. From these, we found several Spanish/Valencia materials usable as parents and earlier than current accessions. We have also found a runner line from Africa that is early relative to Florunner. Exceptionally-early materials may be used as parents for additional crosses. In addition, tissue samples are being taken for future evaluation of these for genetic similarity by use of molecular markers. The least-related plants will most-likely have different earliness genes.
- (5) **Evaluate standard varieties and breeding lines to determine maturity at different locations.** This is being done to obtain a more-comprehensive understanding of the relationship of pod hull color, grade, yield, and flavor, and to determine differences in maturity in West, Central, and South Texas. This test was repeated at the WTPGF, Sudan, Stephenville, and Phillips counties to compare maturity among these locations. Materials have been harvested at all locations, and are currently being analyzed. In 2001, we determined that Spanish material grown at the WTPGF was generally mature, whereas runner accessions were generally from 10% to 25% mature. Seeds were dried at 98.6 degrees F. to provide conditions for off flavor development. These will be tested for flavor to determine the effects of flavor on maturity.