

## National Peanut Board –Annual Report

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**Project Title:** Developing high yielding root-knot nematode resistant peanut varieties with resistance to tomato spotted wilt virus and resistance to rust disease

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### **Proposed achievements for 2002:**

Complete the evaluation of the BC3 generation and then make a 4<sup>th</sup> backcross of nematode-resistant lines to TSWV-resistant recurrent parent (Tamrun 96 and others) and select for nematode-resistance in F2 generation using previously developed molecular markers. Also test F3 individuals derived from TxAg-6 x Florunner to confirm the identification of a second nematode resistance gene. These objectives were revised from original objectives based on reduced funding.

### **Achievements:**

Yield tests of first generation breeding lines with resistance to TSWV and nematodes were conducted at two nematode infested locations and one non-infested location. Nematode populations at the two infested sites were too low to affect yields, but nematode populations were significantly lower on the nematode resistant lines than on the susceptible checks (data not shown). The line J-56 was among the top five yielding lines at the Koonce farm test (Table 1) and the Erath county test (Table 2), whereas line J-206 was among the top five yielding lines at the south Texas site (Table 3) and the Koonce farm site. There was not sufficient disease pressure at any site to rate plants for resistance to TSWV.

A third backcross of nematode-resistance into peanut cultivars with resistance to the tomato spotted wilt virus (TSWV) was achieved and an BC4F2 population has been produced for 22 lines. The lines are currently being screened for nematode-resistance using molecular markers. BC3F3 populations will be produced from lines that are homozygous for nematode resistance and will be subsequently tested in field plots for yield potential and resistance to TSWV.

Although not part of the original objectives for this project, three tests were conducted to determine if the newly released NemaTAM variety carries resistance to peanut rust in addition to nematode resistance. Field observations in 2001 by Dr. M. Black indicated apparent resistance of NemaTAM to the rust disease. In our first test, NemaTAM had few pustules per leaflet than did the susceptible Florunner in tests in a growth chamber (Table 4). However, in two subsequent tests, there was no apparent difference in disease

Table 2. Comparison of tillage systems

<u>Tillage</u>	<u>Yield Lbs/A</u>	<u>Grade SMK + SS</u>
Full	4075	71.5
Strip	3884	72.6
<u>LSD (0.05)</u>	<u>NS</u>	<u>NS</u>

severity or days from inoculation until pustule formation (rust symptoms) between NemaTAM and Florunner.

In a final series of tests, we were able to confirm the presence of a second gene for nematode resistance in two different populations. One population was an F3 from A. hypogaea x TxAG-6, and the other population was a BC3F3 from the same parents, with Florunner as the recurrent parent. The second nematode resistance gene difference from the dominant gene in COAN and NemaTam in that it is inherited as a recessive trait (Table 5). Plants carrying the recessive gene are being propagated vegetatively and will be used for seed production. The identification of a second gene for nematode resistance will ensure greater durability of nematode resistance.

**Table 1 Yield test at Knooce farm site, 2002**

Line	\$val/acre		Lbspd/ac.		%TK		%TSMK		100 sd. wt.
TP298-3-10	825	a*	4489	ab	79	a	75.2	a	61.2 cd
J-56	820	ab	4736	a	74.9	l	70.7	d-f	55 f-h
J-206	820	ab	4506	ab	78.5	a-b	74.7	ab	60.6 cde
Tamrun 96	798	a-c	4380	a-c	77.2	ef	74.5	abc	68 b
TP294-1-4	794	a-c	4366	a-c	77.7	c-e	74.4	abc	55.6 f-h
TP300-2-9	776	a-d	4325	a-c	77.5	de	73.2	a-e	58.7 c-f
NemaTAM	744	a-e	4148	bc	78.7	a-c	73.6	a-d	60.6 cde
J-90	733	a-e	4043	b-d	77.2	ef	74	abc	61.9 c
TP281-4-9	731	a-e	4054	b-d	79	ab	74	abc	58.6 c-f
TP296-4-4	730	a-e	4094	bc	76.9	e-g	72.5	a-e	58.5 c-f
TP280-4-8	721	a-e	4051	b-d	77.8	b-e	72.9	a-e	56.6 e-g
J-211	721	a-e	4099	bc	77.4	de	73.3	a-e	77.2 a
Tx977053	709	a-e	4080	bc	75.8	g-i	71.5	c-f	66.5 b
J-135	704	b-e	4105	bc	76.1	f-h	70.4	ef	53.5 g-l
J-178	680	c-e	4075	bc	75.9	g-i	68.9	f	51.1 hi
J-54	674	de	3906	cd	75.6	hi	70.3	ef	50 l
Florunner	625	ef	3537	de	77.5	de	72.5	a-e	56.7 d-g
J-19	554	fg	3275	e	78	c-e	71.8	b-f	56.9 d-g
COAN	545	fg	3030	e	77.3	e	73.4	a-d	56.7 d-g
J-18	499	g	3046	e	77.6	de	70.8	def	60.9 cde
Mean	710		4017		77.3		72.6		59.2
CV %	11.8		9.1		1		2.9		5.5

\*Means followed by the same letter in a column are not different LSD (P=0.05)

**Table 2. Yield test in Erath county, 2002**

Line	\$val/acre		Lbspd/ac.		%TK		%TSMK		100 sd. wt.	
J-178	832	a*	5020	a	76.3	e-h	67.2	b-d	47	h
Tamrun 96	825	a	4775	ab	76.6	d-h	70.6	a-c	59	b-e
TP300-2-9	821	ab	4605	a-c	77.6	b-e	72.5	a	57	c-f
TP296-4-4	805	ab	4554	a-d	77.9	a-d	71.3	ab	59	b-e
J-56	790	a-c	4580	a-d	75.9	gh	70	a-c	51	gh
Florunner	778	a-c	4427	a-e	78.3	a-c	71.3	ab	59	b-e
Tx977053	775	a-c	4848	ab	75.5	hi	67.3	b-d	61	b
TP281-4-9	755	a-d	4226	a-e	79.2	a	72.5	a	61	b-d
J-54	753	a-d	4344	a-e	76	f-h	69.6	a-c	54	fg
TP298-3-10	744	a-d	4294	a-e	78.6	ab	70.9	ab	59	b-e
NemaTAM	742	a-d	4202	b-e	77.9	a-d	71.1	ab	61	bc
J-135	695	a-e	4271	a-e	76.1	f-h	66.6	c-e	49	h
J-206	675	a-e	4391	a-e	75.8	gh	66.5	c-e	57	c-f
COAN	639	b-f	3886	c-f	76.9	c-g	68.7	a-d	57	b-f
TP294-1-4	614	c-f	3821	c-f	76.9	d-h	67.3	b-d	54	fg
TP280-4-8	613	c-f	3787	d-f	77.4	b-f	67.9	b-d	59	b-e
J-211	577	d-g	3683	e-g	75.7	gh	67.2	b-d	73	a
J-19	552	e-g	3627	e-g	76.4	e-h	65.4	de	56	ef
J-90	477	fg	3222	fg	74.1	i	62.4	e	57	b-f
J-18	416	g	2925	g	75.7	gh	62.6	e	57	d-f
Mean	694		4174		76.7		68.4		57.4	
CV %	18.7		13.5		1.3		4.3		5	

\*Means followed by the same letter in a column are not different LSD (P=0.05)

**Table 3. South Texas yield test, 2002**

Line	\$val/acre		Lbspd/ac.		%TK		%TSMK		100 sd. wt.	
Tx977053	892	a*	5092	a	74.8	k	70.9	e-i	61.3	b
Tamrun 96	826	ab	4627	ab	75.4	h-k	72.1	c-g	57.7	bc

J-135	742	bc	4276	a-c	75.9	g-j	69.2	ij	46.9	hi
J-206	738	bc	4094	b-d	77	b-f	73.3	a-d	52.6	e-g
TP281-4-9	711	b-d	3835	b-e	79	a	74.9	a	56.8	cd
TP300-2-9	711	b-d	3950	b-e	77.7	b-d	72.3	b-f	56	c-e
J-178	705	b-d	4094	b-d	76.1	f-l	68.5	j	46.2	i
TP280-4-8	702	b-d	3876	b-e	78.1	ab	72.9	b-e	53.4	d-g
TP298-3-10	696	b-d	3780	c-e	79	a	74.2	ab	55.7	c-e
J-211	693	b-e	3843	b-e	77	c-g	73.3	a-c	65.4	a
J-56	687	b-e	3921	b-e	74.9	jk	70.2	g-j	50.4	gh
TP296-4-4	671	c-e	3735	c-e	78	a-c	71.9	c-g	53.4	d-g
TP294-1-4	669	c-e	3767	c-e	76.7	d-g	71.1	e-l	49.8	g-i
J-90	668	c-e	3770	c-e	76.9	c-g	71.5	c-h	58	bc
NemaTAM	661	c-e	3717	c-e	77.5	b-e	71.3	d-h	52.5	e-g
J-54	654	c-e	3775	c-e	75	l-k	69.7	h-j	46.9	hi
J-18	583	de	3316	de	75.9	g-j	70.9	e-i	61	b
Florunner	566	d-f	3171	ef	76.9	c-g	71.7	c-g	54.8	c-f
J-19	544	ef	3135	ef	76.4	e-h	70.1	g-j	54.5	c-f
COAN	425	f	2410	f	76.8	d-g	70.6	f-l	51.3	fg
Mean	677		3808		76.8		71.5		54.2	
CV %	15.7		15.1		1		2			

\*Means followed by the same letter in a column are not different LSD (P=0.05)

Table 4 Comparison of NemaTAM and Florunner for susceptibility to peanut rust.

Test #	NemaTam	Florunner
Test 1 - May 2002		
Rust pustules/leaflet	15.5	53.9 *
Test 2 - Nov 2002		
Days to pustule formation	15.5	16.2 ns
Disease severity index	2.7	2.8 ns
Test 3 - Nov 2002		
Days to pustule formation	15.7	16.0 ns
Disease severity index	2.8	3.0 ns

The disease severity index is a 0 to 5 scale with 0 = no pustules and 5 = numerous pustules per leaflet.

Table 5. Chi-square analysis of F<sub>3</sub> generation from susceptible BC<sub>3</sub>F<sub>2</sub> individuals and F<sub>3</sub> generation from susceptible F<sub>2</sub> individuals from the cross between *A. hypogaea* x TxAG-6. Critical value (p=0.05): 3.84

Peanut Line	Observed		Expected		χ <sup>2</sup>
	R	S	R	S	
	BC <sub>3</sub> F <sub>3</sub>				
1-10-14	3	20	5.7	17.3	1.75
1-10-5	2	4	1.5	4.5	0.22
	<i>A. hypogaea</i> x TxAG-6				
4-7	2	33	8.8	26.2	6.94*
4-8	4	42	11.5	34.5	6.52*