Nematode resistance in peanuts with high O/L Ratio & resistance to Sclerotinia Blight & TSWV

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Annual Report to Texas Peanut Producers Board

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Summary

More that 40 breeding lines with multiple disease resistance and the high Oleic to Linoleic fatty acid trait were yield tested in multiple locations. Of four PR lines that were test at all locations, PR-12 had yields that were competitive with the check cultivars. Similarly, four other lines that were tested at two locations had average yields that were equal to or greater than yields of the check cultivars.

Introduction

Our objectives are reduce the costly impact of diseases and nematode parasitism on peanut production through breeding for increased disease and nematode resistance. We have focused our efforts on moving a high level of nematode resistance into a series of breeding lines that also have partial resistance to the Tomato Spotted Wilt Virus and to Sclerotina Blight. Secondly, these resistance traits are being combined with the high O/L fatty acid ratio trait. Having multiple disease resistances combined in one cultivar will greatly reduce the impact of these diseases on peanut yield and lower production costs by reducing the reliance on fungicides and nematicides.

During the past year we have evaluated the yield potential of more than 40 breeding lines with the multiple disease resistance and the high O/L ratio trait. Some of these lines have been tested for yield in multiple locations for up to three years, but most of the lines have been tested for yield potential only one time.

Materials and Methods

Yield tests were conducted at four sites, none of which were nematode infested. At each site there were twenty entries planted in two-row plots that were 40 ft long. Each entry was replicated three times. The entries included four check lines (Florunner, NemaTAM, Tamrun OL 02, and Tamrun OL 07) and 16 test lines. The test lines varied across sites such that not all lines were included in each test. Four lines (PR 2, PR 6, PR 10, and PR 12) are in their third year of testing and were tested at all locations. Nine other lines were tested at two sites, with the remaining lines being tested at one site each

Fatty acid analysis to determine the O/L ration is done by cutting a small piece of tissue from a peanut seed, distal to the embryo. This tissue was macerated, the fatty acids were extracted using organic solvents, and the fatty acids were measured using gas chromatography. Known fatty acids were used as reference standards.

Nematode resistance assays for selected lines was confirmed using our molecular markers linked to nematode resistance.

Results

Results from all yield tests of all lines tested in 2007 are provided in the four tables at the end of the report. More important, however are the comparisons among lines that were included in multiple tests. Four PR lines were included in each test and, when yields were averaged over these four test sites, line PR 12 was very similar to the highest yield cultivar Tamrun OL 07 and much better than NemaTAM (Fig. 1).

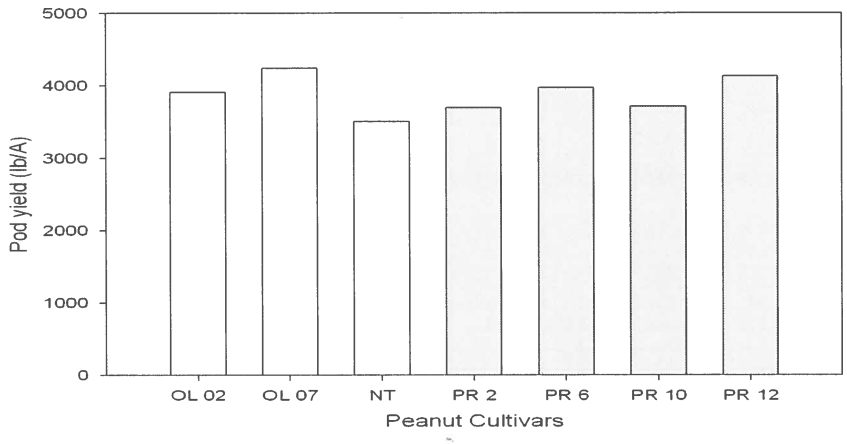

Figure 1. Mean yield averaged over four sites for four breeding lines (PR 2, 6, 10 and 12) with multiple disease resistance and the high O/L trait compared to the cultivars of Tamrun OL 02, Tamrun OL 07, and NemaTAM.

Similarly, when the yields of the nine TP lines tested at two locations in 2007 were compared to the control lines at those locations, four TP lines had greater average yields than did Tamrun OL 07.

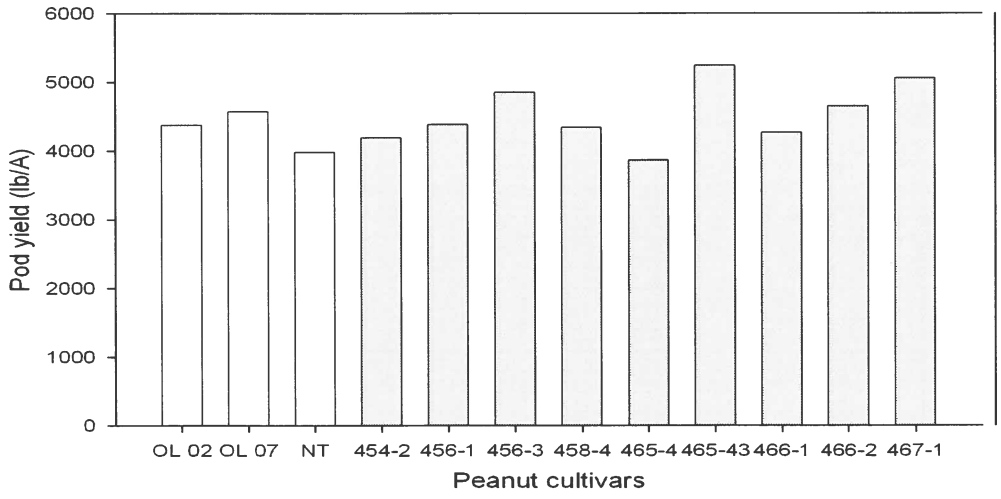

Fig. 2. Comparison of yield potentials of several breeding averaged over two locations. Lines 456-3, 465-43 466-2 and 467-1 were numerically equal to or better than the control cultivars in these tests.

Conclusions

Significant progress has been achieved in our goal to develop a peanut cultivar with multiple disease resistance and the high O/L trait. We currently have yield data from at least one test on more that 40 breeding lines, with some having been tested in multiple locations and years. Several of these breeding lines have yields that are very competitive the cultivars Tamrun OL 02 and Tamrun OL 07 and better than NemaTAM. With another year of yield tests we will be able to begin eliminating those lines with unacceptable yield potential and concentrate on lines with potential for possible release as a cultivar.

Acknowledgements

We greatly appreciate the continuing support of Texas peanut growers and the funding provided through the National Peanut Board.

South Texas test -2007

Cultivar	Value/a		Yield lbs./a		%SMK	
TP456-3-9	1031	ns	5856	ns	71.2	f-j
ARSOK-R1	1096		5836		76.1	a
TP466-1-7	1014		5671		72.6	d-h
TROL02	1010		5561		73.7	b-e
TP465-4-3	1008		5555		73.3	c-f
PR-12	992		5501		73.2	d-f
TP467-1-7	949		5496		69.5	ij
PR-2	998		5477		74.3	a-d
TP456-1-6	940		5376		70.5	h-j
TP465-4-6	989		5314		75.9	ab
TP458-4-9	899		5125		70.7	g-j
TROL07	928		5068		74.4	a-d
PR-6	912		5028		73.3	d-f
TP455-3-4	857		4989		69.1	j
TP454-2-3	885		4981		71.5	e-i
TP466-2-6	904		4960		73.6	b-e
PR-10	880		4929		72.4	d-h
TP468-2-7	858		4734		73.3	d-f
Florunner	836		4471		75.7	a-c
NemaTAM	797		4408		72.9	d-g

Means followed by the same letter are not significantly different by Fisher's LSD (p=0.05).
Value/acre and pounds/acre based on four replications. All other data based on two replications.

2007 Nematode Test 1 Erath Co.						
Cultivar	Value/Ac $		Pods/Ac lbs.		TSMK	
TP465-4-3	953.86	a	4921.9	a	79	ab
TP467-1-7	851.37	ab	4617.8	ab	75	c-f
PR-10	821.66	a-c	4362.6	a-c	77	a-d
TP466-2-6	820.05	a-d	4331.6	a-d	77	a-d
TP468-2-7	745.5	b-f	4153.8	a-e	73	e-g
TamrunOL07	761.29	a-e	4062.6	a-e	76	b-d
PR-12	736.01	b-f	3911	a-e	76	a-d
PR-6	722.05	b-f	3843.6	b-f	76	b-e
TP456-3-9	720.8	b-f	3841.7	b-f	76	a-d
TP454-2-3	690.58	b-f	3670.6	b-f	76	b-e
TP455-4-3	659.75	b-g	3653.7	b-f	73	e-g
TP458-4-9	622.17	d-g	3546.7	c-f	70	g
NemaTAM	670.15	b-f	3533.7	c-f	77	a-d
PR-2	613.28	e-g	3403.5	c-g	73	d-g
TP456-1-6	599.52	e-g	3391.8	c-g	72	fg
Florunner	638.5	c-g	3314.8	d-g	78	a-c
TamrunOL02	589.35	e-g	3180.3	e-g	75	c-f
TP466-1-7	548.11	f-h	2859.5	f-h	78	a-c
TP465-4-6	469.98	gh	2407.9	gh	79	a
ARSOK-R1	383.37	h	1993.9	a	78	a-c

2007 Nematode Test 2 Erath Co.

Cultivar	Value/Ac $		Pods/Ac lbs.		TSMK	
TP496-4-3-1	699.36	a	3706.4	a	77	ab
TamrunOL07	663.38	ab	3529.5	ab	76	ab
TP500-2-4	648.84	ab	3490	a-c	75	ab
TP-501-2-3-1,-2	662.39	ab	3481.3	a-c	78	ab
TP499-2-1-1	635.25	ab	3436.7	a-d	75	ab
PR-12	650.65	ab	3415.3	a-d	77	ab
NemaTAM	629.15	ab	3332.1	a-d	76	ab
PR-6	608.4	ab	3312.4	a-d	73	bc
TP498-8-1-1	610.1	ab	3256.5	a-d	76	ab
TP499-2-5-1,-2-3	607.79	ab	3239.5	a-d	76	ab
PR-2	598.18	ab	3208.6	a-d	76	ab
TP501-2-8-1,-2	603.18	ab	3205.8	a-d	77	ab
TP497-5-9-2	583.79	ab	3062.4	a-d	78	ab
TP499-1-9-1	535.66	bc	3018.6	a-d	69	c
TamrunOL02	552.89	a-c	2995.7	a-d	74	bc
PR-10	527.08	bc	2862.2	b-d	75	ab
Florunner	537.28	bc	2806.4	b-e	76	ab
TP497-5-2-2	530.16	bc	2764	c-e	78	ab
TP497-2-5-2	520.72	bc	2726.1	de	78	ab
ARSOK-R1	409.87	c	2079.8	e	80	a

2007 Nematode Test 3 Erath Co.

Cultivar	Value/Ac $		Pods/Ac lbs.		TSMK	
TamrunOL07	796.6	a	4318.8	a	75	ab
TP503-2-5,-1-2	756.8	a	4029.8	ab	76	ab
PR-6	644.1	a-c	3712.8	a-c	68	c
PR-12	642.5	a-c	3704.2	a-c	71	bc
TP503-3-3	684.1	ab	3628.6	a-d	77	ab
TP507-8-1	676	a-c	3549	a-e	78	a
TP503-2-9-2	647.2	a-c	3391.6	a-f	78	a
TP504-2-10	614.6	a-d	3319	a-f	75	ab
TP507-6-1	603.1	a-d	3258.4	a-f	76	ab
Florunner	604.5	a-d	3220.9	a-f	76	ab
TP502-5-4	607.8	a-d	3208.9	a-f	77	a
TP509-3-9-2	557	a-e	3047.8	a-f	74	a-c
TP501-5-9-2	562.8	a-e	2966.4	b-g	77	a
NemaTAM	493.4	b-e	2764.5	b-g	72	a-c
PR-2	505.7	b-e	2701.9	c-g	76	ab
PR-10	493.1	b-e	2697.6	c-g	74	a-c
TP501-7-8-2	445.8	b-e	2381.4	d-g	77	a
TP501-2-10	430.8	c-e	2326	e-g	76	ab
TP507-2-6-1	390.3	de	2169.1	fg	72	a-c
ARSOK-R1	326.1	e	1710.3	g	78	a