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Final report: March 31, 2009

Project Title:

Development and evaluation of peanut varieties adapted to West Texas.

Personnel and Agency:

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Problem and Need:

The West Texas peanut growing region is unique from all other growing regions in the U.S. and is uncommon relative to peanut growing regions world wide. The combination of high altitude and arid climate sets the region apart from the humid coastal plains where most U.S. peanuts are produced. This unique growing region poses unique challenges to peanut production not experienced elsewhere. Peanut seed varieties grown in West Texas tend to mature more slowly and produce larger kernel size and lower O/L ratios by comparison when grown in other U.S. growing regions. West Texas needs an earlier maturing seed variety that is selected, developed, and tested in West Texas. The variety needs to have high yield and grade, disease resistance, and high oleic oil chemistry.

Plan of Action:

Currently, the most widely grow peanut seed variety in West Texas is 'Flavor Runner 458', developed by Mycogen Seeds. This is the chemically induced high oleic mutant of 'Florunner'. Flavor Runner 458' has the quality characters of 'Florunner' but is still a variety developed for the long hot growing season of the Southeast. After 'Flavor Runner 458' was released as a variety, crosses were

made between 'Flavor Runner 458' and early maturing parental lines. Uniform and segregating lines from these crosses were licensed to ACI by Mycogen/Dow AgroSciences. Over the past 5 years, uniform lines developed from those crosses have been evaluated for adaptability in West Texas. Other uniform lines from the Flavor Runner breeding program are still under evaluation and consideration for commercial production.

This is an ongoing peanut variety development program that requires two principal objectives.

Objective 1: Development of segregating lines for selection in West Texas

Starting in 2003 and continuing to the present, crosses were made between Flavor Runner 458 breeding lines and lines with sources of disease resistance and early maturity. Through generational advancements in the Puerto Rico winter nursery, these lines are in F₂₋₇ generations. Over the past 5 years plant selections have been made in West Texas with emphasis on yield, grade, early maturity, disease resistance and high oleic oil chemistry.

Objective 2: Evaluation of uniform lines

Uniform lines from the original Flavor Runner breeding program were tested in 2008 in multi-location replicated field trials. New uniform lines were selected in 2008 and will enter replicated field trials in 2009. These new lines will first be tested in a preliminary test. The best lines in the preliminary test will go on to be tested the following year in the advanced tests at multiple locations. The best lines in the advanced tests will be considered for seed increase and release.

Current project status

Since the revival of the Flavor Runner Breeding program in 2003, ACI has expanded the breeding program significantly. During the 2008 growing season, 1244 breeding lines were planted and maintained at Brownfield, Texas. Of these breeding lines, only 73 of these lines were developed by the original Mycogen Flavor Runner Breeding program. The remaining 1171 lines were developed by ACI by incorporating the Flavor Runner high oleic character into early maturing germplasm and high yielding sources of disease resistance. Some of these new lines are just coming to uniformity and will be entering replicated field trials in 2009.

In 2008, ten new uniform lines were identified in a preliminary yield trial that were higher yielding than the check variety, Flavor Runner 458, and were earlier maturing. The 2008 advanced tests in Gaines County and Terry County (Table 1 and 2) reconfirmed the superiority of 5 uniform lines over FR 458. These lines are in small seed increases for potential release in the coming year.

Table 1 Advanced yield trial Gaines County Texas 2008

<i>Entry</i>	<i>Reps</i>	<i>Sum</i>	<i>Variance</i>	<i>Average</i>	<i>lbs/acre</i>
WT05-0219	4	96.83	5.1574	24.208	7915.9
WT04-0144	4	93.45	1.8581	23.363	7639.5
WT04-0121	4	93.07	11.038	23.268	7608.5
M04-0149	4	92.5	4.8958	23.125	7561.9
WT03-0048	4	90.26	1.7116	22.565	7378.8
M04-0147	4	89.39	3.0285	22.348	7307.6
Flavor Runner 458	4	88.2	1.4925	22.05	7210.4
WT05-0372	4	88	2.3555	22	7194.0
NC99103	4	79.24	19.125	19.81	6477.9
O1 O2	4	79.2	4.6291	19.8	6474.6
Gregory	4	77.26	7.7432	19.315	6316.0

Table 2 Advanced yield trial Terry County Texas 2008

<i>Entry</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>	<i>lbs/acre</i>
WT04-0144	4	74.19	18.548	7.4132	6065.0
M04-0147	4	71.48	17.87	6.121	5843.5
NC99103	4	70.4	17.6	1.8205	5755.2
WT04-0121	4	69.36	17.34	9.7438	5670.2
WT05-0219	4	69.21	17.303	4.4104	5657.9
M04-0149	4	68.95	17.238	3.458	5636.7
WT03-0048	4	67.67	16.918	0.4128	5532.0
FR 458	4	67.18	16.795	1.7935	5492.0
Gregory	4	66.49	16.623	4.277	5435.6
O1 O2	4	65.94	16.485	8.7534	5390.6
WT05-0372	4	65.3	16.325	5.1072	5338.3

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This is an ongoing peanut variety development program that requires two principal objectives.

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Objective 2: Evaluation of uniform lines

Uniform lines from the original Flavor Runner breeding program were tested in 2009 in multi-location replicated field trials. New uniform lines were selected in 2009 and will enter replicated field trials in 2010. These new lines will first be tested in a preliminary test. The best lines in the preliminary test will go on to be tested the following year in the advanced tests at multiple locations. The best lines in the advanced tests will be considered for seed increase and release.

Current project status

Since the revival of the Flavor Runner Breeding program in 2003, ACI has expanded the breeding program significantly. During the 2009 growing season, 880 breeding line plots were planted near Brownfield, Texas. Also planted at this site, were a preliminary and advanced test and seed increases of 7 potential releases. The preliminary test consisted of 70 uniform lines not previously tested. The advanced yield trial consists of advanced lines that had performed in other tests in other years and locations. Another advanced test with the same entries was planted in Gaines County.

In 2009, 47 new uniform lines were identified in the preliminary yield trial that were equal to or higher yielding than the check variety, Flavor Runner 458 (Table 1). The 2009 preliminary test in Brownfield, Texas was again large due to the increasing number of uniform lines selected in 2008. Lines in the upper 1/3 of this test will be moved into advanced multi-location tests in 2010. Preliminary visual evaluation indicated that many of these lines are earlier maturing than FR 458. The 2009 advanced tests in Gaines County and Terry County (Table 2 and

3) reconfirmed the superiority of 5 uniform lines over FR 458. These lines are in small seed increases for potential release in the coming year.



Test plots near Brownfield, Texas.

Table 1
Preliminary Test 2009 Brownfield, Texas

<i>Entry</i>	<i>reps</i>	<i>Sum</i>	<i>Variance</i>	<i>Average</i>	<i>lbs/acre</i>
WT08-0435	3	46.5	0.1708	15.5	5069
WT08-0757	3	46.26	0.7987	15.42	5042
WT03-0048	3	45.7	1.582033	15.23333	4981
WT08-0198	3	45.07	2.789433	15.02333	4913
WT08-0077	3	44.82	0.0283	14.94	4885
WT08-0110	3	44.69	1.732033	14.89667	4871
WT08-0447	3	44.19	0.0048	14.73	4817
WT08-0406	3	44.06	0.574533	14.68667	4803
WT08-0087	3	43.95	0.6912	14.65	4791
WT08-0798	3	43.87	0.104533	14.62333	4782
WT08-0085	3	43.69	1.171733	14.56333	4762
WT08-0041	3	43.56	2.8273	14.52	4748

WT08-0796	3	43.38	3.8937	14.46	4728
WT08-0448	3	43.26	2.3337	14.42	4715
WT08-0407	3	43.07	1.429433	14.35667	4695
WT08-0199	3	43.01	0.094533	14.33667	4688
WT08-0883	3	42.89	1.520833	14.29667	4675
WT08-0882	3	42.63	1.0159	14.21	4647
WT08-0036	3	42.57	1.0983	14.19	4640
WT08-0017	3	42.38	1.301733	14.12667	4619
WT08-0804	3	42.31	0.625633	14.10333	4612
WT08-0801	3	42.26	5.580633	14.08667	4606
WT08-0046	3	42.25	11.64583	14.08333	4605
WT08-0292	3	41.88	0.0787	13.96	4565
WT08-0441	3	41.75	0.086933	13.91667	4551
WT08-0440	3	41.57	2.169433	13.85667	4531
WT08-0421	3	41.56	0.032033	13.85333	4530
WT08-0443	3	41.56	2.434533	13.85333	4530
WT08-0411	3	41.32	9.386633	13.77333	4504
WT08-0363	3	40.63	0.190633	13.54333	4429
WT08-0797	3	40.51	2.134533	13.50333	4416
WT08-0364	3	40.5	0.3583	13.5	4415
WT08-0065	3	40.44	0.5187	13.48	4408
WT08-0795	3	40.31	2.675633	13.43667	4394
WT08-0049	3	40.19	2.544233	13.39667	4381
WT08-0881	3	40.13	0.189233	13.37667	4374
WT08-0080	3	40	1.349433	13.33333	4360
WT08-0112	3	39.82	10.02083	13.27333	4340
WT08-0414	3	39.81	5.8737	13.27	4339
WT03-0048B	3	39.69	2.1223	13.23	4326
WT08-0042	3	39.69	3.3412	13.23	4326
WT08-0086	3	39.44	5.689233	13.14667	4299
WT08-0011	3	39.38	4.454233	13.12667	4292
WT08-0035	3	39.25	0.024433	13.08333	4278
WT08-0412	3	39.25	4.926633	13.08333	4278
WT08-0417	3	39.19	0.402033	13.06333	4272
WT08-0072	3	39.01	0.980633	13.00333	4252
WT08-0005	3	38.76	1.3887	12.92	4225
WT08-0773	3	38.32	11.39163	12.77333	4177
WT08-0045	3	38.19	0.3937	12.73	4163
WT08-0416	3	38.19	4.0537	12.73	4163
WT08-0419	3	37.37	0.627033	12.45667	4073
WT08-0009	3	37.13	2.481733	12.37667	4047
WT08-0211	3	36.94	0.701733	12.31333	4026
WT08-0215	3	36.88	0.068133	12.29333	4020
WT08-0449	3	36.57	0.7536	12.19	3986
WT08-0800	3	36.07	0.574433	12.02333	3932
FR458	3	36.06	0.0487	12.02	3931
WT08-0802	3	36.06	3.6837	12.02	3931
WT08-0156	3	35.63	3.251733	11.87667	3884

WT08-0070	3	35.25	3.7161	11.75	3842
WT08-0433	3	35.06	0.012033	11.68667	3822
WT08-0429	3	33.75	0.1183	11.25	3679
WT08-0022	3	33.19	0.027033	11.06333	3618
WT08-0984	3	32.81	2.837033	10.93667	3576
OLO2	3	31.7	1.414533	10.56667	3455
WT08-0427	3	31.25	0.270833	10.41667	3406
WT08-0422	3	31	1.741633	10.33333	3379
WT08-0424	3	30.63	0.2559	10.21	3339
WT08-0430	3	28.82	0.214433	9.606667	3141
WT08-0020	3	28.69	4.449233	9.563333	3127
WT08-0432	3	27.81	3.0612	9.27	3031

Results of advanced tests from Terry County and Gaines County are summarized in Table 2 and Table 3.

Table 2

Terry Co. advanced test

<i>Entry</i>	<i>Reps</i>	<i>Sum</i>	<i>Variance</i>	<i>Average</i>	<i>lbs/acre</i>
NC99103	4	53.44	0.019133	13.36	4369
Gregory	4	51.69	2.433825	12.9225	4226
M04-0147	4	50.57	1.027892	12.6425	4134
WT04-0121	4	50.39	0.896825	12.5975	4119
WT08-0444	4	50.06	0.1583	12.515	4092
WT08-0009	4	49.2	2.589133	12.3	4022
M04-0149	4	48.95	1.408092	12.2375	4002
WT05-0372	4	46.94	0.599767	11.735	3837
WT05-0219	4	46.2	0.647467	11.55	3777
WT03-0048	4	46.07	0.336225	11.5175	3766
FR 458	4	45.2	0.4558	11.3	3695
OL02	4	39.57	1.164758	9.8925	3235

Table 3

Gaines Co. Advanced Test 2009

<i>Entry</i>	<i>Reps</i>	<i>Sum</i>	<i>Variance</i>	<i>Average</i>	<i>lbs/acre</i>
WT08-0009	4	87.13	1.833291667	21.7825	7101
WT05-0219	4	83.94	1.5083	20.985	6841
NC99103	4	83.38	1.704433333	20.845	6795
WT03-0048	4	83.18	0.272566667	20.795	6779
WT08-0444	4	82.5	2.213966667	20.625	6724
WT05-0372	4	81.12	1.209533333	20.28	6611
M04-0147	4	79.82	0.217366667	19.955	6505
M04-0149	4	79.45	0.923091667	19.8625	6475
WT04-0121	4	79.13	2.188291667	19.7825	6449
Gregory	4	78.32	2.9358	19.58	6383
FR 458	4	73.45	1.056225	18.3625	5986
OL06	4	62.25	0.220425	15.5625	5073

WT04-0121 was selected in West Texas from segregating lines resulting from a cross between FR 458 and Sunbelt Runner. Consistently, WT04-0121 has yielded well in comparison with Flavor Runner 458. Also, the size of this variety more closely resembles FR 458. WT04-0121 has shown to be disease resistant over the past 2 years as compared with other lines and varieties even when planted adjacent to other varieties with severe symptoms. In the 2009 growing season, 120 acres of WT04-0121 were planted and yield was over 5000 pounds per acre. This has not been shelled to date so the exact amount of planting seed for 2010 has not been determined. This will be breeder seed to be certified as foundation seed, of which some will probably be down-graded to registered seed for planting in 2011. Variety protection will be filed within the next 1-2 months.

M04-0147 and M04-0149 are also potential releases. These varieties have performed well in a wide range of environments. They both have general disease resistance. M04-0147 has been shown to have moderate resistance to CBR and both varieties have resistance to TSWV equal to Georgia Green. One of these lines will be released as a commercial variety based on final results from 2010.