

Final Report to the National Peanut Board  
Funding Year 2003

**Project Title: Selection of a Multiple Disease Resistant Runner-Type Peanut**

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**Statement of Problem:**

The TAMU Peanut Breeding program has developed several good breeding lines with individual levels of resistance to Early and Late Leafspot, Tomato Spotted Wilt Virus, *Sclerotinia minor*, and other soil borne diseases. Crosses have been made in an attempt to combine these individual resistances into single multiple disease resistant breeding lines. The main objectives of this study were to select for multiple disease resistance in new breeding lines and to determine which if any of three different selection techniques used would prove to be the most efficient and effective method in terms of yield, grade, and value/A gained through the disease resistance.

**Plan of Action:**

Individual plant selections were made during the 2000 and 2001 growing season as reported earlier. Nine populations were initially used for selection, but 5 were discarded due to lack of disease resistance. The remaining four populations had 2 lines selected from each population under each of the three different selection techniques for a total of 24 entries. Three parents (Tamrun 96, Tx901639-3, Sun Oleic 95R) and three commonly grown varieties (Tamrun OL 01, Flavor Runner 458, Georgia Green) were added to the test as checks which brought the total number of entries to 30. These entries were yield tested in 2003 and 2004 at four locations. Location 1 was in Frio County under Tomato Spotted Wilt Virus pressure. Location 2 was located in Erath County under multiple disease pressure. Location 3 was in Ft. Cobb, Oklahoma under *Sclerotinia minor* pressure. The final trial was run in location 4 which was in Gaines County under a disease free environment to check the adaptability of the selections to the West Texas environment.

**Result and Conclusions:**

The yield data as shown in **Table 1** reveals that we were able to successfully select several breeding lines which had yield, grade, and value/A statistically equal to or better than the check varieties and the parents. The combined analysis for all four locations is provided in order to show the relative performance across the environments as a whole. Yield data from individual locations is also provided in the four right-hand columns. Depending on the location, there were several lines like Tx01Y4138 and Tx01F5404 that yielded extremely well relative to the other entries.

The Gaines County location, where no disease pressure was present, had all of the selections performing statistically lower in yield than 2 of the commonly grown varieties. However, where there was significant disease pressures, several of the breeding lines outperformed the check varieties.

Table 2 represents the significance levels of the statistical analysis run to determine the effects that the different selection techniques had on yield, grade and value per acre. All analysis were run at the level of  $P=0.05$  for test of significance. The 2002 growing season

showed significance for differences in techniques when looking at the variable 'yield' in 2 of the 4 locations with  $P=.001^{**}$  and  $P=.0298^{*}$ . In addition, one of these locations also showed significance for technique when looking at the variable 'value/A' with  $P=.001^{*}$ .

However, when the combined analysis were run across all four locations for the year 2002, no significant difference was noted between techniques when looking at the effects on yield ( $P=.9944$ ), grade ( $P=.1663$ ) or value/A ( $P=.9423$ ).

The 2003 growing season had very similar results. The only level of significance detected between selection techniques occurred at location 3 when testing the variable 'grade'. The combined analysis once again showed no significant differences between selection techniques when testing any of the three variables.

The results of this study indicate that neither the order of selection when using a sequential selection technique nor the use of a multiple disease screening nursery for selection will change the efficiency or effectiveness of the process. We were able to select breeding lines with multiple disease resistance by using all three selection techniques and these lines will further the breeding efforts of the program.

#### **Acknowledgements:**

We sincerely thank the National Peanut Board and the Texas Peanut Producers Board for the four years of support that we received for this project. The results of this work allows us to pursue selection work for multiple disease resistance traits with the knowledge that any one of the three methods tested will provide accurate data and evaluations in an effective and efficient manner. We have also gained several valuable multiple disease resistant breeding lines which may be used as new germplasm sources.

**Table 1. Selection of a Multiple Disease Resistant Runner-Type Peanut**

Combined Analysis across Four Locations					Gaines Co.	Frio Co.	Erath Co.	Ft. Cobb
Cultivar	Value/A	Lbs./A	TSMK%	Sd./Lb.	Lbs./A	Lbs./A	Lbs./A	Lbs./A
01Y 4138	842a	5107a	66.3ef	799c-g	5722bc	6888a-c	4174a	3646ab
Ga Green	827ab	4654a-c	71.6a-c	829b-d	6250a	6847a-d	2436h-k	3081d-h
T-96	821ab	4715a-c	69.9a-d	761h-k	5388b-f	6933a-c	3554a-e	2985d-j
01F 5404	811a-c	4733ab	69.0b-e	794d-g	5227c-h	7002ab	3444a-f	3259b-e
01Y 4104	801a-d	4537b-e	70.0a-d	710mn	4961f-k	6791a-e	3589a-d	2807e-m
01F 6212	798a-d	4540b-e	70.2a-d	687no	5634b-d	6066d-i	3830ab	2630h-o
01F 6239	781a-e	4368b-g	71.7a-c	782f-j	5071e-j	6202b-h	2780c-i	3421a-d
01F 5478	777a-e	4593b-d	67.8de	806c-f	5507b-e	6200b-h	3630a-d	3033d-i
01F 5445	774a-f	4522b-e	68.3de	822b-e	4950f-k	6868a-d	3850ab	2420k-o
01F 5443	773a-g	4404b-g	70.1a-d	814b-f	5277c-g	6030e-i	3437a-g	2872e-k
01F 6223	768a-g	4459b-f	69.0b-e	727lm	5291c-g	6623a-f	3406a-h	2517j-o
01Y 4126	768a-g	4440b-f	68.3de	702mn	5140d-i	6424a-g	3758a-c	2436k-o
01F 6251	757a-h	4410b-g	71.9ab	811b-f	5627b-d	5529hi	332b-i	3452a-d
01F 6246	755a-h	4255c-h	70.3a-d	750kl	4611j-l	6181c-i	2452g-k	3775a
Tx961639-3	750b-h	4315b-g	69.2a-d	846b	4918f-l	6195b-h	3065b-i	3081d-h
01Y 4133	747b-h	4427b-g	67.4de	752j-l	5246	6327a-h	3312a-h	2823e-l
01F 5415	745b-h	4150d-h	72.1a	848b	4420lm	6123c-i	2474f-k	3582a-c
01F 6269	743b-h	4471b-f	67.7de	828b-d	5274c-g	6447a-g	3048b-i	3114c-g
01F 5405	739b-i	4286b-h	68.5de	759i-k	5158d-h	5988e-i	3740a-c	2259no
01Y 4134	726c-i	4124e-h	70.1a-d	769g-k	4904f-l	5773g-i	3413a-h	2404k-o
FlavRun458	720c-i	4157d-h	68.1de	834bc	5496b-e	5978e-i	2493f-k	2662g-o
01Y 4123	716d-i	4164d-h	67.8de	790e-i	4599j-l	6192b-h	2703d-i	3162c-f
T-OL-01	714d-i	4172d-h	68.1de	667o	4547kl	7030a	2578e-i	2533j-o
01F 6275	703e-j	4091e-h	68.4de	843b	4792g-l	5905f-i	3326a-h	2339m-o
01F 5470	698e-j	4075e-h	68.3de	832bc	4586j-l	6868a-d	2151i-k	2694f-n
01Y 4137	684f-j	4035f-h	67.4de	713mn	4630i-l	5864f-i	3288a-h	2356l-o
SunOleic95F	682g-j	3970g-i	69.4a-d	769g-k	5836ab	5732g-i	1713jk	2598i-o
01Y 4106	666h-j	4114e-h	64.4f	898a	4719h-l	6153c-i	3391a-h	2194o
01F 6250	649ij	3832hi	67.4de	744kl	4974f-k	5913f-i	1781jk	2662g-o
01F 5422	613j	3502i	68.8c-e	794d-g	3976m	5375i	1607k	3049d-i
MEAN	745	4321	68.9	779	5091	6282	3048	2861
CV%	15.3	13.5	5.3	5.3	6.3	8	19.9	10
LSD	92	468	2.9	33	522	816	992	470

**Table 2. Comparison of Techniques**

Significance of Techniques at P=0.05				
Year	Location	Yield	Grade	Value
2002	1	0.1573	0.4074	0.5181
2002	2	<b>.0001**</b>	0.956	<b>.0001**</b>
2002	3	0.6621	0.4468	0.6522
2002	4	<b>.0298*</b>	0.0639	0.126
2002	Combined	<b>0.994</b>	0.1663	0.9423
2003	1	0.4471	0.2955	0.82
2003	2	0.0774	0.6891	0.1866
2003	3	0.1644	<b>0.0211*</b>	0.2204
2003	4	0.2273	0.063	0.2541