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NATIONAL PEANUT BOARD Final Report

PROJECT TITLE: Selecting New Candidates and Maintaining Breeder Seed of Varieties Released from the Virginia Peanut Development Program

TERM OF PROJECT: 1 year

FUNDING AMOUNT: $4,464

PROJECT CO-INVESTIGATORS: Dr. Dennis L. Coker and Hugh Pittman (Virginia Tech)
(Report submitted by F. M. Shokes, Interim PVQE Coordinator)

LOCATIONS: Tidewater AREC, Suffolk, VA and Jack Pond Farm, Southampton Co., VA

RESEARCH OBJECTIVES:

1. Select germplasm with early maturity, high yield, reduced disease susceptibility, bright pods, desirable seed size, and quality characteristics through the Virginia Peanut Development Program .

2. Maintain the purity of Virginia released peanut varieties by supplying breeder seed to the Foundation Seed Program.

3. Document the effect of disease pressure, accumulated heat units, and seasonal rainfall patterns on the maturity and economic value of large seeded, virginia-type peanuts in multiple locations.

Breeder tests were conducted in 2006, at the Hare Road Research Farm of the Tidewater AREC and at the Jack Pond Farm in Southampton County. In general the 2006 cropping season began with a dry spring, was alleviated by early summer rains, punctuated by a mid-season dry spell, and wetted with a late-season tropical storm. Soil moisture at planting was adequate at the Suffolk, and Southampton County, sites. Tests were planted beginning May 22 and concluded by May 23 and good stands were obtained at all sites. Rainfall was higher than normal at both locations during the growing season Table 1. The Southampton site received a high amount of precipitation with frequent rains during June, July, and August, followed by a major amount in September. Rainfall was less at the Suffolk site with near normal precipitation except for a dry period in July and August. Heat units were adequate for normal crop development and exceeded 2600 heat units by harvest.

Table 1. Precipitation (inches) at each test site during the 2006 growing season.

Location	May	June	July	Aug.	Sep.	Oct.	Total
Suffolk	3.46	8.00	3.39	3.84	8.14	7.84	34.67
Southampton	2.80	7.10	7.30	7.65	11.00	8.50	44.35

Objective 1: Only data from Breeder Test 5 at the Tidewater AREC is shown for illustration. This particular study (Breeder Test 5) was duplicated at the Southampton location. In this test 33 peanut breeding lines from the Virginia Tech Varietal Development Program were compared to three standard commercial varieties for growth habit, plant height, disease susceptibility, and major grade factors (Table 2). Yields, relative pod sizes, pod brightness and values are given in Table 3. When selecting breeding lines for further evaluation the various scores are taken into consideration. Consider for example, that VT024064 scores above the mean (average) for most of the measurements and has a high yield and dollar value. This is a good selection for further testing in the Peanut Variety Quality Evaluation Program (PVQE) trials. The purpose of the Breeder tests is to select breeding lines with desirable character traits for intensive evaluation. Four Breeder Tests were conducted in 2006 and data from several of these trials is still being analyzed. Results from these trials will be used to select entries into the 2007 PVQE trials. Results of the PVQE trials will then determine whether lines should be further advanced toward varietal development. All of these efforts are integral to the viability of virginia-type peanut production in Virginia.

Table 2: Comparison of peanut genotypes from Breeder Test 5 at the Tidewater AREC in 2006, for and major grading factors in 2006.

*GH designates the growth habit as.*growth habit, plant height, disease runner or intermediate runner; Plant height is in inches; Disease is the mean number of feet per row

Genotypes	GH	Plant Height	Disease	% ELK	% SMK	% Total Kernels
VT 023096	R, IR	13.9 a-d	2.3 a-d	46 a-g	67 ab	74.8 ab
VT 023014	R	12.7 a-i	1.3 bcd	49 ab	67 ab	73.2 a-e
VT 023079	R	12.8 a-h	4.7 a	49 abc	64 a-e	70.1 d-j
VT 023086	R	12.3 b-i	1.3 bcd	38 h	60 c-j	69.2 g-k
VT 023117	R	11.8 d-i	1.3 bcd	40 d-h	65 a-e	71.9 b-g
VT 023152	R	14.0 a-d	0.7 bcd	46 a-g	64 a-f	71.2 c-i
VT 023162	R	12.6 a-i	3.3 abc	37 h	58 g-j	67.6 jkl
VT 024039	IR	10.8 f-j	1.7 a-d	48 a-d	64 a-e	71.6 b-h
VT 024045	R	13.4 a-g	1.0 bcd	46 a-g	62 b-i	69.7 f-k
VT 024064	**R**	**11.1 e-j**	**0.0 d**	**47 a-e**	**65 abc**	**72.1 b-g**
VT 024128	R	14.9 ab	0.7 bcd	49 abc	65 a-e	72.6 a-f
VT 003168	R	13.1 a-g	0.7 bcd	50 ab	66 ab	71.6 b-h
VT 004156	R	11.5 d-i	2.3 a-d	46 a-g	62 b-i	69.9 e-j
VT 01338	IR	13.9 a-d	3.0 a-d	49 ab	66 ab	73.6 abc
VT 024134	R	10.1 hij	2.0 a-d	47 a-e	63 a-g	71.9 b-g
VT 024152	R	9.9 ij	0.0 d	38 gh	67 ab	74.4 abc
VT 976106-2	R	11.6 d-i	2.0 a-d	40 d-h	63 b-h	69.2 g-k
VT 976131	R	12.4 b-i	1.0 bcd	49 abc	67 ab	73.3 a-d
VT 004062	R	12.3 b-i	3.0 a-d	40 e-h	57 ij	65.8 l
VT 004103	R	13.0 a-g	3.0 a-d	47 a-e	62 b-i	69.8 f-k
VT 004152	R	13.4 a-f	2.3 a-d	44 b-h	65 a-d	71.6 b-h
VT 004125	R	13.4 a-g	1.0 bcd	43 b-h	57 hij	66.5 kl
VT 004045	R	13.7 a-e	0.7 bcd	42 b-h	60 c-j	68.1 i-l
VT 004102	IR	13.9 a-d	3.7 ab	46 a-f	60 d-j	67.2 jkl
VT 003174	IR	15.3 a	1.0 bcd	46 a-g	62 b-i	67.6 jkl
VT 003185	IR	12.1 c-i	3.0 a-d	39 fgh	58 f-j	68.4 h-l
VT 003191	R	8.6 j	0.7 bcd	43 b-h	64 a-f	73.8 abc
VT 003200	R	12.7 a-h	1.7 a-d	43 b-h	60 e-j	68.9 g-l
VT 004098	R	13.2 a-g	4.7 a	53 a	69 a	75.6 a
VT 9506083-3	R	11.3 d-i	0.7 bcd	41 c-h	55 j	62.5 m
VT 003123	R	14.8 abc	1.7 a-d	41 c-h	60 c-j	68.2 i-l
VT 003046	R	11.7 d-i	0.3 cd	43 b-h	60 c-j	68.1 i-l
VT 003177	IR	15.3 a	1.0 bcd	46 a-f	62 b-i	68.4 h-l
VA 98R	R	11.7 d-i	1.7 a-d	40 e-h	58 g-j	69.1 g-l
Perry	R	13.5 a-f	2.3 a-d	47 a-e	64 a-e	72.1 b-g
CHAMPS	R	10.6 g-j	2.3 a-d	49 ab	66 ab	73.6 abc
Mean		**12.6**	**1.8**	**44**	**63**	**70.4**

showing symptoms, mainly tomato spotted wilt virus; % ELK is the percentage of extra large kernels; % SMK is the percentage of sound mature kernels; % Total kernels includes SMK, damaged kernels and other kernels (not shown).

Table 3: Comparison of peanut genotypes for pod size, brightness, yield, and value in Breeder Test 5 at the Tidewater AREC in 2006.*

Genotypes	% Jumbo	L Score	% Fancy	L Score	Support Price $/CWT	Yield lb/A	$ Value/A
VT 023096	18.5 m	41.1 b-g	63.0 a	42.1 abc	18.27 a	5533 a-d	1010 a-d
VT 023014	61.5 e-i	40.5 d-g	28.5 g-j	40.0 a-f	17.42 a-e	5588 abc	968 a-f
VT 023079	55.0 hij	43.4 a-d	34.0 e-h	40.8 a-e	17.30 a-f	5424 a-e	938 a-f
VT 023086	42.0 kl	43.5 a-d	35.0 e-h	42.1 abc	15.85 c-i	4884 b-e	772 d-g
VT 023117	36.0 l	42.0 a-g	46.5 bc	41.5 abc	17.19 a-f	4606 cde	788 c-g
VT 023152	39.0 l	42.7 a-e	38.5 c-f	41.8 abc	17.03 a-f	4892 b-e	837 a-g
VT 023162	65.0 d-i	42.0 a-g	23.0 i-l	41.3 abc	15.36 e-i	5054 b-e	775 c-g
VT 024039	35.0 l	43.3 a-d	45.5 bcd	41.0 a-d	17.04 a-f	5396 a-e	917 a-f
VT 024045	53.0 ijk	43.4 a-d	36.0 d-g	42.3 ab	16.63 a-h	5835 abc	970 a-f
VT 024064	**60.0 f-i**	**43.0 a-e**	**32.0 f-i**	**40.5 a-e**	**17.59 a-d**	**6002 ab**	**1053 abc**
VT 024128	80.5 abc	42.7 a-e	16.0 k-o	37.5 efg	17.65 a-d	5335 a-e	940 a-f
VT 003168	81.5 abc	40.1 efg	14.0 l-o	39.2 b-f	17.58 a-d	5028 b-e	885 a-g
VT 004156	73.0 b-f	43.4 a-d	21.0 j-n	40.2 a-f	16.86 a-g	5444 a-e	915 a-f
VT 01338	36.0 l	42.8 a-e	40.0 c-f	40.8 a-e	17.62 a-d	5556 a-d	975 a-f
VT 024134	68.5 c-g	43.3 a-d	23.5 i-l	38.9 c-f	17.47 a-e	4666 cde	813 b-g
VT 024152	12.5 m	44.0 abc	38.0 c-g	43.2 a	17.54 a-e	4193 e	732 efg
VT 976106-2	74.0 a-e	43.2 a-d	18.5 j-n	41.5 abc	16.41 a-i	5067 b-e	828 a-g
VT 976131	57.5 ghi	44.1 ab	34.5 e-h	42.1 abc	18.06 ab	5686 abc	1021 a-d
VT 004062	71.5 b-f	43.9 abc	22.0 j-m	42.9 a	15.54 d-i	5363 a-e	832 a-g
VT 004103	81.0 abc	42.6 a-e	15.0 l-o	40.0 a-f	15.18 f-i	5650 abc	856 a-g
VT 004152	78.5 a-d	44.7 a	17.0 k-o	40.3 a-f	17.28 a-f	5762 abc	992 a-e
VT 004125	83.5 ab	39.1 g	12.5 mno	37.2 fg	15.19 f-i	4766 b-e	724 efg
VT 004045	84.0 ab	41.3 b-g	12.5 mno	38.8 c-f	15.91 b-i	5395 a-e	858 a-g
VT 004102	83.5 ab	43.3 a-d	12.0 mno	40.5 a-e	14.80 ghi	5446 a-e	805 b-g
VT 003174	77.0 a-d	43.4 a-d	18.5 j-n	43.3 a	16.65 a-h	5650 abc	939 a-f
VT 003185	73.0 b-f	43.7 abc	19.5 j-n	40.3 a-f	14.44 i	4808 b-e	698 fg
VT 003191	21.5 m	42.3 a-f	54.0 b	41.1 abc	17.72 a-d	4562 cde	805 b-g
VT 003200	77.0 a-d	44.7 a	17.5 k-o	41.6 abc	16.80 a-g	5804 abc	972 a-f
VT 004098	68.0 c-h	42.4 a-f	21.0 j-n	37.7 d-g	18.40 a	5357 a-e	979 a-e
VT 9506083-3	87.5 a	39.5 fg	7.5 o	35.7 g	14.52 hi	4294 de	622 g
VT 003123	85.0 ab	42.4 a-f	11.0 no	40.7 a-e	15.99 b-i	5377 a-e	864 a-g
VT 003046	82.5 ab	42.3 a-f	12.0 mno	39.3 b-f	15.96 b-i	5524 a-d	878 a-g
VT 003177	68.5 c-g	44.5 a	21.5 j-m	41.9 abc	16.97 a-f	6500 a	1100 a
VA 98R	38.5 l	41.0 c-g	43.0 cde	41.0 a-d	14.61 hi	5538 a-d	806 b-g
Perry	44.5 jkl	41.7 a-g	39.5 c-f	39.9 a-f	17.30 a-f	5307 a-e	916 a-f
CHAMPS	63.0 e-i	42.1 a-f	26.0 h-k	40.6 a-e	18.02 abc	5960 ab	1071 ab
Mean	**61.6**	**42.6**	**26.9**	**40.5**	**16.67**	**5313**	**885**

*% Jumbo represents the percentage of jumbo pods; % Fancy represents the percentage of fancy pods; L scores are an indication of pod brightness; Support price is based on the value per hundred weight; Value is based on the price support and yield.

Objective 2: In order to maintain a source of pure and viable seed of Virginia- released peanut varieties, seed increases for NC-V11, CHAMPS, and VA-98R were grown from breeder seed at the Tidewater AREC in 0.6A plots. Because of low demand, the variety Wilson was excluded from the seed increase in 2006. Plots were planted using breeder seed that is maintained at the Tidewater AREC as a seed source. Plots were rogued and harvested with a clean combine to keep the varieties segregated. This crucial phase of the Virginia Tech Peanut Varietal Development Program is necessary in order to maintain the purity of released varieties. Approximately 900 lbs of each variety will be transferred to the Virginia Foundation Seed Program to be used for production of foundation seed. Maintaining foundation seed from a pure source allows the production of certified seed with the assurance that the commercial varieties will perform true to the expectations for that variety year after year.

Objective 3: Lines selected from previous breeder tests for inclusion in the detailed evaluations of PVQE are listed in Table 4 with VT numbers and are compared to nine commercial varieties of virginia-type peanuts. This table actually presents an average of three years of testing of these lines at five locations, in effect, 15 different environments. Note that a number of lines from the North Carolina State University Breeding Program of Dr. Tom Isleib are included in the tables. Although only the first harvest date information is given here, these tests actually include an early and a late harvest so that early maturing lines may be selected. This is important since Virginia is at the northern end of the peanut belt and early frosts can be a problem. Although these trials frequently have up to 50 entries, only the 27 genotypes (lines and varieties) common across three years, are shown. Table 5 gives the rankings of the same 27 lines for seven important characteristics. Several lines performed consistently well over the different environments as shown by high rankings (low numbers). For example, VT03069 ranked high for 6 of 7 parameters and VT024051 ranked high for 5 of 7 parameters. Two North Carolina lines also ranked similarly, N003013T and N02009. Lines that consistently do well over several years and locations are scrutinized by a PVQE Advisory Committee for their potential as future varieties. Members of the committee represent every segment of the peanut industry. Lines that are eventually selected for development into a variety will undergo seed increase and further scrutiny after being processed into commercial peanut products.

Breeder tests funded by the National Peanut Board through the Virginia Peanut Growers Association make it possible to continue the selection of promising breeding lines for development into future varieties. The seed increases that were funded help our Foundation Seed organization to maintain sufficient quantities of pure breeder seed to become foundation seed and ultimately provide certified seed for commercial production. This maintains the integrity of the virginia-type peanut varieties that were developed by Virginia Tech.

Table 4. Performance of peanut genotypes (lines and varieties) for early harvest, averaged over three years (2004-2006) across five locations.

Genotype	% Fancy	% ELK	% SMK	% Total Kernels	Price $/cwt	Yield lb/A	Value $/A
Wilson	83 e-h	33 lm	63 ghi	69 h	16.36 e-j	4394 a	732 abc
VT 024051	77 kl	40 fg	67 ab	74 b	17.58 abc	4346 ab	596 h
VT 003069	87 bcd	43 de	68 a	75 a	17.83 ab	4248 abc	690 b-g
N01013T	87 bcd	47 abc	67 abc	73 bcd	17.93 a	4232 a-d	682 c-g
N99103ol(9)	77 kl	34 klm	66 b-e	73 bcd	17.38 abc	4207 a-e	707 a-e
N02009	85 c-f	48 a	67 ab	73 bcd	17.32 a-e	4177 a-f	649 d-h
Phillips	81 g-j	44 d	66 b-e	73 cde	17.18 a-e	4150 a-g	710 a-e
NC-V 11	77 kl	33 m	66 b-f	72 c-f	16.92 b-g	4102 a-g	774 a
VT 003126	79 jk	41 ef	66 b-e	73 bcd	17.20 a-e	4059 a-g	688 c-g
CHAMPS	80 hij	35 jkl	66 bcd	73 cde	17.07 a-f	4042 a-g	727 a-d
N01054	89 b	42 de	63 ghi	70 h	16.08 g-k	4018 b-g	693 b-g
N02007	88 bc	47 ab	66 b-f	72 def	17.21 a-e	4016 b-g	653 d-h
VA 98R	74 lm	35 klm	64 d-g	72 c-f	16.66 c-h	4012 b-h	739 abc
VT 003159	86 b-e	41 ef	61 ij	70 h	15.44 jk	3959 c-h	686 c-g
VT 003194	84 d-g	38 g-j	66 b-f	73 bcd	17.19 a-e	3956 c-h	626 fgh
N02006	89 b	49 a	65 d-g	71 g	16.79 c-h	3952 c-h	674 c-g
NC 12C	83 f-i	45 bcd	67 abc	73 bc	17.37 a-d	3950 c-h	767 ab
VT 003193	80 ijk	37 h-k	64 fgh	72 def	16.15 f-j	3925 c-h	639 e-h
Gregory	88 bc	45 cd	62 hi	70 h	15.60 ijk	3908 c-h	767 ab
N02005	88 bc	49 a	67 abc	73 cde	17.29 a-e	3892 c-h	675 c-g
Brantley	87 bcd	49 a	64 d-g	72 fg	16.39 d-i	3885 c-h	702 a-f
VT 003181	86 b-e	38 ghi	65 c-f	72 efg	16.94 a-g	3882 c-h	683 c-g
Perry	73 m	38 ghi	66 b-f	73 cde	17.43 abc	3860 d-h	727 a-d
N00035J	92 a	48 a	60 jk	68 i	15.18 k	3844 e-h	698 a-f
VT 004180	83 f-i	39 fgh	64 efg	72 c-f	16.59 c-h	3817 fgh	597 h
VT 004167	88 bc	36 i-l	59 k	69 i	15.19 k	3795 gh	617 gh
N02020J	89 b	48 a	63 ghi	70 h	15.93 h-k	3645 h	643 e-h
MEAN	**84**	**42**	**65**	**72**	**16.75**	**4010**	**687**
CV (%)	**6**	**10**	**4**	**2**	**9**	**13**	**16**

*Genotypes are the breeding lines or varieties. Parameters shown are the % fancy pods, % extra large kernels (ELK), % sound mature kernels (SMK), % total kernels, support price in $/hundred weight, yield in lb/acre, and the $ value per acre. Means are the averages across three years at five locations for each parameter, and CV is the coefficient of variation, a value indicating how much variability there is in the data (CV's below 10 are very good and values below 20 are acceptable for field data).

Table 5. Performance of lines averaged across all locations -Dig I - three year averages 2004-2006.

Genotype	% Fancy	% ELK	% SMK	% Total Kernels	Price $/CWT	Yield lb/A	Value $/A
Wilson	8	16	6	8	20	1	5
VT 024051	12	9	2	2	3	2	27
VT 003069	4	6	1	1	2	3	13
N01013T	4	3	2	3	1	4	17
N99103ol(9)	12	15	3	3	5	5	9
N02009	6	2	2	3	7	6	21
Phillips	9	5	3	3	12	7	8
NC-V 11	12	16	3	4	15	8	1
VT 003126	11	8	3	3	10	9	14
CHAMPS	10	14	3	3	13	10	6
N01054	2	7	6	6	22	11	12
N02007	3	3	3	4	9	12	20
VA 98R	13	14	5	4	17	13	4
VT 003159	5	8	8	6	25	14	15
VT 003194	7	11	3	3	11	15	24
N02006	2	1	4	5	16	16	19
NC 12C	8	4	2	3	6	17	2
VT 003193	10	12	5	4	21	18	23
Gregory	3	4	7	6	24	19	3
N02005	3	1	2	3	8	20	18
Brantley	4	1	5	4	19	21	10
VT 003181	5	11	4	4	14	22	16
Perry	14	11	3	3	4	23	7
N00035J	1	2	9	9	27	24	11
VT 004180	8	10	5	4	18	25	26
VT 004167	3	13	10	7	26	26	25
N02020J	2	2	6	6	23	27	22
MEAN	**84**	**42**	**65**	**72**	**16.75**	**4010**	**687**

*Genotypes are the breeding lines or varieties. Parameters shown are the % fancy pods, % extra large kernels (ELK), % sound mature kernels (SMK), % total kernels, support price in $/hundred weight, yield in lb/acre, and the $ value per acre. Means are the actual averages across three years at five locations for each parameter.

**The rankings given indicate where each genotype (line or variety) fit for a given parameter. The highlighted data indicates the genotype that was at, or near the mean for the 27 entries. One or more genotype(s) may be at or near the mean that is listed in the bottom row and was taken from Table 3. Genotypes with lower numbers than th, ranked higher than the mean and conversely those with higher numbers were ranked below the mean for a given parameter.