Agronomic Performance and Economic Return among Peanut Genotypes with Maximum and Minimum Production Inputs

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ABSTRACT

Maximum (Max) and minimum (Min) peanut (*Arachis hypogaea* L.) input production tests were conducted for three consecutive years (2004–06) to evaluate agronomic performance and economic return among several runner and virginia genotypes. Mid-April planting dates were used each year. The Max tests included recommended production practices of seeding rate, fertilization, irrigation, and pesticides; whereas, the Min tests excluded irrigation, insecticides, and included only three fungicide sprays. Results showed variation among years, locations, and genotypes for TSWV and total disease incidence, pod yield, gross dollar value, and dollar value return above variable cost. The performance results also show the benefit to growers from agronomic and economic improvement with many of the newly released peanut cultivars in Georgia. Significant differences ($P \leq 0.05$) among the peanut genotypes for tomato spotted wilt disease [caused by *Tomato spotted wilt virus* (TSWV)] where noted. The lowest TSWV incidence was noted for the cultivars Georgia-06G, Georgia Greener, Georgia-07W, Georgia-08V, Georgia-05E, Georgia-03L, Georgia-02C, Georgia-01R, and AP-3. Highest pod yields were found among Georgia-06G, Georgia Greener, Georgia-07W, Georgia-08V, Georgia-05E, and Georgia-01R. In general, the highest average dollar value return above variable cost was found in the Max test as compared to the Min test, and the highest average dollar value return above variable cost including seed cost was found with the runner-type cultivars Georgia-06G and Georgia Greener.

Key Words: *Arachis hypogaea* L., disease resistance, dollar value return, gross dollar value, groundnut, irrigation, and pod yield.

Cultivated peanut (*Arachis hypogaea* L.) production in the U. S. has become dependant upon numerous types of fungicides, herbicides, insecticides, miticides, and nematicides (Warren *et al.*, 1995). Annually, pesticides and irrigation contribute the largest variable input costs to U.S. peanut growers (Smith, 2006).

Current pesticides used in the U.S. are very effective but expensive. Likewise, irrigation is needed to increase yield and market grades in peanut production. However, the maximum yield and grade may not be the most economical. Possibly, growers could utilize minimum inputs and still achieve the highest dollar value return above variable cost. However in previous studies without any fungicides and insecticides, pod yield performance was found to be relatively low (Branch and Fletcher, 2001; Branch and Culbreath, 2008). So, an integrated disease management approach with resistant cultivars, reduced fungicides, and no irrigation could substantially lower production variable cost, and still result in high economical returns.

In the southeast U.S., tomato spotted wilt disease caused by *Tomato spotted wilt virus* (TSWV) has been found to be more severe with planting dates early in April (Beasley, 2008; Tillman *et al.*, 2007). However, later planting dates result in increased early and late leafspot disease pressure caused by *Cercospora arachidcola* Hori and *Cercosporidium personatum* (Bert. & Curt.) Deighton, respectively (Culbreath *et al.*, 2009). Consequently, increasing fungicide cost with these later planting dates.

The objective of this study was thus two-fold a) to evaluate the agronomic performance among several peanut genotypes when planted early for TSWV disease incidence, pod yield, and dollar values and b) to perform an economic analysis between genotype and Max vs. Min combinations for the greatest dollar return above variable cost.

Material and Methods

During 2004, 24 different peanut cultivars (runner-and virginia-types) and advanced breeding lines developed by the University of Georgia Peanut Breeding Program were evaluated for TSWV and total disease incidence, pod yield, and dollar value in separate Max and Min input production tests at Tifton and Plains, GA. Similarly, during 2005 and 2006 the numbers of peanut genotypes evaluated were 26 and 30, respectively.

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Table 1. Three-year rainfall distribution (mm) during the peanut growing season for the maximum and minimum field tests at two Georgia locations, 2004–06.

	Tifton			Plains		
Month	2004	2005	2006	2004	2005	2006
April	91.95	143.26	47.24	46.23	113.79	72.14
May	13.21	97.79	99.31	66.80	65.28	86.36
June	171.96	268.99	139.45	238.76	209.80	37.85
July	68.83	247.90	62.23	145.54	268.22	132.08
August	117.86	111.00	154.43	139.70	207.01	252.73
September	325.12	50.29	70.87	355.60	20.83	60.96
Total	788.93	919.23	573.53	992.63	884.93	642.12

Max and Min field trials were conducted on a Tifton loamy soil (fine-loamy, siliceous, thermic Plinthic Kandiudults) at the Gibbs Research Farm near the Coastal Plain Experiment Station in Tifton and on a Greenville sandy clay loam soil (clayey, kaolinitic, thermic Rhodic Kandiudults) at the Southwest Georgia Research and Education Center near Plains. Plots consisted of two rows spaced 1.8 m apart by 6.1 m long. At Tifton, planting dates were 14 April 2004, 13 April 2005, and 14 April 2006. At Plains, planting dates were 21 April 2004, 18 April 2005, and 18 April 2006. The Max tests included all recommended production practices of seeding rate, fertilization, irriga-

Table 2. Evaluation of TSWV and total disease incidence, pod yield and dollar value among 24 peanut genotypes in early- planted maximum-input irrigated field trials at two Georgia locations, 2004.

Peanut Genotype	TSWV		Total Disease		Pod Yield		Gross Value		Dollar Return‡	
	Tifton	Plains	Tifton	Plains	Tifton	Plains	Tifton	Plains	Tifton	Plains
	%				kg/ha		$/ha			
Georgia-06G	20.0 lm*	13.8 h	34.6 klm	22.9 k	5449 a	7548 a	2182 a	2857 a	672 a	1337 a
†Georgia-05E	26.2 i–l	19.2 fgh	45.8 hij	33.8 ij	4722 bcd	6180 b	2108 a	2657 a	598 a	1137 a
Georgia Greener	22.1 j–m	20.4 fg	37.5 jkl	31.2 ij	5432 a	7070 a	2146 a	2650 a	636 a	1130 a
Georgia-02C	26.2 i–l	17.9 fgh	45.0 ij	32.1 ij	4402 c–f	5498 c	1786 cde	2132 b	276 cde	612 b
Georgia-03L	17.1 m	15.4 gh	32.1 lm	34.6 hi	5400 a	5520 c	2025 ab	2108 b	515 ab	588 b
Georgia-01R	20.4 klm	18.8 fgh	28.3 m	27.1 jk	4530 cde	5203 cd	1851 bc	2083 b	341 bc	563 b
†Georgia-08V	27.5 g–j	20.4 fg	43.3 ijk	37.1 ghi	4762 bc	6318 b	1711 c–f	2004 bc	201 c–f	484 bc
Georgia Green	29.2 f–i	20.4 fg	43.8 ij	34.2 ij	4247 c–f	5221 cd	1690 c–f	1960 bcd	180 c–f	440 bcd
GA 011521	30.8 e–i	23.8 ef	56.7 efg	41.7 gh	4412 c–f	5112 cd	1823 cd	1917 b–e	313 cd	397 b–e
Carver	45.0 bc	32.5 cd	57.5 d–g	44.2 fg	3930 f–i	4748 de	1444 ghi	1850 c–f	−66 ghi	330 c–f
AP-3	20.4 klm	21.2 efg	49.2 ghi	33.3 ij	4282 c–f	5108 cd	1616 efg	1842 c–f	106 efg	322 c–f
DP-1	26.7 h–l	23.3 ef	57.9 d–g	34.6 hi	3672 g–j	4664 de	1436 ghi	1782 def	−74 ghi	262 def
Hull	41.7 cd	26.7 de	56.7 efg	41.7 gh	3672 g–j	4582 de	1417 g–j	1711 efg	−93 g–j	191 efg
Tifrunner	27.1 h–k	20.4 fg	61.2 c–f	33.8 ij	3542 h–k	4450 ef	1412 hij	1710 efg	−98 hij	190 efg
C-99R	33.3 e–h	27.1 de	60.1 c–f	42.9 g	3266 jkl	4431 efg	1260 ijk	1689 fg	−250 ijk	169 fg
Andru II	35.8 def	31.7 cd	54.6 fgh	53.8 e	4064 e–h	4128 e–h	1524 fgh	1533 gh	14 fgh	13 gh
ANorden	34.2 efg	30.0 cd	56.2 efg	50.8 ef	2938 l	3791 ghi	1052 l	1404 hi	−458 l	−116 hi
GA 002501	48.3 bc	40.4 b	73.3 ab	64.6 bc	3051 kl	3807 f–i	1133 kl	1358 hij	−377 kl	−162 hij
†Georgia Hi-O/L	26.7 h–l	31.7 cd	28.8 lm	50.8 ef	5093 ab	4168 e–h	1874 bc	1221 ijk	364 bc	−299 ijk
†Perry	44.6 bc	32.5 cd	69.2 bc	65.8 b	4167 d–g	3437 ij	1649 def	1140 jkl	139 def	−380 jkl
Tamrun OL02	60.4 a	54.6 a	81.2 a	78.8 a	2937 l	3588 hi	1102 kl	1101 klm	−408 kl	−419 klm
†Wilson	50.0 b	35.8 bc	69.2 bc	62.5 bcd	3415 i–l	2921 j	1225 jkl	931 lmn	−285 jkl	−589 lmn
†Gregory	47.5 bc	35.4 bc	66.2 bcd	57.9 cde	3426 i–l	3424 ij	1244 i–l	905 mn	−266 i–l	−615 mn
†NC-V 11	36.7 de	26.7 de	55.0 fg	56.2 de	3908 f–i	3317 ij	1336 hij	778 n	−174 hij	−742 n
Mean	33.3	26.7	52.8	44.4	4137	4760	1585	1722	75	202

*Within columns, means followed by the same letter are not significantly different at $P \leq 0.05$.
†Denotes virginia market types.
‡Dollar returns above variable costs excluding seed cost.

Table 3. Evaluation of TSWV and total disease incidence, pod yield and dollar value among 26 peanut genotypes in early-planted maximum-input irrigated field trials at two Georgia locations, 2005.

Peanut Genotype	TSWV		Total Disease		Pod Yield		Gross Value		Dollar Return‡	
	Tifton	Plains	Tifton	Plains	Tifton	Plains	Tifton	Plains	Tifton	Plains
	%				kg/ha		$/ha			
Georgia-06G	8.5 ij*	20.0 ijk	23.5 ijk	30.0 ijk	4546 ab	5458 a	1704 abc	2206 a	259 abc	713 a
Georgia Greener	9.5 hij	17.9 jk	29.0 g–j	25.8 k	4204 a–e	5436 a	1524 c–f	2196 a	79 c–f	703 a
Georgia-07W	10.0 g–j	21.2 hij	21.0 jk	31.7 h–k	4320 a–e	5441 a	1597 b–e	2175 ab	152 b–e	682 ab
Georgia-02C	11.0 e–j	21.7 hij	24.5 ijk	26.7 jk	3955 a–g	4914 a–d	1546 c–f	1990 abc	101 c–f	497 abc
GA 011523	12.0 d–j	21.7 hij	28.5 g–j	40.0 fgh	4527 abc	4969 abc	1679 a–d	1960 a–d	234 a–d	467 a–d
Georgia-03L	10.0 g–j	16.2 k	20.5 jk	26.7 jk	4112 a–f	4977 abc	1422 e–i	1924 a–e	−23 e–i	431 a–e
†Georgia-05E	8.0 j	21.2 hij	17.0 k	30.0 ijk	4451 a–d	4999 ab	1872 a	1921 a–e	427 a	428 a–e
Georgia Green	11.0 e–j	18.3 jk	45.0 bcd	38.3 f–i	3935 a–g	4676 a–e	1433 e–h	1867 b–f	−12 e–h	374 b–f
Georgia-01R	13.0 c–i	17.5 jk	25.5 ijk	32.1 h–k	3968 a–g	4635 a–f	1511 c–f	1866 b–f	66 c–f	373 b–f
Carver	19.0 ab	28.3 d–g	40.0 b–f	44.2 ef	3595 e–k	4613 a–f	1143 j–m	1827 c–g	−302 j–m	334 c–g
Tifrunner	15.5 b–e	24.2 ghi	28.5 g–j	34.2 g–k	3373 f–l	4383 b–f	1179 i–m	1752 c–h	−266 i–m	259 c–h
†Perry	17.5 bc	33.3 bc	45.0 bcd	55.4 bcd	3005 kl	4360 b–f	1075 klm	1750 c–h	−370 klm	257 c–h
AT-3081R	14.5 b–g	29.6 cde	36.5 d–g	44.6 ef	3137 i–l	4514 b–f	1024 lm	1749 c–h	−421 lm	256 c–h
†GA 012534	12.0 d–j	26.7 efg	32.0 f–i	45.0 ef	3865 a–i	4303 b–f	1481 c–g	1679 d–h	36 c–g	186 d–h
†Georgia Hi-O/L	13.5 c–h	27.5 d–g	37.5 c–g	41.7 efg	3909 a–h	4117 c–g	1587 b–e	1626 e–h	142 b–e	133 e–h
AP-3	12.5 d–j	24.6 f–i	24.5 ijk	41.7 efg	3792 c–j	4270 b–f	1244 g–l	1619 e–h	−201 g–l	126 e–h
Andru II	16.0 bcd	27.9 d–g	35.5 e–h	42.1 efg	3411 f–l	4079 d–g	1111 j–m	1591 fgh	−334 j–m	98 fgh
C-99R	15.0 b–f	27.5 d–g	31.5 f–i	45.4 ef	3791 c–j	4045 d–g	1438 d–h	1580 f–i	−7 d–h	87 f–i
Hull	16.5 bcd	29.2 c–f	36.0 d–g	47.1 def	3173 h–l	3927 efg	1162 j–m	1560 f–i	−283 j–m	67 f–i
ANorden	15.5 b–e	27.9 d–g	49.0 b	50.4 cde	3099 jkl	3908 efg	1065 klm	1530 ghi	−380 klm	37 ghi
DP-1	14.5 b–g	23.8 ghi	29.0 g–j	35.0 g–j	3286 g–l	3871 efg	1215 h–l	1518 ghi	−230 h–l	25 ghi
†Gregory	15.0 b–f	35.4 b	47.0 b	60.4 b	3633 e–k	3790 fg	1309 f–k	1484 hi	−136 f–k	−9 hi
†Georgia-08V	10.5 f–j	25.0 e–h	26.5 hij	44.2 ef	4601 a	4692 a–e	1832 ab	1468 hi	387 ab	−25 hi
†Wilson	16.5 bcd	31.7 bcd	46.0 bc	57.1 bc	3705 d–k	4208 b–f	1241 g–l	1463 hi	−204 g–l	−30 hi
Tamrun OL02	22.5 a	50.8 a	69.5 a	79.2 a	2834 l	3316 g	949 m	1272 ij	−496 m	−221 ij
†NC-V 11	16.5 bcd	33.3 bc	44.5 b–e	57.1 bc	3812 b–j	3870 efg	1339 f–j	1046 j	−106 f–j	−447 j
Mean	13.7	26.2	34.3	42.5	3771	4453	1372	1716	−73	223

*Within columns, means followed by the same letter are not significantly different at $P \leq 0.05$.
†Denotes virginia market types.
‡Dollar returns above variable costs excluding seed cost.

tion, and pesticides. The Min tests excluded irrigation and insecticides and only three fungicides sprays were included during the growing season beginning 30 d after planting and then applied at 28 d intervals.

During 2004, 2005, and 2006 at Tifton, the number of times and amount of irrigation applied totaled (7×) 127.00, (4×) 99.06, and (8×) 267.97 mm respectively; whereas, during 2004, 2005, and 2006 at Plains, the number and amount of irrigation applied totaled (6×) 116.84, (4×) 66.04, and (6×) 127.00 mm, respectively. These field trials were in a three-year rotation following cotton (*Gossypium* sp.L.) and corn (*Zea mays* L.). Individual entries were dug near optimum maturity based upon hull-scrape determined from adjacent border rows (Williams and Drexler, 1981).

Incidence of *Tomato spotted wilt virus* (TSWV) was first assessed at approximately 70 d after planting, when TSWV is usually the only disease occurring at this time during the season. Percentages of total disease were also scored prior to digging, which included primarily TSWV and any soilborne disease. A disease hit equaled one or more diseased plants in a 30.5-cm section of row.

After digging and threshing, pods were dried with forced warm air to 6% moisture. Pod samples were then hand-cleaned over a screen table before weighing for yield determinations. Market grades were determined according to federal state inspection service procedures for runner and virginia-type peanut, respectively (USDA-AMS, 1998).

Gross dollar values were calculated from yield and grade based upon USDA-Farm Service Agency (FSA) peanut loan schedules for each crop year. Economic analyses were performed on each of the Max and Min tests by year and location. Variable cost estimates were calculated based upon

Table 4. Evaluation of TSWV and total disease incidence, pod yield and dollar value among 30 peanut genotypes in early-planted maximum-input irrigated field trials at two Georgia locations, 2006.

Peanut Genotype	TSWV		Total Disease		Pod Yield		Gross Value		Dollar Return ‡	
	Tifton	Plains	Tifton	Plains	Tifton	Plains	Tifton	Plains	Tifton	Plains
	%				kg/ha		$/ha			
Georgia-07W	14.0 jkl*	10.0 l–o	32.0 klm	30.4 ij	5936 a	6429 a	2470 a	2590 a	893 a	1150 a
Georgia-06G	16.5 h–l	8.3 no	35.6 jkl	27.5 j	5401 abc	6503 a	2134 bcd	2584 a	557 bcd	1144 a
†Georgia-08V	23.5 d–g	13.3 i–m	45.5 fgh	43.3 efg	5003 bcd	6010 abc	1996 c–g	2565 a	419 c–g	1125 a
Georgia Greener	16.0 i–l	10.8 k–n	32.0 klm	35.4 g–j	5965 a	6157 ab	2302 ab	2470 ab	725 ab	1030 ab
†Georgia-05E	23.0 d–h	13.3 i–m	45.0 f–i	39.6 e–h	4763 de	5540 cde	2014 c–f	2407 abc	437 c–f	967 abc
GA 032902	18.0 f–k	12.1 j–n	35.0 jkl	39.6 e–h	5549 ab	5665 bcd	2234 abc	2302 bcd	657 abc	862 bcd
Georgia-02C	18.5 f–k	9.2 mno	34.0 j–m	29.6 ij	4792 cde	5630 bcd	1998 c–g	2263 b–e	421 c–g	823 b–e
GA 032913	19.0 e–k	11.2 j–n	37.5 h–l	37.5 f–i	5511 ab	5529 cde	2169 bc	2218 c–f	592 bc	778 c–f
GA 032625	10.5 l	5.8 o	26.0 m	19.2 k	4614 d–g	5448 cde	1865 e–i	2185 c–g	288 e–i	745 c–g
Georgia-01R	13.5 kl	10.4 lmn	30.5 klm	29.6 ij	5401 abc	5142 d–g	2214 bc	2082 d–h	637 bc	642 d–h
†Gregory	36.5 ab	22.1 cde	67.0 ab	55.4 c	3801 ijk	5338 def	1528 j–m	2076 d–h	−49 j–m	636 d–h
Georgia-03L	14.5 jkl	10.4 lmn	32.0 klm	28.8 j	4728 de	5460 cde	1871 e–i	2066 e–h	294 e–i	626 e–h
York	20.5 d–j	15.0 g–k	42.5 g–j	40.0 e–h	4662 def	5146 d–g	1760 g–j	2000 f–i	183 g–j	560 f–i
Florida-07	25.5 cde	19.2 efg	51.5 def	33.3 hij	4643 def	5065 d–h	1796 f–i	1951 g–j	219 f–i	511 g–j
†CHAMPS	36.5 ab	24.6 bc	64.0 bc	57.9 bc	4069 f–j	5008 e–h	1643 i–l	1927 hij	66 i–l	487 hij
Tifrunner	22.0 d–i	17.9 e–h	42.0 g–j	34.6 hij	4547 d–g	4766 g–i	1758 g–j	1904 hij	181 g–j	464 hij
Georgia Green	20.5 d–j	15.0 g–k	49.0 efg	47.1 de	4620 d–g	4766 g–i	1909 d–h	1889 hij	332 d–h	449 hij
†NC-V 11	37.0 ab	25.0 bc	61.0 bc	57.9 bc	3899 h–k	5138 d–g	1431 lm	1850 hij	−146 lm	410 hij
McCloud	32.0 bc	26.7 b	63.5 bc	59.6 bc	3782 ijk	4723 g–j	1503 klm	1819 ij	−74 klm	379 ij
†Perry	42.0 a	28.3 b	75.0 a	75.4 a	3312 k	4470 hij	1305 m	1806 ij	−272 m	366 ij
C-99R	32.0 bc	17.9 e–h	60.0 bcd	54.2 cd	4607 d–g	4652 g–j	1838 e–i	1805 ij	261 e–i	365 ij
Carver	37.5 ab	18.3 efg	62.5 bc	40.0 e–h	4392 d–i	4589 g–j	1728 h–k	1782 ij	151 h–k	342 ij
AT-3085RO	13.0 kl	20.0 def	36.5 i–l	35.0 hij	4480 d–h	4536 hij	1733 h–k	1771 ij	156 h–k	331 ij
AT-3081R	24.5 def	21.2 cde	56.0 cde	56.2 c	4386 d–i	4659 g–j	1650 i–l	1770 ij	73 i–l	330 ij
AP-3	14.0 jkl	13.8 h–l	39.0 h–k	34.6 hij	4571 d–g	4642 g–j	1743 h–k	1739 j	166 h–k	299 j
CRSP 38	33.5 b	33.3 a	60.0 bcd	64.6 b	3652 jk	4380 ij	1432 lm	1722 j	−145 lm	282 j
†Georgia Hi-O/L	22.0 d–i	19.2 efg	38.5 h–l	44.6 ef	4634 def	4137 j	2042 c–f	1718 j	465 c–f	278 j
†GA 012519	17.5 g–k	16.7 f–i	33.0 klm	32.5 hij	4785 cde	3014 kl	2066 b–e	1262 k	489 b–e	−178 k
Andru II	26.5 cd	24.2 bcd	56.0 cde	55.0 cd	3993 g–j	3373 k	1517 j–m	1252 k	−60 j–m	−188 k
GA 012517	22.5 d–i	15.4 g–j	30.0 lm	30.8 ij	4361 e–i	2764 l	1752 g–j	1090 k	175 g–j	−350 k
Mean	23.4	17.0	45.7	42.3	4629	4956	1847	1962	270	522

*Within columns, means followed by the same letter are not significantly different at $P \leq 0.05$.
†Denotes virginia market types.
‡Dollar returns above variable costs excluding seed cost.

the current 2009 UGA extension service budget (Smith and Smith, 2008) for line item inputs less seed, fungicide, insecticide, and irrigation in which prices were based upon actual pesticide and rates used for each test. Each genotype was grouped into either large virginia, virginia, large runner, runner, and small runner seed size categories to better estimate the total variable cost. The 2009 variable cost for seed to plant six seed per 30.5 cm of row equaled $176/ha for small runner, $201/ha for runner, $232/ha for large runner, $289/ha for virginia, and $355/ha for large virginia.

The experimental design was a randomized complete block with six replications. Data from each individual test was subjected to analysis of variances. Waller-Duncan's T-test (k-ratio = 100) was used for mean separation of significant differences ($P \leq 0.05$).

Results and Discussion

Each year, different cultivars and advanced Georgia breeding lines were evaluated in both the Max and Min field tests at Tifton and Plains, GA. Combined years and location comparisons were not possible because of significant ($P \leq 0.05$) interaction between genotypes, years, and locations across Max and Min tests.

As seen in Table 1, the three year rainfall distribution during the peanut growing season was variable across years and locations which

Table 5. Evaluation of TSWV and total disease incidence, pod yield and dollar value among 24 peanut genotypes in early-planted minimum-input non-irrigated field trials at two Georgia locations, 2004.

Peanut Genotype	TSWV		Total Disease		Pod Yield		Gross Value		Dollar Return‡	
	Tifton	Plains	Tifton	Plains	Tifton	Plains	Tifton	Plains	Tifton	Plains
	%				kg/ha		$/ha			
Georgia-06G	25.4 hi*	12.9 j	40.4 jk	29.2 l	3438 ab	5325 a	1331 cd	2067 a	257 cd	993 a
Georgia Greener	28.3 ghi	18.8 g–j	38.8 k	31.7 kl	3596 ab	5000 ab	1459 abc	2065 a	385 abc	991 a
Georgia-03L	23.3 i	15.4 ij	41.2 jk	35.8 i–l	3169 bcd	4990 ab	1191 de	1976 ab	117 de	902 ab
†Georgia-05E	30.0 ghi	23.3 e–h	42.1 jk	35.4 i–l	3759 a	4699 bc	1600 a	1963 ab	526 a	889 ab
Georgia-02C	34.6 fgh	17.9 hij	44.2 ijk	33.3 kl	3370 ab	4450 bcd	1349 bcd	1852 bc	275 bcd	778 bc
Georgia-01R	31.2 ghi	15.8 ij	42.9 jk	32.9 kl	3717 a	4501 bc	1522 ab	1819 bc	448 ab	745 bc
C-99R	45.0 cde	25.4 def	58.8 ef	44.2 ghi	1563 klm	4325 cde	574 ij	1708 c	−500 ij	634 c
DP-1	30.4 ghi	27.1 de	45.4 h–k	42.5 g–j	2199 ghi	4333 cd	828 gh	1701 cd	−246 gh	627 cd
GA 011521	45.0 cde	24.6 d–g	60.0 ef	50.8 efg	2750 def	3767 fgh	1076 e	1514 de	2 e	440 de
Georgia Green	32.5 f–i	25.0 def	55.0 fg	51.2 efg	2629 efg	3752 fgh	1052 ef	1499 e	−22 ef	425 e
†Georgia Hi-O/L	36.2 efg	26.2 de	47.9 g–j	44.2 ghi	2774 cde	4629 bc	862 g	1491 e	−212 g	417 e
AP-3	27.5 ghi	18.3 hij	42.1 jk	33.8 jkl	3273 abc	3772 e–h	1270 d	1435 ef	196 d	361 ef
Tifrunner	29.2 ghi	20.0 f–i	52.5 f–i	45.0 gh	2252 fgh	3549 ghi	840 g	1375 efg	−234 g	302 efg
GA 002501	58.3 b	39.2 ab	66.7 cd	61.2 cd	2171 g–j	3372 g–j	826 gh	1278 fgh	−248 gh	204 fgh
Andru II	47.1 cd	25.4 def	57.9 f	49.2 fg	2231 gh	3429 g–j	845 g	1242 gh	−229 g	168 gh
†Georgia-08V	30.0 ghi	15.4 ij	45.8 h–k	36.2 h–l	2836 cde	3925 d–g	638 i	1239 gh	−436 i	165 gh
Hull	41.2 def	30.4 cd	54.2 fgh	54.6 def	1194 m	3143 ij	434 j	1206 gh	−640 j	132 gh
Tamrun OL02	78.8 a	45.0 a	87.9 a	76.7 a	1456 lm	2986 j	433 j	1206 gh	−641 j	132 gh
Carver	62.5 b	25.4 def	67.5 de	39.6 h–k	2392 e–h	3195 ij	644 hi	1196 gh	−430 hi	122 gh
†NC-V 11	74.6 a	29.6 d	82.5 ab	54.2 def	2181 ghi	3750 fgh	586 ij	1131 hi	−488 ij	57 hi
†Perry	77.5 a	36.2 bc	87.1 ab	67.9 abc	1667 j–m	3273 hij	588 ij	1100 hi	−486 ij	26 hi
†Wilson	72.9 a	42.5 a	78.3 bc	70.4 ab	2034 h–k	3649 f–i	601 ij	1005 i	−473 ij	−69 i
†Gregory	57.9 b	39.6 ab	70.0 cd	62.1 bcd	2359 e–h	4186 c–f	887 fg	993 i	−187 fg	−81 i
ANorden	54.2 bc	30.4 cd	70.4 cd	58.8 de	1711 i–l	2086 k	603 ij	762 j	−471 ij	−312 j
Mean	44.7	26.2	57.7	47.5	2530	3920	918	1451	−156	377

*Within columns, means followed by the same letter are not significantly different at $P \leq 0.05$.
†Denotes virginia market types.
‡Dollar returns above variable costs excluding seed cost.

influenced plant growth and development. In general, plant growth and development in the nonirrigated Min tests were smaller and slower due to early-season drought stress (April and May) as compared to the irrigated Max tests in each year. Since no systemic insecticides were used at planting, plants in the Min tests exhibited uniformly severe insect damage from tobacco thrips (*Frankliniella fusca*, Hinds) feeding injury early each year but plants seemingly recovered by midseason. Tomato spotted wilt caused by TSWV was the most noticeable disease problem each year and progressively increased from midseason until digging (Tables 2–7).

At midseason, incidence of *Tomato spotted wilt virus* (TSWV) varied from year to year (Tables 2–7). In the Max test, the lowest TSWV incidence (best resistance) was found in 'Georgia-03L' (Branch, 2004) at Tifton and 'Georgia-06G' (Branch, 2007a) at Plains during 2004 (Table 2), in 'Georgia-05E' (Branch, 2006) at Tifton and Georgia-03L at Plains during 2005 (Table 3), and in the advanced Georgia breeding line, GA 032625 at both Tifton and Plains during 2006 (Table 4). In the Min test, the lowest TSWV incidence was again found in Georgia-03L at Tifton and Georgia-06G at Plains during 2004 (Table 5), in 'AP-3' (Gorbet, 2007) at Tifton and in 'Georgia-01R' (Branch, 2002) and Georgia-03L at Plains during 2005 (Table 6), and in GA 032625 at Tifton and 'Georgia-07W' (Branch and Brenneman, 2008) and Georgia-06G at Plains during 2006 (Table 7). TSWV for several genotypes was not different from these lowest TSWV incidence cultivars and breeding lines mentioned previously.

Prior to digging, percentage of total disease incidence also varied by year (Tables 2–7). In the Max test, the lowest total disease incidence was found in Georgia-01R at Tifton and Georgia-06G at Plains during 2004 (Table 2), in Georgia-05E at Tifton and 'Georgia Greener' (Branch, 2007b) at Plains during 2005 (Table 3), and in GA 032625 at

Table 6. Evaluation of TSWV and total disease incidence, pod yield and dollar value among 26 peanut genotypes in early-planted minimum-input non-irrigated field trials at two Georgia locations, 2005.

Peanut Genotype	TSWV		Total Disease		Pod Yield		Gross Value		Dollar Return ($/ha)‡	
	Tifton	Plains	Tifton	Plains	Tifton	Plains	Tifton	Plains	Tifton	Plains
	%				kg/ha		$/ha			
GA 011523	29.0 g–j*	27.1 hi	41.0 g–l	44.6 hi	3103 a–d	4378 a	1106 cde	1663 a	32 cde	589 a
†Georgia-05E	27.5 hij	29.6 ghi	35.0 i–l	41.2 hi	3627 a	3910 abc	1418 a	1639 a	344 a	565 a
Georgia Greener	35.5 c–h	27.9 ghi	49.5 efg	43.8 hi	2845 b–e	4093 ab	1058 c–g	1524 ab	−16 c–g	450 ab
Georgia-07W	25.0 ij	29.6 ghi	34.0 jkl	46.2 ghi	3268 abc	3777 bcd	1173 bcd	1437 bc	99 bcd	363 bc
Georgia-01R	30.0 ghi	24.6 i	37.0 h–l	41.2 hi	3228 abc	3559 b–f	1200 bc	1394 bcd	126 bc	320 bcd
Georgia-06G	26.0 ij	25.8 hi	43.5 ghi	45.0 hi	3128 a–d	3806 bc	1147 bcd	1394 bcd	73 bcd	320 bcd
Georgia-03L	33.0 e–i	24.6 i	41.5 g–k	39.6 i	2714 c–f	3673 b–e	930 e–i	1367 bcd	−144 e–i	293 bcd
Georgia-02C	33.0 e–i	27.5 ghi	45.5 fgh	37.1 i	2942 b–e	3466 c–g	1136 b–e	1338 b–e	62 b–e	264 b–e
C-99R	37.5 c–g	31.2 gh	49.5 efg	54.6 efg	3038 bcd	3379 c–g	1090 c–f	1323 cde	16 c–f	249 cde
Tifrunner	31.0 f–i	29.2 ghi	36.0 i–l	45.0 hi	2394 e–i	3236 d–h	890 f–j	1262 c–f	−184 f–j	188 c–f
†Georgia-08V	24.5 ij	31.7 gh	36.5 h–l	58.3 def	3415 ab	3552 b–f	1314 ab	1237 d–g	240 ab	163 d–g
DP-1	28.0 hij	27.1 hi	33.0 kl	45.4 ghi	2442 e–i	3241 d–h	881 g–j	1210 d–g	−193 g–j	136 d–g
Hull	33.5 d–i	39.2 ef	42.5 g–j	59.6 de	2416 e–i	3088 f–j	804 h–l	1168 e–h	−270 h–l	94 e–h
Georgia Green	39.5 c–f	29.2 ghi	54.0 def	58.3 def	2696 c–g	2979 g–j	970 d–h	1156 e–h	−104 d–h	82 e–h
AT-3081R	42.5 cd	40.4 e	57.5 de	56.7 def	2038 hij	3162 e–i	654 k–n	1154 e–h	−420 k–n	80 e–h
†GA 012534	33.5 d–i	33.3 fg	45.5 fgh	59.2 de	2927 b–e	3030 f–j	1131 b–e	1111 fgh	57 b–e	37 fgh
AP-3	20.0 j	31.7 gh	32.0 l	49.6 fgh	2614 d–h	3081 f–j	881 g–j	1054 gh	−193 g–j	−20 gh
Carver	52.0 ab	40.4 e	60.5 cd	57.5 def	2172 f–j	2783 h–k	711 j–m	991 hi	−363 j–m	−83 hi
Andru II	43.5 bc	41.7 de	62.5 cd	59.2 de	1934 ij	2600 i–l	644 lmn	842 ij	−430 lmn	−232 ij
†Georgia Hi-O/L	41.0 cde	43.8 de	53.5 def	58.8 def	2134 g–j	2140 lmn	852 g–k	837 ij	−222 g–k	−237 ij
ANorden	39.5 c–f	39.6 e	57.5 de	64.2 cd	1889 ijk	2406 klm	632 lmn	806 ijk	−442 lmn	−268 ijk
†Wilson	58.5 a	46.7 cd	75.5 b	70.4 c	1706 jk	2531 jkl	564 mn	782 jk	−510 mn	−292 jk
†NC-V 11	57.5 a	50.4 bc	73.5 a	72.1 bc	2085 hij	2282 klm	735 i–m	707 jkl	−339 i–m	−367 jkl
†Gregory	52.5 ab	53.3 b	69.5 bc	72.9 bc	1745 jk	2567 jkl	629 lmn	667 jkl	−445 lmn	−407 jkl
†Perry	61.0 a	54.2 b	77.0 ab	80.8 ab	1339 kl	1842 mn	469 no	625 kl	−605 no	−449 kl
Tamrun OL02	59.0 a	65.4 a	85.5 a	87.9 a	958 l	1583 n	279 o	542 l	−795 o	−532 l
Mean	38.2	36.3	51.1	55.7	2492	3082	896	1124	−177	51

*Within columns, means followed by the same letter are not significantly different at $P \leq 0.05$.
†Denotes virginia market types.
‡Dollar returns above variable costs excluding seed cost.

both Tifton and Plains during 2006 (Table 4). In the Min Test, the lowest total disease incidence was found in Georgia Greener at Tifton and Georgia-06G at Plains during 2004 (Table 5), in AP-3 at Tifton and in 'Georgia-02C' (Branch, 2003) and Georgia-03L at Plains during 2005 (Table 6), and in GA 032625 at both Tifton and Plains during 2006 (Table 7). Total disease for several other genotypes was also not different from these previously mentioned genotypes for lowest total disease incidence at each location and across years.

Highest pod yields among peanut genotypes likewise varied by year and location (Table 2–7). In the Max test, the highest pod yields were noted for Georgia-06G, Georgia Greener, and Georgia-03L at Tifton and Georgia-06G and Georgia Greener at Plains during 2004 (Table 2), in 'Georgia-08V' (Branch, 2009) at Tifton and Georgia-06G, Georgia-07W, and Georgia Greener at Plains during 2005 (Table 3), and in Georgia Greener and Georgia-07W at Tifton and Georgia-06G and Georgia-07W at Plains during 2006 (Table 4). In the Min test, the highest pod yields were found in Georgia-05E and Georgia-01R at Tifton and in Georgia-06G at Plains during 2004 (Table 5), in Georgia-05E at Tifton and GA 011523 at Plains during 2005 (Table 6), and in Georgia-07W at Tifton and Georgia-03L, Georgia-06G, and Georgia-01R at Plains during 2006 (Table 7). Pod yield for several other genotypes was also not different from those mentioned above for highest pod yield.

The highest gross dollar values varied among genotypes, years, and location (Tables 2–7). In the Max test, the highest gross dollar values were noted for Georgia-06G, Georgia Greener, and Georgia-05E at Tifton and Plains during 2004 (Table 2), in Georgia-05E at Tifton and Georgia-06G and Georgia Greener at Plains during 2005 (Table 3),

Table 7. Evaluation of TSWV and total disease incidence, pod yield and dollar value among 30 peanut genotypes in early-planted minimum-input non-irrigated field trials at two Georgia locations, 2006.

Peanut Genotype	TSWV		Total Disease		Pod Yield		Gross Value		Dollar Return‡	
	Tifton	Plains	Tifton	Plains	Tifton	Plains	Tifton	Plains	Tifton	Plains
	%				kg/ha		$/ha			
Georgia-03L	22.0 i–m*	9.2 g–k	46.5 f–i	22.5 ijk	3599 bcd	3995 a	1302 c–f	1493 a	228 c–f	419 a
Georgia-01R	20.0 j–n	5.4 lm	35.5 j–m	24.2 ijk	4016 ab	3913 a	1564 ab	1458 ab	490 ab	384 ab
Georgia-06G	15.0 mn	4.2 m	30.5 m	19.2 jkl	3709 bcd	3963 a	1468 bcd	1429 abc	394 bcd	355 abc
Georgia-02C	13.5 mn	6.2 klm	32.5 klm	21.2 ijk	3886 abc	3821 ab	1500 abc	1427 abc	426 abc	353 abc
Georgia-07W	14.5 mn	4.2 m	32.0 klm	17.5 kl	4330 a	3786 ab	1700 a	1383 a–d	626 a	309 a–d
Georgia Greener	21.0 i–m	7.5 i–l	33.0 klm	22.1 ijk	3630 bcd	3699 abc	1442 bcd	1364 a–e	368 bcd	290 a–e
†Georgia-08V	27.5 f–k	10.0 f–j	50.5 e–h	35.4 e	3397 cde	3493 a–d	1332 cde	1349 a–f	258 cde	275 a–f
†Georgia-05E	19.0 k–n	8.3 h–l	36.0 j–m	22.1 ijk	3680 bcd	3774 ab	1565 ab	1330 a–g	491 ab	256 a–g
York	19.5 j–n	10.4 e–i	31.5 lm	33.3 efg	3659 bcd	3469 a–d	1315 cde	1292 b–h	241 cde	218 b–h
Florida-07	31.0 e–h	10.4 e–i	45.5 g–j	26.7 ghi	3504 b–e	3746 ab	1190 e–h	1291 b–h	116 e–h	217 b–h
GA 032913	24.5 h–l	7.1 j–m	42.0 h–k	27.5 f–i	3458 b–e	3765 ab	1343 cde	1280 b–h	269 cde	206 b–h
CRSP 38	28.0 f–j	16.7 ab	44.5 g–j	37.5 cde	2646 f–j	3322 bcd	989 h–l	1255 c–i	−85 h–l	181 c–i
AT-3081R	38.0 cde	11.2 c–h	60.5 b–e	44.6 bc	2411 g–j	3337 bcd	863 i–m	1226 d–j	−211 i–m	152 d–j
Tifrunner	18.5 lmn	10.4 e–i	32.0 klm	26.7 ghi	3375 cde	3108 de	1275 d–g	1183 e–k	201 d–g	109 e–k
Georgia Green	29.5 e–i	7.5 i–l	56.5 def	37.1 de	2956 efg	3142 de	1148 e–h	1176 f–k	74 e–h	102 f–k
AP-3	15.5 mn	7.5 i–l	31.0 lm	25.0 hij	3194 def	3291 b–e	1189 e–h	1174 f–k	115 e–h	100 f–k
GA 032625	12.0 n	5.8 lm	20.0 n	13.3 l	2949 efg	3081 def	1176 e–h	1173 f–k	102 e–h	99 f–k
C-99R	34.0 d–g	10.4 e–i	57.5 de	37.1 de	3586 bcd	3135 de	1341 cde	1167 f–k	267 cde	93 f–k
AT-3085RO	25.5 g–l	10.8 d–h	41.0 h–l	34.6 ef	2982 efg	3205 cde	1094 fgh	1160 g–k	20 fgh	86 g–k
McCloud	45.0 abc	13.3 cde	68.5 abc	47.9 ab	2165 hij	3133 de	801 lm	1150 g–k	−273 lm	76 g–k
GA 032902	21.0 i–m	6.7 klm	39.0 i–m	24.2 ijk	3491 b–e	3144 de	1336 cde	1146 g–k	262 cde	72 g–k
†Perry	53.0 a	10.8 d–h	76.0 a	49.2 ab	1401 k	3063 def	514 n	1137 h–k	−560 n	63 h–k
Andru II	35.5 def	14.2 bc	61.0 bcd	47.5 ab	2070 j	3308 bcd	707 mn	1109 h–k	−367 mn	35 h–k
†Georgia Hi-O/L	40.0 bcd	10.4 e–i	57.5 de	38.3 cde	2507 g–j	2772 e–h	1043 hij	1070 i–l	−31 hij	−4 i–l
Carver	38.0 cde	12.9 c–f	59.0 cde	44.2 bcd	2712 fgh	2981 d–h	1028 hij	1042 j–m	−46 hij	−32 j–m
†CHAMPS	47.5 ab	18.3 a	68.0 abc	48.3 ab	2308 hij	3000 d–g	809 klm	1037 klm	−265 klm	−37 klm
†NC-V 11	48.0 ab	12.1 c–g	70.5 ab	45.8 ab	2124 ij	3067 def	657 mn	889 lmn	−417 mn	−185 lmn
†GA 012519	35.5 def	8.3 h–l	52.5 d–g	35.4 e	2528 g–j	2525 gh	1021 h–k	871 mn	−53 h–k	−203 mn
†Gregory	48.0 ab	13.8 bcd	70.5 ab	52.5 a	2355 hij	2554 fgh	861 j–m	856 mn	−213 j–m	−218 mn
GA 012517	28.0 f–j	7.1 j–m	42.0 h–k	31.7 e–h	2700 f–i	2466 h	1077 ghi	808 n	3 ghi	−266 n
Mean	28.9	9.7	47.4	33.1	3044	3302	1155	1191	81	117

*Within columns, means followed by the same letter are not significantly different at $P \leq 0.05$.
†Denotes virginia market types.
‡Dollar returns above variable costs excluding seed cost.

and in Georgia-07W at Tifton and in Georgia-07W, Georgia-06G, and Georgia-08V at Plains during 2006 (Table 4). In the Min test, the highest gross dollar values were found in Georgia-05E at Tifton and Georgia-06G and Georgia Greener at Plains during 2004 (Table 5), in Georgia-05E at Tifton and GA 011523 and Georgia-05E at Plains during 2005 (Table 6), and in Georgia-07W at Tifton and Georgia-03L at Plains during 2006 (Table 7). Again, dollar values for several other genotypes were not different from those mentioned above for highest gross dollar values at each location and across years.

While gross dollar value is important, dollar value return above variable cost is the key economic indicator. Thus, variable cost estimates were then calculated to address the question of which genotype and input combination results in the greatest dollar return above variable cost. When seed, fungicide, insecticide, and irrigation costs were excluded, since these differed by location in the Max and Min tests, all other variable costs were the same. Based on the 2009 UGA extension service budget, the irrigated peanut variable costs less seed, fungicide, insecticide and irrigation was $985/ha. The non-irrigated peanut variable costs less seed, fungicide and insecticide was $943/ha. The 2009 fungicide, insecticide and irrigation variable cost estimates were as follows: 2004 Max tests at Tifton and Plains = $525/ha and $535/ha; 2005 Max tests at Tifton and Plains = $460/ha and $508/ha; and 2006 Max tests at Tifton and Plains =

Table 8. Three-year variable costs within the maximum-input irrigated field tests for insect control, disease control, and irrigation at two Georgia locations, 2004–06.

	2004		*2005*		*2006*	
Variable Input Cost	Tifton	Plains	Tifton	Plains	Tifton	Plains
	\$/ha					
Insect Control	142	163	104	185	72	72
Disease Control	259	259	259	259	259	259
Irrigation	124	114	96	64	261	124
Total	525	535	460	508	592	455

\$592/ha and \$455/ha, respectively (Table 8). Both Tifton and Plains were fairly similar in 2004 and 2005. However during 2006, considerably more irrigation was needed at Tifton compared to Plains due to lower rainfall (Table 1). Thus, irrigation increased the variable cost at the Tifton location and resulted in reduced dollar return above the variable costs as compared to the Plains location.

The 2009 fungicide variable cost was also calculated similarly for the Min tests but with reduced inputs compared to the Max tests. The fungicide variable cost was as follows: 2004, 2005, and 2006 Min tests at Tifton and Plains = \$130/ha and \$130/ha, respectively (Table 9). All of these calculated variable costs are constant within each test and location since seed cost is not included, the ranking means and significant differences ($P \leq 0.05$) remained the same for both gross dollar values and dollar value returns above variable costs excluding seed cost in Tables 2–7. While the ranking means and significant differences remain the same, a key fact is that many of the genotypes had negative dollar value returns above variable costs excluding seed cost. Another interesting finding, in general, is that the highest average dollar value returns above variable cost were found in the Max test as compared to the Min test.

In the 2006 Max test, several newly released runner-type cultivars were compared (Table 4). Georgia-07W, Georgia-06G, Georgia Greener, and GA 032902 had significantly higher dollar value return above variable cost per hectare compared to 'Florida-07' (Gorbet and Tillman, 2009), 'York', 'McCloud', 'Tifrunner' (Holbrook and Culbreath, 2007), 'C-99R' (Gorbet and Shokes, 2002), 'Carver' (Gorbet, 2006), 'AT-3085RO', 'AT-3081R' (Anderson and Harvey, 2006), 'AP-3', and 'Andru II' (Gorbet, 2006). Also in the same 2006 Max test (Table 4), Georgia-08V had significantly higher dollar value return above variable cost per hectare compared to the other virginia-type cultivars: 'Gregory' (Isleib *et al.*, 1999), 'CHAMPS' (Mozingo *et al.*, 2006), 'NC-V 11' (Wynne *et al.*, 1991), and 'Perry' (Isleib *et al.*, 2003). Similar results were found in the 2006 Min test.

Another variable cost that must be considered is for the seed. Because peanut genotypes have different seed size, it will cost more for large-seeded genotypes to plant the same fixed number of seed per area as compared to smaller-seeded genotypes.

After deducting seed cost from the dollar return above variable cost, the highest 3-yr average return above variable cost was found with Georgia-06G and Georgia Greener in the Max tests at approximately \$500/ha. However, Georgia-05E, Georgia Greener, Georgia-01R, Georgia-06G, and Georgia-02C had the highest average return above variable cost in the Min tests but at only about \$200/ha which for the same cultivars is approximately half of the Max tests dollar return.

Summary

The results from this study show the variation from year-to-year, location-to-location, and geno-

Table 9. Three-year variable costs within the minimum-input non-irrigated field tests for disease control at two Georgia locations, 2004–06.

	2004		*2005*		*2006*	
Variable Input Cost	Tifton	Plains	Tifton	Plains	Tifton	Plains
	\$/ha					
Insect Control	–	–	–	–	–	–
Disease Control	130	130	130	130	130	130
Irrigation	–	–	–	–	–	–
Total	130	130	130	130	130	130

type-to-genotype for disease incidence, pod yield, gross dollar values, and dollar value return above variable costs. The performance results likewise show the potential benefit to growers from agronomic and economic improvement with many of the newly released runner and virginia-type peanut cultivars in Georgia. Peanut growers competitiveness should be enhanced with utilization of these new and improved cultivars in both maximum and minimum production input scenarios.

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