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ARTICLE

Dryland Field Performance and Disease Assessment among Runner and Virginia-Type Peanut Genotypes.

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ABSTRACT

In Georgia, approximately half of the annual peanut (*Arachis hypogaea* L.) production is under dryland conditions. Currently, production costs are increasing for disease control and irrigation. Consequently, utilization of peanut cultivars with multiple disease resistance and drought tolerance would be economically beneficial. During each of five years (2018-22), several peanut genotypes were assessed for multiple diseases under dryland field conditions without any fungicides or insecticides and no irrigation at Tifton, GA. The 14 runner and five virginia-type cultivars that were common across these five years were also compared for tomato spotted wilt virus (TSWV), total disease, leaf spot, white mold (WM), pod yield, and dollar values. Early April planting dates were used to enhance TSWV and WM or stem rot disease pressure. 'Georgia-12Y' and 'Georgia-06G' had the lowest TSWV and total disease (TD) incidence (resistance) among the runner-type cultivars; whereas, 'Georgia-19HP' had the lowest TSWV and TD among the virginia-types. The virginia-type cultivars 'Bailey II', 'Sullivan', 'Wynne', and Georgia-19HP had among the lowest leaf spot rating and WM disease incidence of both runner and virginia-types. However, Georgia-12Y, 'Georgia-16HO', 'Georgia-07W', and 'Georgia-20VHO' had the highest pod yield and gross dollar value returns per hectare, thus had the best drought tolerance among both runner and virginia-types in this five-year study.

INTRODUCTION

In Georgia, the most recent disease loss and cost of control estimates for peanut (*Arachis hypogaea* L.) was $214.5 million which represents 31.6% of the 2020 total crop value (Kemerait, 2023). This was an increase compared to 2015 where total damage and cost of control was $153.0 million which represented 22.3% of the peanut crop value (Kemerait, 2017). During both years (2015 and 2020), white mold (WM) or stem rot caused by *Agroathelia rolfsii* (Curzi) C. C. Tu & Kimbr, = *Sclerotium rolfsii* Sacc. resulted in the highest percent reduction in total crop value compared to other diseases at 6.0% and 8.0%, respectively. However these other soilborne and foliar peanut diseases also cause considerable economical damage, resulting in several additional millions of U. S. dollars lost due to damage and cost of control each year (Kemerait, 2017; Kemerait, 2023).

In addition to the soilborne disease white mold, tomato spotted wilt caused by *Tomato spotted wilt virus* (TSWV), early leaf spot caused by *Passalora arachidicola* (Hori) U. Braun syn. *Cercospora arachidicola* (Hori), and late leaf spot caused by *Nothopassalora personata* (Berk & M. A. Curtis) U. Braun, C. Nakesh., Videira & Crous syn. *Cercospordium personatum* (Berk. & Curt.) Deighton are foliar diseases that are endemic each year and cause considerable yield loss. Dryland peanut

production in Georgia accounts for roughly half of the total hectarage during any given growing season (Monfort, 2022). Consequently, the objective of this study was to assess these multiple diseases and the performance of several different peanut genotypes without fungicides or insecticides under dryland test conditions for disease resistance and drought tolerance.

MATERIALS AND METHODS

During five-years (2018-22), several peanut genotypes were assessed for multiple diseases [TSWV, white mold (WM), total disease (TD) = TSWV+WM, (early and late) leaf spot]. Within each year, these runner and virginia-type genotypes were evaluated for dryland field performance at the Gibbs Research Farm (latitude: 31.43°N and longitude: 83.59°W) near the University of Georgia, Coastal Plain Experiment Station, Tifton, GA.

A randomized complete block field design with four replications was used each year. No fungicides, insecticides, or irrigation were applied. These dryland field tests were conducted on a Tifton loamy sand soil type (fine-loamy, siliceous, thermic Plinthic Kandidult). All plots in each test consisted of two rows, 6.1m long x 1.8 m wide, and six seed were planted per 30.5 cm of row. Early April planting dates were used to increase TSWV and WM disease pressure (Tillman et al., 2007 and Culbreath et al., 2009). These field tests were also in a desirable three-year rotation following corn (*Zea mays* L.) and cotton (*Gossypium* sp.)

TSWV incidence (0-100%) was first assessed at midseason (approximately 70 days after planting), when TSWV is usually the predominant disease present and easier to assess. Additionally, percentages of total disease (TD) incidence were assessed prior to digging, which included primarily TSWV but also any soilborne disease. A disease "hit" equaled one or more symptomatic diseased plants in a 30.5-cm section of row (Rodriguez-Kabana et al., 1975). Leaf spot ratings among all genotypes were recorded on an individual plot basis within a few days prior to digging during each growing season. Both early and late leaf spot were prevalent and evaluated together on a 0-9 visual canopy rating scale where 0 = no visible leaf spot (immune) and 9 = dead and defoliated plants (very highly susceptible). The 0-9 leaf spot rating scale used in this study is most similar to the 1-9 scale of Pittman (1995), except for the addition of the 0 = immune rating. Immediately after digging and inverting, the incidence of only WM was also assessed among the different genotypes. This is the most definitive white mold rating assessment since signs and symptoms of this disease are often below ground, especially under dryland production. For TSWV, TD, and WM assessments, the disease incidence was determined by counting the number of hits in both rows and converting to a percentage of total row length for each plot.

Each genotype was individually dug near optimum maturity based upon the hull-scrape method from adjacent border plants (Williams and Drexler, 1981). After harvesting with a two-row combine, peanut pods from each plot were dried with forced warm-air to approximately 6% seed moisture content. Pod samples were then cleaned before weighing for yield determinations. Grade samples were presized and shelled on federal state inspection service (FSIS) equipment accordingly for runner and virginia-type peanut, respectively (USDA-AMS, 2019). Gross dollar values were calculated from yield and grade based upon USDA – Farm Service Agency (FSA) peanut loan schedules for each year. Dollar values included premiums for % ELK in virginia-types, and deductions included visual damage > 1% and sound splits > 4% for both market types as specified in annual peanut loan schedules (USDA-FSA, 2024).

Data from each test and combined data across tests were statistically analyzed by analysis of variance (ANOVA) using general linear model PROC GLM in SAS 9.4 version (SAS Institute, Inc. Cary, NC). Waller-Duncan Bayesian T-test (k-ratio = 100) was used for mean separation of significant differences ($P \leq 0.05$).

RESULTS

Rainfall during the five growing seasons recorded at each test site showed that the seven-month totals for three seasons (2019, 2020, and 2022) out of the five years were below the long-term average at Tifton, GA (Table 1). Likewise, four average monthly (April, July, September, and October) rainfall out of the seven during the five growing seasons was also below the long-term average. Even during the two high rainfall seasons (2018 and 2021), there were at least one or more months where drought stress was a major limiting factor. Maximum and minimum air temperatures averaged across the April thru October growing season (Table 2) showed that 2019 had the highest temperatures (31.6 and 19.4 °C), whereas 2021 had the lowest seven-month maximum and minimum temperatures (29.3 and 18.2 °C), respectively. Compared to the long-term (1923-2016) averages, the air temperatures were similar for the maximum temperatures for each month as well as the seven-month average. However, there seems to be a consistent trend in the seven-month minimum air temperature being slightly higher for each month and averaged 1.1 °C higher across the growing season (Table 2). Significant differences ($P \leq 0.05$) were found among both runner and virginia genotypes within each year (Tables 3-7) and across years (Table 8) for multiple diseases and overall field performance (pod yield and dollar values). Except for 2018 and 2021, significant differences were found for TSWV among the many assessed peanut genotypes. However during 2018 (Table 3), TD incidence which included predominantly TSWV near harvest time did show that the runner-type cultivar 'Georgia-12Y' (Branch, 2013) had the lowest percent TD of all genotypes, but it was not significantly lower than GA 122706; GA 132705; 'Georgia-20VHO' (Branch, 2021); 'Georgia-18RU' (Branch, 2019); 'Georgia-13M' (Branch, 2014); GA 132712; and one virginia-type cultivar, 'Georgia-19HP' (Branch and Brenneman, 2020). Likewise in 2018, the advanced Georgia breeding line, GA 132705 had the lowest leaf spot rating, but it was not significantly different from GA 132712, (a sister line); GA 152545; Georgia-12Y; 'TifNV-High O/L' (Holbrook et al., 2017) and the virginia-type cultivars Georgia-19HP, 'Georgia-11J' (Branch, 2012), and 'Bailey II'. The virginia-type cultivars 'Sullivan' and Bailey II had numerically lowest WM disease incidence, but they were not significantly different from three other virginia-types and 14 runner-types. These multiple disease assessments agree with a previous report (Chapin *et al.*, 2010) regarding TSWV, WM, and leaf spot resistance for the virginia-type cultivar 'Bailey' (Isleib *et al.*, 2011) the recurrent parent of Bailey II. Pod yield and dollar values were the highest for the Georgia breeding line, GA 152545. However, it was not

significantly higher than several other runner-types for both pod yield and dollar values.

Table 1. Five-year average monthly rainfall distribution during the growing season at Tifton, GA, 2018-22.

	Rainfall (mm)							
Year	Apr.	May	June	July	Aug.	Sept.	Oct.	7-Month Total
2018	80.8	186.9	179.8	162.3	173.0	23.9	51.3	858.0
2019	60.4	35.3	146.0	100.1	170.2	0.0	73.2	585.2
2020	38.1	94.0	120.9	49.8	106.7	63.2	24.4	497.1
2021	171.2	25.6	183.9	173.5	96.3	105.4	47.0	802.9
2022	67.8	91.7	30.7	108.5	142.7	108.7	30.5	580.6
Mean	83.7	86.7	132.3	118.8	137.8	60.2	45.3	664.8
Long-Term (1923-2016)[a]								
Avg.	98.8	82.3	117.1	137.9	124.0	96.8	57.7	714.6

[a]http://www.georgiaweather.net/?variable=AV&site=TIFTON

Table 2. Five-year average monthly maximum and minimum air temperature (°C) distribution during the growing season at Tifton, GA, 2018-22.[a]

	Apr.		May		June		July		Aug.		Sept.		Oct.		7 Month Avg.	
Year	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
2018	23.4	10.9	30.0	18.9	32.2	21.7	31.8	22.3	32.4	22.1	32.8	22.2	27.4	16.7	30.0	19.2
2019	25.9	13.3	32.0	19.6	32.1	21.4	33.6	22.1	34.5	22.3	34.9	20.3	28.2	16.9	31.6	19.4
2020	25.3	12.9	28.3	16.3	30.8	20.8	33.7	22.3	33.3	22.5	29.4	20.1	27.7	16.8	29.8	18.8
2021	24.2	12.0	28.7	15.7	31.3	21.1	31.7	22.0	31.9	22.5	30.4	19.2	26.5	15.1	29.3	18.2
2022	25.5	12.7	30.4	17.9	34.2	21.8	32.9	22.3	32.2	21.9	29.6	18.6	25.1	11.8	30.0	18.2
Mean	24.9	12.3	29.9	17.7	32.1	21.4	32.7	22.2	32.9	22.3	31.4	20.1	27.0	15.5	30.1	18.8
Long-Term (1923-2016)a																
Avg.	25.4	12.1	29.3	16.5	32.0	20.2	32.8	21.5	32.7	21.3	30.7	19.0	26.3	13.0	29.9	17.7

[a]http://www.georgiaweather.net/?variable=AV&site=TIFTON

Table 3. Disease assessment and dryland field performance among runner and virginia-type peanut genotypes when planted early and grown without fungicides or insecticides and no-irrigation at Tifton, GA, 2018

Peanut Genotype	TSWV[a] (%)	TD[b] (%)	Leafspot (0-9)	WM[c] (%)	Yield (kg/ha)	Value ($/ha)
Runner-Types:						
GA 152545	2.5 a*	21.0 e-i	2.0 hij	9.0 d-i	4912 a	2011 a
Georgia-12Y	2.0 a	8.0 j	2.2 g-j	9.0 d-i	4742 ab	1880 ab
GA 122706	2.5 a	15.5 hij	2.4 f-i	3.5 ghi	4621 abc	1858 abc
Georgia-20VHO	3.5 a	17.0 g-j	2.6 e-h	13.0 b-f	4511 a-d	1853 abc
Georgia-16HO	2.0 a	27.5 d-g	3.2 cde	9.5 d-i	4641 abc	1843 a-d
TUFRunner '297'	3.5 a	25.5 d-h	4.8 b	14.0 a-e	4589 a-d	1806 a-d
Georgia Greener	4.0 a	24.0 d-h	2.6 e-h	11.0 c-h	4374 a-f	1774 b-e
Georgia-06G	2.5 a	21.5 e-i	2.4 f-i	6.5 d-i	4389 a-f	1749 b-e
Georgia-09B	4.0 a	23.0 d-h	3.8 c	10.5 c-i	4215 b-h	1705 b-f
FloRun '107'	5.0 a	40.0 abc	4.6 b	14.0 a-e	4255 b-g	1698 b-f
AU-NPL 17	4.0 a	26.0 d-h	3.0 def	6.0 d-i	4410 a-e	1688 b-f
FloRun '331'	9.0 a	47.0 a	3.0 def	4.0 f-i	4245 b-g	1670 c-g
TifNV-High O/L	6.5 a	26.0 d-h	2.2 g-j	3.0 ghi	4260 b-g	1638 d-h
Florida-07	6.0 a	40.0 abc	3.8 c	21.0 ab	4115 c-i	1572 e-i
Tifguard	6.0 a	25.0 d-h	2.6 e-h	15.0 a-d	3965 e-j	1525 f-j
Georgia-07W	2.5 a	24.0 d-h	2.8 d-g	8.0 d-i	3852 f-k	1470 g-k
GA 132705	3.5 a	10.5 ij	1.6 j	2.5 hi	3867 f-k	1470 g-l
Georgia-18RU	5.0 a	19.0 f-j	4.6 b	12.0 b-g	3677 h-m	1465 g-l
Georgia-13M	4.5 a	18.0 f-j	5.6 a	9.0 d-i	3737 g-k	1450 h-l
TUFRunner '511'	6.5 a	44.5 ab	5.2 ab	23.0 a	3682 h-l	1443 h-l
GA 132712	1.5 a	15.5 hij	1.8 ij	4.0 f-i	3732 g-k	1408 i-m
ACI 3321	4.5 a	34.0 bcd	2.8 d-g	5.5 e-i	3480 j-o	1300 k-o
Georgia-14N	2.5 a	21.5 e-i	3.0 def	14.0 a-e	2959 o	1191 no
Virginia-Types:						
Georgia-19HP	2.0 a	15.0 hij	1.8 ij	4.5 f-i	4060 d-i	1683 b-f
Georgia-11J	2.5 a	29.5 c-f	1.8 ij	19.5 abc	3608 i-m	1517 f-j
GA 142528	3.0 a	26.0 d-h	3.4 cd	19.5 abc	3509 j-n	1394 i-n
Wynne	3.5 a	31.5 cde	2.6 e-h	5.5 e-i	3328 k-o	1315 j-o
Sullivan	3.5 a	31.0 cde	2.4 f-i	1.5 i	3169 l-o	1260 l-o
Bailey	2.0 a	29.0 c-f	2.6 e-h	4.0 f-i	3139 mno	1213 mno
Bailey II	2.0 a	29.5 c-f	2.2 g-j	1.5 i	3039 no	1174 o

*Within columns, genotypic means followed by the same letter are not significantly different at P≤0.05.
[a]TSWV = Tomato spotted wilt virus
[b]TD = Total disease
[c]WM = White mold or stem rot

Table 4. Disease assessment and dryland field performance among runner and virginia-type peanut genotypes when planted early and grown without fungicides or insecticides and no-irrigation at Tifton, GA, 2019

Peanut Genotype	TSWV[a] (%)	TD[b] (%)	Leafspot (0-9)	WM[c] (%)	Yield (kg/ha)	Value ($/ha)
Runner-Types:						
Georgia-12Y	0.1 h*	11.5 e-h	2.0 def	9.0 h-k	5811 a	2236 a
Georgia-07W	4.5 a-f	19.0 a-g	2.6 bcd	14.0 f-j	5303 abc	2199 ab
TUFRunner '511'	6.5 ab	27.5 ab	4.4 a	24.5 b-f	5380 ab	2174 ab
GA 142510	2.5 d-h	21.0 a-f	1.8 efg	25.0 b-f	4957 b-e	2029 abc
GA 132712	3.5 b-h	8.5 gh	1.2 ghi	11.5 g-k	5029 b-e	2024 abc
GA 163119	3.5 b-h	11.5 e-h	4.8 a	26.5 b-e	4969 b-e	2009 a-d
Georgia-21GR	4.0 b-g	19.0 a-g	1.2 ghi	34.0 b	4673 c-h	1954 b-e
Georgia-16HO	4.5 a-f	16.0 b-h	3.0 b	25.0 b-f	4725 c-g	1905 c-f
GA 132705	4.0 b-g	14.0 d-h	1.2 ghi	7.5 ijk	4697 c-g	1898 c-f
Georgia-22MPR	1.0 gh	18.5 a-g	4.2 a	28.0 bcd	4710 c-g	1880 c-g
GA 142509	3.0 c-h	19.5 a-g	1.8 efg	28.5 bc	4533 d-j	1856 c-h
TUFRunner '297'	5.5 a-d	28.0 a	2.4 b-e	23.0 b-g	4567 d-i	1846 c-h
FloRun '331'	6.5 ab	26.0 abc	2.8 bc	7.0 ijk	4704 c-g	1839 c-h
Georgia-14N	2.5 d-h	12.0 e-h	2.0 def	11.5 g-k	4427 e-j	1836 c-h
AU-NPL 17	5.5 a-d	6.5 h	0.6 ij	7.0 ijk	4808 b-f	1824 c-h
Georgia-20VHO	1.5 fgh	25.0 a-d	2.2 cde	20.5 c-h	4477 e-j	1821 c-h
GA 152545	1.0 gh	23.0 a-e	1.4 fgh	20.0 c-h	4555 d-j	1819 c-i
Georgia-06G	1.5 fgh	19.5 a-g	1.2 ghi	16.5 d-i	4444 e-j	1764 d-i
ACI 3321	6.0 abc	8.5 gh	1.2 ghi	7.5 ijk	4546 d-j	1743 e-j
Georgia-18RU	3.0 c-h	24.5 a-d	2.4 b-e	46.0 a	4048 h-k	1707 e-k
Georgia Greener	2.0 e-h	15.5 c-h	1.2 ghi	16.0 e-i	4190 f-k	1658 f-k
TifNV-High O/L	4.0 b-g	17.5 a-h	1.2 ghi	10.0 h-k	4254 f-k	1623 g-k
Tifguard	7.5 a	20.0 a-g	1.0 hij	10.5 h-k	3980 ijk	1564 ijk
Georgia-09B	4.0 b-g	26.0 abc	2.4 b-e	30.5 bc	3625 k	1465 k
Virginia-Types:						
Georgia-11J	4.0 b-g	19.5 a-g	3.0 b	9.0 h-k	5154 bcd	1952 b-e
Georgia-19HP	3.5 b-h	15.0 c-h	0.8 hij	9.5 h-k	4159 g-k	1715 e-k
Sullivan	6.0 abc	14.0 d-h	0.4 j	2.5 jk	4184 f-k	1673 f-k
Bailey	5.0 a-e	10.5 fgh	1.0 hij	2.0 k	4121 g-k	1660 f-k
Bailey II	4.5 a-f	13.5 d-h	0.6 ij	1.5 k	4113 g-k	1614 h-k
Wynne	5.0 a-e	21.0 a-f	1.2 ghi	8.0 ijk	3913 jk	1493 jk

*Within columns, genotypic means followed by the same letter are not significantly different at P≤0.05.
[a]TSWV = Tomato spotted wilt virus
[b]TD = Total disease
[c]WM = White mold or stem rot

During 2019 (Table 4), Georgia-12Y had the lowest percent incidence of TSWV, but it was not significantly lower than several other runner and virginia-types. Likewise in 2019, 'AU-NPL 17' had the lowest percent incidence of TD, but it also was not significantly lower than several other genotypes. Whereas, leaf spot rating was the lowest for Sullivan, but it was not significantly different from the virginia-types: Bailey II, Georgia-19HP, Bailey and runner-types: AU-NPL 17 and 'Tifguard' (Holbrook et al., 2008). Percent WM was the lowest for Bailey II, but it was not significantly lower than all of the other virginia-types and several of the runner-types. Pod yield and dollar values were both the highest for Georgia-12Y. However, it was not significantly different from 'Georgia-07W' (Branch and Brenneman, 2008) and TUFRunner '511' in pod yield, and Georgia-07W, 'TUFRunner 511' (Tillman and Gorbet, 2017), GA 142510, GA 132712, and GA 163119 for dollar value.

In 2020 (Table 5), no data was collected for the percentage of white mold (WM) due to COVID-19 pandemic restrictions. However, Georgia-12Y and 'Georgia-06G' (Branch, 2007) were found to have the lowest percentage of TSWV. But these two runner-type cultivars were not significantly different from several other runner-types at mid-season. Near harvest, the lowest TD percentages were found in Georgia-12Y. However, it was not significantly different from several other runner and virginia-types. Georgia-19HP had the lowest leaf spot rating of all genotypes, but it was not significantly different from several other runner and virginia-types. Pod yield and dollar values were the highest for 'TifJumbo' and Georgia-12Y, respectively. However, both high performing cultivars were not significantly different from each other and several other different genotypes.

Table 5. Disease assessment and dryland field performance among runner and virginia-type peanut genotypes when planted early and grown without fungicides or insecticides and no-irrigation at Tifton, GA, 2020

Peanut Genotype	TSWV[a] (%)	TD[b] (%)	Leafspot (0-9)	WM[c] (%)	Yield (kg/ha)	Value ($/ha)
Runner-Types:						
Georgia-12Y	2.5 g*	9.4 i	4.2 cde	-	4784 ab	1903 a
Georgia-07W	6.2 c-g	13.1 hi	3.8 def	-	4363 a-e	1782 abc
TifNV-High O/L	7.5 b-e	14.4 ghi	2.5 ghi	-	3575 a-d	1759 a-d
AU-NPL 17	11.2 ab	19.4 a-h	3.0 f-i	-	4338 a-f	1670 a-e
GA 142509	5.0 efg	17.5 b-k	5.0 bc	-	3957 d-g	1660 a-f
Georgia-21GR	5.6 d-g	23.8 abc	4.2 cde	-	3918 d-g	1648 b-f
Georgia Greener	10.0 abc	13.1 hi	3.2 e-h	-	4107 c-g	1643 b-f
Georgia-14N	4.4 efg	12.5 hi	3.2 e-h	-	3931 d-g	1621 b-f
Georgia-20VHO	5.6 d-g	25.0 a	3.0 f-i	-	3959 d-g	1601 b-f
Georgia-06G	2.5 g	16.9 c-h	3.8 def	-	3971 d-g	1576 b-f
TUFRunner '297'	11.2 ab	23.1 a-d	4.5 bcd	-	4009 c-g	1572 b-f
FloRun '331'	11.9 a	24.4 ab	3.2 e-h	-	3946 d-g	1537 c-g
GA 142510	4.4 efg	20.6 a-g	5.5 ab	-	3704 f-i	1527 c-g
Georgia-16HO	5.6 d-g	19.4 a-h	5.0 bc	-	3843 e-h	1515 d-g
Tifguard	7.5 b-e	25.0 a	2.5 ghi	-	3615 g-j	1421 e-i
Georgia-22MPR	3.1 fg	13.1 hi	5.2 bc	-	3245 hij	1310 ghi
Georgia-18RU	7.5 b-e	19.4 a-h	6.5 a	-	3113 ij	1293 ghi
GA 163119	5.6 d-g	20.6 a-g	5.2 bc	-	3036 j	1226 hij
Georgia-09B	3.1 fg	20.6 a-g	4.5 bcd	-	3019 j	1198 ij
Virginia-Types:						
TifJumbo	8.1 a-e	15.0 f-i	2.2 hi	-	4932 a	1814 ab
Bailey II	10.0 abc	16.9 c-h	2.8 f-i	-	4638 abc	1799 ab
Bailey	9.4 a-d	15.6 e-i	3.2 e-h	-	4853 ab	1796 ab
Walton	9.4 a-d	16.2 d-i	2.2 hi	-	4617 abc	1754 a-d
Sullivan	7.5 b-e	15.0 f-i	3.0 f-i	-	4486 a-d	1591 b-f
Georgia-19HP	5.6 d-g	18.8 a-h	2.0 i	-	3833 e-h	1460 e-h
Georgia-11J	10.0 abc	16.9 c-h	5.2 bc	-	3594 g-j	1416 f-i
Wynne	9.4 a-d	21.9 a-f	2.5 ghi	-	4231 b-g	1290 ghi
GA 142528-1	6.9 c-f	22.5 a-e	3.5 d-g	-	3130 ij	983 j

*Within columns, genotypic means followed by the same letter are not significantly different at P≤0.05.
[a]TSWV = Tomato spotted wilt virus
[b]TD = Total disease
[c]WM = White mold or stem rot

Table 6. Disease assessment and dryland field performance among runner and virginia-type peanut genotypes when planted early and grown without fungicides or insecticides and no-irrigation at Tifton, GA, 2021

Peanut Genotype	TSWV[a] (%)	TD[b] (%)	Leafspot (0-9)	WM[c] (%)	Yield (kg/ha)	Value ($/ha)
Runner-Types:						
Georgia-12Y	7.0 a*	18.5 def	5.0 c-f	12.5 h-l	5220 a	2098 a
Georgia-07W	8.0 a	26.5 c-f	3.6 i	16.0 g-k	4968 ab	2036 ab
Georgia-20VHO	6.5 a	25.0 c-f	4.4 f-i	12.0 h-l	4837 abc	2016 abc
Georgia-16HO	11.0 a	28.0 c-f	4.2 f-i	17.5 f-j	4942 abc	2009 abc
GA 142510	9.5 a	28.0 c-f	4.6 e-h	21.0 e-i	4814 a-d	1964 a-d
GA 142509	10.5 a	34.0 a-e	5.0 c-f	29.0 def	4771 a-d	1947 a-e
Georgia-22MPR	6.5 a	11.5 f	6.8 a	28.5 def	4822 a-d	1930 a-e
Georgia-21GR	4.5 a	25.0 c-f	4.0 ghi	36.0 bcd	4725 a-d	1915 a-e
TifNV-High O/L	6.5 a	23.5 c-f	4.0 ghi	4.5 kl	4726 a-d	1883 a-e
FloRun '331'	13.5 a	50.5 a	5.0 c-f	6.5 jkl	4650 a-d	1851 a-f
TUFRunner '297'	10.5 a	29.0 b-e	6.2 ab	30.0 cde	4472 a-e	1794 b-f
Georgia-06G	7.5 a	22.5 c-f	4.8 d-g	18.0 e-j	4403 b-e	1789 b-f
Georgia Greener	8.5 a	30.5 b-e	4.0 ghi	22.5 e-h	4301 b-f	1742 b-g
Tifguard	7.5 a	25.0 c-f	5.0 c-f	21.5 e-i	4281 b-g	1740 c-h
AU-NPL 17	10.0 a	35.0 a-e	5.8 bc	17.5 f-j	4391 b-e	1730 c-h
Georgia-14N	7.5 a	21.0 c-f	3.6 i	8.5 jkl	4052 d-h	1690 d-i
TifNV-HG	11.5 a	35.5 a-d	4.8 d-g	9.5 i-l	4162 c-g	1658 e-j
GA 163103	10.0 a	28.5 b-f	4.8 d-g	18.5 e-j	3722 e-i	1564 f-k
Georgia-09B	8.0 a	33.0 b-e	5.8 bc	28.5 def	3732 e-i	1458 g-l
Georgia-18RU	8.0 a	29.0 b-e	5.8 bc	48.5 a	3750 e-i	1446 h-l
GA 162724	10.5 a	31.5 b-e	6.2 ab	48.0 ab	3092 ij	1191 lm
GA 162725	7.5 a	32.0 b-e	5.4 b-e	41.5 abc	3348 hij	1137 m
GA 162722	7.5 a	29.5 b-e	5.6 bcd	50.0 a	2883 j	1129 m
Virginia-Types:						
Georgia-19HP	5.0 a	18.0 ef	4.0 ghi	12.5 h-l	4413 b-e	1917 a-e
Georgia-11J	11.5 a	31.0 b-e	4.0 ghi	26.5 d-g	4760 a-d	1875 a-e
TifJumbo	11.0 a	34.5 a-e	3.8 hi	11.0 h-l	4805 a-d	1851 a-f
Bailey	10.0 a	26.5 c-f	1.8 j	3.0 l	3691 e-i	1453 g-l
Sullivan	8.0 a	27.5 c-f	1.6 j	3.0 l	3707 e-i	1413 i-m
Wynne	13.5 a	45.5 ab	2.2 j	3.5 l	3589 f-j	1389 j-m
Bailey II	11.0 a	37.5 abc	1.8 j	3.5 l	3509 g-j	1352 klm

*Within columns, genotypic means followed by the same letter are not significantly different at P≤0.05.
[a]TSWV = Tomato spotted wilt virus
[b]TD = Total disease
[c]WM = White mold or stem rot

As previously mentioned, no significant differences were found among the runner and virginia genotypes for TSWV incidence during 2021 (Table 6). However, significant differences were found for TD incidence. 'Georgia-22MPR' (Branch and Brenneman, 2023) had the lowest percentage of

TD among these genotypes, but it was not significantly different from several other runner and virginia-types. For leaf spot, four virginia cultivars, 'Sullivan', Bailey, Bailey II, and 'Wynne' had the lowest significant ratings of all genotypes. These same four virginia cultivars also had the lowest WM percentages, however all four were not significantly different from many other runner and virginia-types. Field performance again resulted in Georgia-12Y having the highest pod yield and dollar values similar to 2019 and 2020. However, it was not significantly different from several other runner and virginia-types.

Table 7. Disease assessment and dryland field performance among runner and virginia-type peanut genotypes when planted early and grown without fungicides or insecticides and no-irrigation at Tifton, GA, 2022.

Peanut Genotype	TSWV[a] (%)	TD[b] (%)	Leafspot (0-9)	WM[c] (%)	Yield (kg/ha)	Value ($/ha)
Runner-Types:						
Georgia-16HO	11.5 a-d*	37.0 e-k	2.8 b	5.0 b-e	4751 a	1895 a
Georgia-21GR	11.0 a-e	36.5 e-l	1.0 f	4.0 b-e	4429 ab	1789 ab
GA 192710	5.5 e	24.0 lmn	1.8 cd	2.0 de	4084 bc	1628 bc
Georgia-20VHO	9.5 cde	23.5 mn	1.0 f	9.5 a-d	3885 cde	1534 cd
GA 182521	11.5 a-d	36.0 f-m	3.2 a	4.5 b-e	3643 c-g	1492 cde
Georgia-22MPR	5.5 e	29.5 i-n	2.8 b	7.0 a-e	3825 c-f	1490 cde
Georgia-06G	7.5 cde	25.0 k-n	1.0 f	11.0 ab	3833 c-f	1475 cde
Georgia-12Y	6.0 de	22.5 n	2.0 c	0.5 e	3976 bcd	1463 c-f
Georgia-07W	10.5 a-e	48.0 cde	1.8 cd	2.0 de	3716 c-g	1463 c-f
Georgia-18RU	10.0 b-e	45.5 c-g	1.4 e	7.5 a-e	3542 d-h	1450 c-g
TifNV-HG	10.5 a-e	27.5 j-n	1.0 f	2.5 de	3723 c-g	1426 d-h
FloRun 'T61'	16.0 a	44.5 c-h	1.0 f	5.5 a-e	3690 c-g	1401 d-h
FloRun '331'	16.0 a	64.5 a	1.0 f	2.5 de	3604 c-g	1386 d-h
GA 182729	9.0 cde	29.5 i-n	1.4 e	5.5 a-e	3419 e-i	1381 d-h
AU-NPL 17	10.0 b-e	34.5 f-n	1.0 f	2.5 de	3512 d-h	1327 e-h
TUFRunner '297'	11.5 a-d	44.5 c-h	1.0 f	13.0 a	3361 f-j	1275 g-j
Georgia Greener	11.0 a-e	41.0 d-i	1.0 f	6.5 a-e	3224 g-l	1270 g-j
GA 192517	13.0 abc	61.0 ab	3.0 ab	4.0 b-e	3231 g-l	1260 hij
Georgia-14N	10.0 b-e	47.0 c-f	1.6 de	2.5 de	2759 l	1104 ijk
Georgia-09B	11.0 a-e	55.0 abc	1.0 f	7.0 a-e	2898 jkl	1102 ijk
GA 163103	10.5 a-e	35.5 f-m	1.0 f	9.5 a-d	2766 l	1092 jk
TifNV-High O/L	11.0 a-e	34.0 g-n	1.0 f	2.0 de	2927 i-l	1067 k
Tifguard	15.5 ab	51.0 bcd	1.0 f	9.0 a-d	2808 kl	1025 k
Virginia-Types:						
Georgia-11J	10.5 a-e	45.5 c-g	1.8 cd	2.5 de	3539 d-h	1408 d-h
TifJumbo	9.5 cde	32.0 h-n	1.0 f	6.0 a-e	3569 d-g	1329 e-h
Georgia-19HP	7.5 cde	35.0 f-n	1.0 f	10.5 abc	3305 g-k	1280 f-i
Bailey II	9.0 cde	33.5 g-n	0.0 g	2.0 de	2936 i-l	1072 k
Sullivan	9.5 cde	39.0 d-j	0.0 g	2.0 de	2950 i-l	1048 k
NC 20	9.5 cde	37.0 e-k	1.0 f	1.0 e	3067 h-l	1011 k
Wynne	9.0 cde	40.0 d-j	0.0 g	3.0 cde	2762 l	951 k

*Within columns, genotypic means followed by the same letter are not significantly different at P≤0.05.
[a]TSWV = Tomato spotted wilt virus
[b]TD = Total disease
[c]WM = White mold or stem rot

Table 8. Five-year average disease assessment and dryland field performance among 14 runner and five virginia-type peanut cultivars when planted early and grown without fungicides or insecticides and no-irrigation at Tifton, GA, 2018-22.

Peanut Cultivar	TSWV[a] (%)	TD[b] (%)	Leafspot (0-9)	WM[c] (%)	Yield (kg/ha)	Value ($/ha)
Runner Types:						
Georgia-12Y	3.5 i*	14.0 g	3.1 bcd	7.8 def	4907 a	1916 a
Georgia-16HO	6.9 b-f	25.6 b-f	3.6 ab	14.2 bcd	4580 ab	1833 ab
Georgia-07W	6.3 d-g	26.1 b-f	2.9 b-e	10.0 c-f	4440 abc	1790 abc
Georgia-20VHO	5.3 f-i	23.1 def	2.6 c-f	13.8 b-e	4334 bcd	1765 a-d
Georgia-06G	4.3 hi	21.1 fg	2.6 c-f	13.0 b-e	4208 b-e	1671 b-e
TUFRunner '297'	8.4 bc	30.0 bcd	3.8 ab	20.0 ab	4200 b-e	1659 b-f
FloRun '331'	11.4 a	42.5 a	3.0 b-e	5.0 ef	4230 bcd	1657 b-f
AU-NPL 17	8.1 bcd	24.3 c-f	2.7 c-f	8.2 def	4292 bcd	1648 b-f
Georgia Greener	7.1 b-f	24.8 b-f	2.4 d-g	14.0 b-e	4039 c-g	1617 c-g
TifNV High O/L	7.1 b-f	23.1 def	2.2 e-h	4.9 ef	3948 d-h	1594 d-g
Georgia-14N	5.4 f-i	22.8 def	2.7 c-f	9.1 def	3626 gh	1488 e-h
Georgia-18RU	6.7 c-g	27.5 b-f	4.1 a	28.5 a	3626 gh	1472 f-i
Tifguard	8.8 b	29.2 b-e	2.4 d-g	14.0 b-e	3730 e-h	1455 ghi
Georgia-09B	6.0 e-h	31.5 bc	3.5 abc	19.1 bc	3498 h	1386 hi
Virginia-Types:						
Georgia-11J	7.7 b-e	28.5 b-f	3.2 bcd	14.4 bcd	4131 b-f	1634 c-g
Georgia-19HP	4.7 ghi	22.5 ef	1.9 fgh	11.2 b-f	3954 d-h	1611 c-g
Bailey II	7.3 b-f	26.2 b-f	1.5 h	2.1 f	3647 gh	1402 hi
Sullivan	6.9 b-f	25.3 b-f	1.5 h	2.2 f	3699 fgh	1397 hi
Wynne	8.1 bcd	32.0 b	1.7 gh	5.0 ef	3565 gh	1288 i
Mean	6.8	26.3	2.7	11.4	4034	1594
% CV	24.0	22.5	26.8	55.6	9.5	9.8

*Within columns, means followed by the same letter are not significantly different at P≤0.05.
[a]TSWV = Tomato spotted wilt virus
[b]TD = Total disease
[c]WM = White mold or stem rot

During 2022 (Table 7), percent TSWV incidence was the lowest with GA 192710 and Georgia-22MPR; whereas, the highest TSWV percentages were found with FloRun 'T61' and FloRun '331' (Tillman, 2021). However, these genotypes were not significantly different from several other runner and virginia-types. In addition, TD was the lowest with Georgia-12Y and the highest with FloRun '331'. In contrast, Georgia-12Y was not significantly different for TD from several genotypes; whereas, FloRun '331' was significantly different from all genotypes, except GA 192517 for TD. Leaf spot pressure was low during 2022. Most genotypes had less than a 3.0 rating, except for GA 182521 and GA 192517 which had the highest leaf spot ratings of 3.2 and 3.0, respectively. GA 192517 was not significantly different from Georgia-16HO and Georgia-22MPR in leaf spot rating. TUFRunner '297' (Tillman, 2018) had the highest percentage of WM; whereas, Georgia-12Y had the lowest WM percentage. Both were not significantly different from many other runner and virginia genotypes. Georgia-16HO had the highest pod yield and dollar value, except it was not significantly higher than Georgia-21GR. Both of these runner-type cultivars were higher than all other runner and virginia-types, except that Georgia-21GR was not significantly better than GA 192710 for pod yield and dollar value.

DISCUSSION

In the five-year combined results for multiple disease and dryland performance (Table 8), Georgia-12Y had the lowest TSWV percentage (resistance), but it was not significantly different from Georgia-06G, 'Georgia-14N' (Branch and Brenneman, 2015), Georgia-20VHO, and Georgia-19HP. Likewise, Georgia-12Y was found to have the most resistance for late-season TD. However, it was not significantly different from Georgia-06G. These results agree with another recent report (Branch, *et al.*, 2021b).

In the leaf spot disease assessment, Bailey II and Sulllivan were found to be the most leaf spot resistant, but both virginia-type cultivars were not significantly different from Wynne, Georgia-19HP, and TifNV High O/L. These results agree with previous findings that early April plantings have less leaf spot pressure than later planting dates (Branch, *et al.*, 2021a).

WM disease assessments found that Bailey II, Sullivan, Wynne, TifNV High O/L, FloRun '331', Georgia-12Y, Georgia-14N, Georgia-07W, AU-NPL17, and Georgia-19HP were the most resistant under these dryland conditions with good crop rotation which resulted in low overall WM disease incidence. However, under heavier WM disease pressure with irrigation and following continuous peanut rotation, Georgia-12Y has been found to have long-term (>10 years) stable combined general field resistance to both TSWV and WM disease (Branch *et al.*, 2023).

Quizenberry (1982) defined drought tolerance as, "the ability of one genotype to be more productive with a given amount of soil moisture than another genotype". Overall field performance in this five-year study found that Georgia-12Y had the highest pod yield and dollar value per hectare (drought tolerance). However, it was not significantly higher than Georgia-16HO and Georgia-07W for pod yield and including Georgia-20VHO for dollar value. These results agree in part with a previous report involving minimum-inputs and without irrigation (Branch and Fletcher, 2017). The previous report only included a few of the runner and virginia-type cultivars used in this study.

Coefficient of variation (CV) percentages were relatively higher for these multiple disease assessments across years compared to the pod yield and dollar values (Table 8). These findings suggest greater stability for cultivar field performance (pod yield and dollar values) under these dryland test conditions. Obviously, irrigation provides for more uniform disease pressure versus sporadic rainfall during any given growing season. This was particularly apparent with WM which had the highest CV at 55.6%. Leaf spot disease also had a relatively low mean rating of only 2.7 on a 0-9 scale because of planting early without irrigation (Branch *et al.*, 2021a). In this study, significant differences were found among peanut genotypes for pod yield, dollar values, and several of our most common diseases when grown without fungicides, insecticides, and irrigation. However, drought stress was probably the major overall limiting factor in field performance compared to these low rating diseases.

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