

Yield response of runner peanut lines and their reaction to diseases in Southwest Alabama in 2004

A. K. Hagan, D. Hartzog, C. H. Campbell, J. R. Weeks, C. Balkom, and M. Pegues.

Resistance remains among the most effective methods for minimizing loss to damaging diseases in field crops and reducing the dependence on costly fungicide inputs needed for their control. Until the last decade or two little emphasis was placed on developing peanut lines with multiple disease resistance. The appearance of tomato spotted wilt virus, however, spurred interest in identifying peanut lines that have resistance to this destructive virus disease. While screening of virus resistant breeding lines, resistance or tolerance to other diseases such as late leaf spot, rust, southern stem rot (white mold) was found. Currently, several newly released peanut lines have not only shown good resistance to the above diseases but have excellent yield potential as well.

The objective of this series of trials conducted in 2004 at the Gulf Coast Research and Extension Center in Fairhope was to compare the yield response and sensitivity of newly released peanut lines to late leaf spot, rust, tomato spotted wilt virus, and southern stem rot with that of the current industry standard Georgia Green. In addition, the impact of tillage practices and row spacing on disease and the yield of selected runner peanut lines were evaluated.

Methods:

In all trials, peanuts were planted in an area that was cropped to peanut once every three years. The plots were not irrigated. Weed and insect control practices recommended by ACES were employed. In Trial 1, a total of 7 full canopy sprays of Bravo Ultrex at 1.4 lb/A were made on a 14-day calendar schedule with a 4-row ATV-mounted boom sprayer. In Trial 2 and 3, the first application of Bravo Ultrex at 1.4 lb/A was followed by two applications of Tilt 3.6E at 2.0 fl oz/A + 1 pt/A of Bravo Weather Stik 6F, an application of Abound 2SC at 1.6 pt/A, Bravo Ultrex at 1.4 lb/A, Abound 2SC at 1.6 pt/A, and finally three consecutive applications of Bravo Ultrex at 1.4 lb/A. In total, 8 fungicide applications were made on a 14-day calendar schedule starting on June 21 and ending on September 13. In all trials, incidence of tomato spotted wilt virus (TSWV) was rated on September 14. Rust damage was assessed using the 1-9 ICRISAT rust rating scale. Early and late leaf spot severity was recorded using the 1 to 10 Florida rating scale approximately 1 week before the plots were dug. Southern stem rot (white mold) incidence was taken immediately after each peanut line was inverted. Yields are reported at approximately 10% moisture.

Results:

Trial1 – Overall pressure from tomato spotted wilt virus (TSWV) was higher in 2004 than in previous years. Virus levels were significantly higher in GA01R and Georgia Green than in Andru II, Tifrunner, and AP-3, which were similar (Table 1). The TSWV ratings for Carver, Florida C-99R, GA02C, and ANorden were intermediate between those of all of the other peanut lines.

In this study, late leaf spot was far more common and damaging than early leaf spot. Leaf spotting and defoliation was heavier on Hull compared with all other peanut lines (Table 1). In contrast, light leaf spotting with very little premature leaf shed was seen on DP-1, Florida C-99R, GA01R, and Tifrunner. Leaf spot ratings for Andru II, Carver, GA02C, Georgia Green, ANorden, and AP-3 were statistically similar.

Peanut rust pressure was much higher than levels seen in recent years. Hull and ANorden suffered severe rust damage. Other peanut lines hit heavily by this disease were AP-3, Carver and Georgia Green. The least leaf loss due to peanut rust was found on Florida C-99R and GA01R. Other peanut lines with low to intermediate rust ratings were Tifrunner, DP-1, Andru II and GA02C.

While overall southern stem rot pressure was fairly low, many of the late maturing group 5 peanut lines had higher disease ratings than the earlier maturing peanuts. Heaviest SSR damage was seen on Hull and Tifrunner. Disease ratings for Andru II and Georgia Green were lower than those of several other peanut lines.

On several peanut lines, yield response did not appear to be greatly influenced by diseases. ANorden and AP-3, which were heavily damaged by rust, yielded the same as other lines had low rust ratings. Yields for Andru II, DP-1, Florida C-99R, GA01R, GA02C, Georgia Green, ANorden, and AP-3 were statistically similar (Table 1). Hull had lower yields than GA01R but not most of the other previously mentioned peanut lines. Carver yielded significantly less than all other peanut lines except for Tifrunner and Hull.

Table 1. Disease severity and yield response of commercial peanut lines at the Gulf Coast Research and Extension Center, 2004.

Peanut Line	Maturity Group ^z	TSWV hits/plot ^y	LLS rating ^x	Rust rating	SSR hits/plot ^w	Yield lb/A
Andru II	3	6.5 bc ^v	4.1 b	4.5 cd	0.8 f	5070 abc
Carver	4	8.5 abc	4.0 b	5.5 bc	2.5 bcdef	4114 d
DP-1	5	10.5 ab	3.3 c	4.5 cd	3.8 abc	5046 abc
Florida C-99R	5	7.8 abc	3.1 c	3.8 d	3.5 bcd	5034 abc
GA01R	5	13.0 a	3.0 c	3.5 d	2.5 bcdef	5590 a
GA02C	5	8.0 abc	3.8 b	4.5 cd	2.0 cdef	5300 ab
Georgia Green	4	13.3 a	4.0 b	5.5 bc	1.5 ef	5009 abc
Hull	5	11.5 ab	4.8 a	7.3 a	5.5 a	4513 bcd
ANorden	4	7.8 abc	3.8 b	6.3 ab	2.8 bcde	5179 ab
AP-3	4	4.3 c	3.9 b	6.0 b	2.3 cdef	5114 abc
Tifrunner	5	5.8 bc	2.9 c	4.3 d	4.3 ab	4259 cd

^zMaturity for early, mid-season, and late maturing lines occurs approximately 126-140, 130-145, and 140-165 DAP, respectively.

^yIncidence of tomato spotted wilt virus is expressed as the number of TSWV hits per plot.

^xLate leaf spot rating.

^wIncidence of southern stem rot (SSR) is expressed as the number of SSR hits per plot.

^vMeans followed by the same letter are not significantly different according to analysis of variance and Fisher's protected least significant difference (LSD) test.

Trial 2 – Considerable TSWV damage was seen on nearly all of the peanut lines screened. The least TSWV was seen on the early maturing Andru II and mid-maturing AP-3 (Table 2). While the highest TSWV hit counts were found in Carver and DP-1, disease ratings for these two lines were not significantly higher than those of ANorden, Georgia Green, GA02C, and DP-1.

Late leaf spot again was the most common leaf spot disease. With a disease rating of 5.0, considerable leaf spotting with up to 25% defoliation was seen on Andru II (Table 2). All other peanut lines except for AP-3 had lower leaf spot ratings than Andru II. Light to moderate leaf spotting with very little premature leaf shed was noted on DP-1, Florida C-99R, and GA02C. Carver, Georgia Green, and ANorden had leaf spot ratings that were similar to those of AP-3.

Significant differences in rust damage were found between peanut lines. The lines DP-1, Florida C-99R, and GA02C not only had the lowest leaf spot ratings but also suffered far less rust damage than the other peanut lines (Table 2). However, rust ratings of 4.4 to 4.8 indicate that 30 to 40% of the leaf canopy was damaged by peanut rust. Disease ratings of 6.6 to 7.6 shows that rust damage was very high on Andru II, Carver, Georgia Green, ANorden, and AP-3.

The peanut line that suffered the least southern stem rot damage was GA02C (Table 2). Incidence of this disease was higher for ANorden compared to AP-3, Georgia Green, and Florida C-99R. The number of SSR hits on Andru II, Carver, DP-1 were similar to those recorded for ANorden.

Peanut lines such as DP-1, Florida C-99R, and GA02C that had the lowest rust and late leaf spot ratings had the highest yields (Table 2). Yields for Georgia Green were similar to those reported for Andru II and AP-3. Carver and ANorden were the lowest yielding peanut lines. TSMK values for GA02C were higher than those for most peanut lines

except for DP-1 and Georgia Green. The poorest TSMK values were recorded for ANorden and AP-3.

Table 2. Peanut cultivar trial at the Gulf Coast Research and Extension Center, 2004.

Peanut Line	Maturity Group ^z	TSWV hits/plot ^y	LLS Rating ^x	Rust Rating	SSR hits/pot ^w	Yield lb/A	TSMK
Andru II	3	3.2 c ^y	5.0 a	7.6 a	7.8 ab	4289 bc	70.8 bcd
Carver	4	10.0 a	4.1 bc	6.8 a	8.4 ab	3763 cd	70.4 bcd
DP-1	5	8.2 ab	3.3 d	4.4 b	9.0 ab	5291 a	72.4 ab
Florida C-99R	5	9.8 a	3.2 d	4.8 b	6.6 bc	5380 a	71.2 bc
GA02C	5	6.8 abc	3.6 cd	5.4 b	3.0 c	5380 a	73.4 a
Georgia Green	4	7.0 abc	4.0 bc	6.8 a	6.4 bc	4513 b	71.4 abc
ANorden	4	6.2 abc	4.0 bc	6.6 a	11.0 a	3283 d	69.0 d
AP-3	4	4.6 bc	4.4 ab	7.2 a	7.0 b	4358 bc	69.6 cd

^zMaturity for early, mid-season, and late maturing lines occurs approximately 126-140, 130-145, and 140-165 DAP, respectively.

^yIncidence of tomato spotted wilt virus is expressed as the number of TSWV hits per plot.

^xLate leaf spot rating.

^wIncidence of southern stem rot (SSR) is expressed as the number of SSR hits per plot.

^vMeans followed by the same letter are not significantly different according to analysis of variance and Fisher's protected least significant difference (LSD) test.

Trial 3 – Incidence of TSWV was very low on all five peanut lines (Table 3). The number of TSWV hits was lower for AP-3 than for GA02C.

Significant differences in the level of late leaf spot were found between peanut lines (Table 3). Late leaf spot ratings for DP-1, GA02C, and Georgia Green were lower than those recorded for AP-3 and ANorden. Leaf spot and defoliation levels were higher on ANorden compared with AP-3.

When compared to Georgia Green, ANorden, and AP-3, considerably less rust development was seen on DP-1 and GA02C (Table 3). Rust levels were lower on Georgia Green than ANorden and AP-3. With a disease rating of 7.1, over 60% of the leaves on AP-3 were damaged or destroyed by rust.

Peanut lines differed significant in their susceptibility to southern stem rot (SSR) (Table 3). Hit counts were higher on ANorden than any other peanut lines. Incidence of this disease on AP-3, DP-1, and Georgia Green were statistically similar. The least SSR damage was noted on GA02C.

The high yields recorded for the late maturing DP-1 and GA02C reflect their partial resistance to late leaf spot, peanut rust, and southern stem rot (Table 3). While Georgia Green yielded less than the above peanut lines, this line suffered less disease damage and had higher yields than ANorden and AP-3. The combination of severe rust and to a lesser extent higher SSR damage ratings had a detrimental impact on the yield potential of ANorden and AP-3. The TSMK values for GA02C and Georgia Green were higher than those for the remaining three peanut lines.

Table 3. Impact of row spacing and tillage on disease development and yield response of selected peanut lines at the Gulf Coast Research and Extension Center, 2004.

Peanut Line	Maturity Group ^z	TSWV hits/plot ^y	LLS Rating ^x	Rust Rating	SSR hits/plot ^w	Yield lb/A	TSMK
DP-1	5	1.0 b ^y	2.9 d	3.4 d	5.7 b	5682 a	71.5 b
GA02C	5	1.9 a	3.3 c	3.9 d	3.4 c	5671 a	73.1 a
Georgia Green	4	1.3 ab	3.1 c	5.3 c	4.9 bc	5232 b	72.8 a
ANorden	4	1.1 ab	4.0 a	6.2 b	9.5 a	3885 d	71.7 b
AP-3	4	0.8 b	3.6 b	7.1 a	6.0 b	4631 c	71.3 b

^zMaturity for early, mid-season, and late maturing lines occurs approximately 126-140, 130-145, and 140-165 DAP, respectively.

^yIncidence of tomato spotted wilt virus is expressed as the number of TSWV hits per plot.

^xLate leaf spot rating.

^wIncidence of southern stem rot (SSR) is expressed as the number of SSR hits per plot.

^vMeans followed by the same letter are not significantly different according to analysis of variance and Fisher's protected least significant difference (LSD) test.

Summary

The disease resistance package and yield potential of the late maturing group 5 peanut lines was usually superior to that of the mid-season group 4 and the single early maturing group 3 line. Late leaf spot and peanut rust ratings were consistently lower for the late maturing DP-1, Florida C-99R, GA02C, and GA01R than for the earlier maturing peanut lines. In two of three years, GA02C also suffered the less SSR damage than DP-1, Carver, ANorden, and AP-3 but not Georgia Green.

In all three cultivar trials, the late maturing DP-1 and GA02C which have demonstrated partial resistance against late leaf spot, rust, and southern stem rot, consistently outyielded all other peanut lines. Yield of Florida C-99R was similar to that recorded for DP-1 and GA02C in the two trials that included this cultivar. In the one trial that GA01R was entered, its yields were similar to those of DP-1, GA02C, and Florida C-99R. In one trial, Hull proved very susceptible to several diseases and failed to meet the yield standards of other late maturing peanut lines.

In two of three trials, the mid-season peanut lines yielded significant less than all of the late maturing lines. Of these lines, Georgia Green and to a lesser extent AP-3 had the best yield response. Carver and ANorden consistently yielded significantly less than Georgia Green. Yield response of Andru II was similar to that obtained with Georgia Green.

Despite its TSWV sensitivity, Georgia Green is a better choice than Carver and ANorden for the Baldwin-Mobile area. Although AP-3 has done well in southeast Alabama trials, this cultivar may be too sensitive to late leaf spot and peanut rust to be grown in Baldwin and Mobile County. The late maturing DP-1, GA02C, and Florida C-99R, which

combine good disease resistance with high yield potential, may be the cultivars of choice for this area. Also, GA01R has performed well in limited trials.