REACTION OF COTTON VARIETIES TO TARGET SPOT (CORYNESPORA LEAF SPOT) IN ALABAMA

A. Hagan
Department of Entomology and Plant Pathology, Auburn University
Auburn, AL
M. Pegues
J. Jones
Gulf Coast Research and Extension Center, Auburn University
Fairhope, AL
L. Wells
Wiregrass Research and Extension Center, Auburn University
Headland, AL

Abstract

Commercial flex cotton varieties and selected experimental lines were evaluated for their reaction to target spot. Dryland and irrigated studies were located at the Gulf Coast Research and Extension and Wiregrass Research and Extension Centers, respectively. Light to moderate leaf spotting attributed to target spot was observed in late July to early August. Disease intensification on all varieties continued until the onset of cooler and drier weather in mid-September. At the Gulf Coast Research and Extension Center, final defoliation levels varied from an estimated 38% for Stoneville 4288 to 83% for Phytogen 499 with most varieties suffering between 50 and 60% premature leaf shed. In a mid- and late season flex variety trial at the location, Phytogen 499, Phytogen 375, Phytogen 565, and DPL 1252 suffered similarly high target spot-incited defoliation. Similar differences in the reaction of cotton varieties were noted in irrigated trials at the Wiregrass Research and Extension Center. Turnout (%) and yields for all four field trials at both locations will also be discussed.

Introduction

Target spot or Corynespora spot, caused by the fungus *Corynespora cassiicola*, was first noted on irrigated cotton in southwest Georgia in 2003 (Kemeriat et al., 2011). Fulmer et al. (2012) noted that the appearance of leaf lesions with light and dark brown concentric rings was followed by 70% premature defoliation and lint losses estimated at 200 lb/A. In some instances, defoliation may occur so late in the production cycle that this disease served more as a harvest aid and had minimal impact on yield. In 2011, disease outbreaks were noted statewide in Alabama cotton (Campbell et al., 2012). While target spot was observed in dryland cotton, the greatest leaf spotting and defoliation was observed in irrigated cotton, particularly when strip- or conservation tilled (Campbell et al., 2012). In 2012, disease outbreaks were observed in the Florida Panhandle (Donahue, 2012), South Carolina (Hagan, personal communication), Mississippi (Allen, personal communication), North Carolina (Edminsten, 2012), and Virginia (Phipps, personal communication) cotton.

Target spot is not a new disease of cotton. Jones (1961) described a leaf spot of *Gossypium hirsutum* and *G. barbadense* caused by *C. cassiicola* that may have been present in the Mississippi Delta for 25 years prior to the 1959 observation. In the same report, *C. cassiicola* isolates from cotton also produced diagnostic symptoms on soybean for target spot and on sesame for Corynespora blight (Jones, 1961). This same leaf spot disease was previously misidentified as Helminthosporium leaf spot in the Philippines (Clara, 1935). A *C. cassiicola*-incited boll rot in India was reported by Lakshmanan et al. (1990) but no observations concerning possible seed infestations were made. While the mechanism for the widespread dissemination of target spot in cotton has not been determined, Stone and Jones (1960) noted that *C. cassiicola* was carried in and on seed of soybean and sesame. Seed transmission may account for the rapid spread of target spot in recent years into Alabama and up the eastern seaboard. Efficacy of commercial fungicide seed dressings for cotton against *C. cassiicola* has yet to be determined.

Neither, Jones (1961) or Fulmer et al. (2012) reported differences in cotton variety susceptibility to target spot. Kemeriat et al. (2011) reported significant differences in target spot severity among a number of Deltapine commercial varieties and experimental lines. In Alabama in 2011, Campbell et al. (2012) and Hagan et al. (2012) noted the greatest level of leaf spotting and premature defoliation on several Phytogen cotton varieties, particularly Phytogen 499, while Stoneville 5288 and several Deltapine varieties had among the lowest Corynespora leaf spot

ratings. The objective of this study was to assess the reaction of early-, mid-, and full season flex commercial varieties and experimental lines of cotton to target spot in dryland and irrigated settings at multiple sites in Alabama.

Materials and Methods

Two studies were conducted in 2012 at both the Gulf Coast Research and Extension Center (GC1 and GC2) in Fairhope, AL and the Wiregrass Research and Extension Center (WG1 and WG2) in Headland, AL. Studies conducted at the Gulf Coast Research and Extension Center were dryland, while those at Wiregrass Research and Extension Center were irrigated.

Gulf Coast Research and Extension Center

A wheat cover crop, which was drilled at a rate of 2.5 bu seed/A, was killed with 22 fl oz/A of RoundUp Weather Max). For GC1, 297 lb/A of 7-20-30 fertilizer with 10 lb/A sulfur + 0.5 lb/A boron was broadcast on April 10, while 200 lb/A of 10-21-21 fertilizer with 10 lb/A sulfur, 3 lb/A zinc was broadcast on March 19 for GC2. A layby application of 23 gal/a 28-0-0-5S (70-0-0) liquid fertilizer was made on June 18. Cotton was hill dropped behind a KMC strip till unit at 3 seed/1.1 row ft in a Malbis fine sandy loam (OM <1%). Thrips and seedling disease control was provided by an at-plant, in-furrow applications of 5 lb/A Temik 15G and 7 lb/A Terraclor 10G, respectively. Weed control was obtained with a pre-plant application of 2 pt/A Prowl H_2O followed by 2 pt/A Cotoran at-planting. An application of the plant growth regulator Mepichlor at 6 fl oz/A + Induce at 1 pt/50 gal on June 18 was followed by three additional applications of 8 fl oz Mepichlor + 1 pt/50 gal Induce + 4 fl oz Bidrin + 1 gal/A of 5-0-20 liquid fertilizer on July 5, July 16, and July 30. Cotton was prepared for harvest with applications of Diuron at 1 oz/A + Dropp 50W at 2 oz/A + Ethephon at 21 fl oz /A on September 22 and September 27. Cotton was mechanically harvested on October 10 (GC1) and October 11 (GC2). Plots consisted of four 30–ft rows on 3.2 ft centers arranged in a randomized complete block with four replications. Previous crop for the GS1 study site was corn, while the GS2 study followed two previous years of cotton. Yields are reported as lb/A seed cotton.

Wiregrass Research and Extension Center

On 15 May, 100 lb/A of P and 60 lb/A K was broadcast. A layby application of 18-0-0-3S liquid fertilizer on 18 June was followed by a broadcast application of 60 lb/A of K on July 3. Rows were laid out with a KMC strip till rig on May 15 and cotton was sown a rate of 3 seed/1.1 row ft on May 18 in a Dothan fine loamy sand (organic matter <1%). Weed control was obtained with a pre-emergence incorporated application of 1 pt/A Prowl H_2O on May 18 followed early post application of a tank mixture 1 pt/A Cotoran + 1 pt/A Reflex + 1 qt/A RoundUp WeatherMax on May 21, and a layby application of 0.15 oz/A Envoke + 1 pt/A Dual on July 5. Stink bug control was obtained with a tank mix application of 8 fl oz/A Bidrin + 2 fl oz/A Tracer on July 25 and 6 fl oz/A of Bidrin on August 16. The plant growth regulator Pix at 16 fl oz/A was broadcast on August 16. Cotton was prepared for harvest with an application of 6 fl oz/A Dropp + 1 pt/A Def + 1.5 pt/A Prep on October 19. Cotton was mechanically harvested on October 28. Plots received 0.4, 0.5, 0.5, 1.0, and 1.0 acre in. of water on May 31, June 20, June 27, July 9, and July 24, respectively. Plots consisted of four 30-foot rows spaced 3 feet apart arranged in a randomized complete block with four replications. Previous summer crop for both studies was peanut. Turnout (%) was determined by replicate for all cotton varieties in both studies.

Disease Assessment and Statistical Methods

Target spot intensity was visually assessed on September 18 for GC1 and GC2, and September 27 and October 9 for WG1 and WG2, respectively, using a leaf spot rating scale where 1 = no disease, 2 = very few lesions in canopy, 3 = few lesions noticed in lower and upper canopy, 4 = some lesions seen and $\leq$ 10% defoliation, 5 = lesions noticeable and $\leq$ 25% defoliation, 6 = lesions numerous and $\leq$ 50% defoliation, 7 = lesions very numerous and $\leq$ 75% defoliation, 8 = numerous lesions on few remaining leaves and $\leq$90% defoliation, 9 = very few remaining leaves covered with lesions and $\leq$ 95% defoliation, and 10 = plants defoliated (Chiteka *et al.*, 1988). Statistical analysis on non-normal data was done on rank transformations, which were then back transformed for presentation. Means were separated using Fisher's protected least significant difference (LSD) test (P <0.05).

Results

For GS1, equally high target spot intensity ratings were recorded for the commercial lines Deltapine 1044, Phytogen 499, Phytogen 565, and Phytogen 375 as well as the experimental lines Phytogen PX4339-15, Phytogen PX4339-

CB, Phytogen PX 5322-11 and Phytogen PX 5277-02 (Table 1). With disease intensity ratings at or above 7.0, defoliation levels on Deltapine 1044, Phytogen 499, Phytogen 375 were approximately 75%. When compared with All-Tex Nitro 44, which suffered just over 25% defoliation, equally low levels of target spot-associated leaf spotting and premature defoliation were observed on Deltapine 1252, Deltapine 1050, Deltapine MON 11R136, Deltapine MON 11R159, NexGen 0012, and DynaGro DG2610. Seed cotton yield of 12 commercial varieties and experimental lines equaled those of the greatest yielding variety Deltapine 1137. Lowest seed cotton yields were recorded for Deltapine MON 11R159, Phytogen PX 5403-05, All-Tex Nitro 44, Deltapine 1044, and Americot 1511.

Table 1. Yields and reaction of mid- and full-season flex cotton varieties and experimental lines to target spot at the Gulf Coast Research and Extension Center (GC1).

Variety	Disease intensity[z]	Seed cotton lb/A[y]	Variety	Disease intensity	Seed cotton lb/A
All-Tex Nitro 44 B2RF	5.2 k[xw]	2759 fg	FiberMax 1944 GLB2	6.5 b-g	3226 a-d
Americot 1511 B2RF	6.4 c-h	2838 d-g	Phytogen 375 WRF	7.0 ab	3011 c-f
NexGen 0012 B2RF	6.0 g-k	3268 abc	Phytogen 499 WRF	7.1 a	3118 b-f
Croplan Genetics 3787 B2RF	6.3 d-h	3268 abc	Phytogen 565 WRF	6.8 a-d	2989 c-f
Deltapine 1044 B2RF	7.2 a	2774 efg	Phytogen PX 4339-15 WRF	7.1 a	3247 abc
Deltapine 1048 B2RF	6.2 f-j	3419 ab	Phytogen PX 4339-6 WRF	6.7 b-f	3204 a-d
Deltapine 1050 B2RF	5.9 h-k	3097 b-f	Phytogen PX 4339-CB WRF	6.8 a-e	3312 abc
Deltapine 1137 B2RF	6.3 e-i	3591 a	Phytogen PX 5277-02 WRF	6.9 abc	3268 abc
Deltapine 1252 B2RF	5.5 jk	3268 abc	Phytogen PX 5322-11 WRF	6.8 a-e	3376 abc
Deltapine MON 11R136 B2RF	5.7 jk	3075 b-f	Phytogen PX 5403-05 WRF	6.4 c-h	2752 fg
Deltapine MON 11R159 B2RF	6.0 i-k	2559 g	Phytogen PX 5409-03 WRF	6.4 c-h	3333 abc
DynaGro DG 2610 B2RF	6.0 g-k	3312 abc			

[z]Target spot intensity was assessed on September 18 using a 1 to 10 leaf spot scoring system, where 1 = no disease and 10 = completely defoliated plants.
[y]Seed cotton yield = weight of seed + lint.
[x]Means of each variable followed by the same letter are not significantly different according to Fisher's protected least significant difference (LSD) test ($P \leq 0.05$).
[w]Disease intensity data in columns are calculated means, but letters differentiating means were calculated using rank transformations.

For the GS2 study, significant differences in target spot intensity and seed cotton yield were noted between cotton varieties. Similarly high disease intensity ratings were recorded for Phytogen 499, Phytogen 375, Stoneville 5458, and FiberMax 1740 (Table 2). Phytogen 565, Deltapine 1048, Deltapine 1050, Deltapine 1044, Deltapine 1252, and FiberMax 1944 had target spot ratings similar to those recorded for Stoneville 4288, which suffered nearly 40% defoliation as compared with over 80% for Phytogen 499. Seed cotton yield was equally high for Deltapine 1252, Deltapine 1048, Deltapine 1050, Phytogen 375, Deltapine 1137, Phytogen 565, and Phytogen 499. Lower yields were reported for Deltapine 1044 than all other varieties except for Stoneville 4288, Stoneville 5458, and FiberMax 1944.

Table 2. Yield and reaction of mid- and full season flex cotton varieties to target spot at the Gulf Coast Research and Extension Center (GC2).

Variety	Disease intensity[z]	Seed cotton lb/A[y]	Variety	Disease intensity	Seed cotton lb/A
Phytogen 375 WFR	7.0 ab[xw]	2959 ab	Deltapine 1137 B2RF	6.3 bc	2945 abc
Phytogen 499 WFR	7.5 a	2849 a-d	Deltapine 1252 B2RF	6.0 cd	3111 a
Phytogen 565 WFR	6.2 bcd	2904 abc	FiberMax 1740 B2F	6.5 abc	2793 bcd
Deltapine 1044 B2RF	6.0 cd	2461 e	FiberMax 1944 GLB2	6.4 bcd	2641 cde
Deltapine 1048 B2RF	6.2 bcd	3028 ab	Stoneville 4288 B2F	5.5 d	2544 de
Deltapine 1050 B2RF	5.8 cd	3056 ab	Stoneville 5458 B2RF	6.6 abc	2544 de

[z]Target spot intensity was assessed on September 18 using a 1 to 10 leaf spot scoring system.
[y]Seed cotton yield = weight of seed + lint.
[x]Means of each variable followed by the same letter are not significantly different according to Fisher's protected least significant difference (LSD) test ($P \leq 0.05$).
[w]Disease intensity data in columns are calculated means, but letters differentiating means were calculated using rank transformations.

At the Wiregrass Research and Extension Center, significant differences in target spot intensity, % turnout, and lint yield were noted between cotton varieties and experimental lines in WG1. Phytogen 499 and DynaGro 2570, which suffered approximately 65 and 46% defoliation, respectively, as well as the experimental lines Phytogen PX 4433-14, Phytogen PX 4339-CB, and Phytogen PX 3122-40 had equally high disease ratings, while DynaGro 2530 and an additional 10 varieties suffered similarly low levels of target spot-related leaf spotting and premature defoliation (Table 3). Highest % turnout was recorded for Phytogen 367, Deltapine 1028, Deltapine 1133, and Phytogen 499, while Deltapine 0912, Americot 1550, DynaGro CT 12214, and FiberMax 1944 had the lowest % turnout (Table 4). Lint yield for Phytogen PX 3122-40, Deltapine 1034, Phytogen 499, Phytogen PX 4339-6, Phytogen PX 4339-15, Deltapine 1133, DynaGro 2530, Phytogen PX 4339-CB, Deltapine 1028, Croplan Genetics 3428, Americot 1511, and Fiber Max 1944 were equally high. When compared with DynaGro 2570, an additional 11 varieties and experimental lines had similarly low yields. Potash deficiency symptoms were observed on the early maturing varieties screened in WG1 as compared with the full season Phytogen 499 standard.

Table 3. Target spot intensity for early flex cotton varieties and experimental lines in WG1 irrigated study at Wiregrass Research and Extension Center.

Cotton variety	Disease intensity[z]	Cotton variety	Disease intensity[z]
All-Tex 9CR253 B2RF	4.9 d-i[xw]	DynaGro 2530 B2RF	4.8 i
All-Tex CR103233 B2RF	5.5 bcd	DynaGro 2570 B2RF	5.8 abc
Americot 1511 B2RF	5.2 d-g	DynaGro CT 12214	4.9 hi
Americot 1550 B2RF	5.0 d-i	FiberMax 1944 GLB2	5.1 d-i
Cropland Genetics 3428 B2RF	5.3 d-g	Phytogen 367 WRF	5.4 bcd
Deltapine 0912 B2RF	5.3 b-e	Phytogen 375 WRF	5.0 d-i
Deltapine 0920 B2RF	5.1 d-i	Phytogen 499 WRF	6.4 a
Deltapine 1028 B2RF	5.0 f-i	Phytogen PX 3122-40 WRF	5.8 abc
Deltapine 1034 B2RF	5.1 d-i	Phytogen PX 4339-15 WRF	5.5 bcd
Deltapine 1133 B2RF	4.7 ghi	Phytogen PX 4339-6 WRF	5.2 d-g
Deltapine MON 11R112	5.3 c-f	Phytogen PX 4339-CB WRF	5.9 ab
Deltapine MON 11R124	5.2 d-h	Phytogen PX 4433-14 WRF	6.0 ab
DynaGro CT 11212 B2RF	4.9 f-i		

[z]Target spot intensity was assessed on September 27 using a 1 to 10 leaf spot scoring system.
[y]Means followed by the same letter are not significantly different according to Fisher's protected least significant difference (LSD) test ($P \leq 0.05$).
[x]Disease intensity data are calculated means, but letters differentiating means were calculated using rank transformations.

Table 4. Turnout (%) and lint yield for early flex cotton varieties and experimental lines in WG1 irrigated study at Wiregrass Research and Extension Center.

Cotton variety	Turnout %	Lint yield lb/A	Cotton variety	Turnout (%)[y]	Lint yield lb/A
All-Tex 9CR253 B2RF	0.44 de	1993 c-j	DynaGro 2530 B2RF	0.45 c	2207 a-f
All-Tex CR103233 B2RF	0.43 ef	1864 g-j	DynaGro 2570 B2RF	0.44 d	1702 j
Americot 1511 B2RF	0.46 bc	2108 a-i	DynaGro CT 12214	0.42 g	1953 d-j
Americot 1550 B2RF	0.42 g	1885 f-j	FiberMax 1944 GLB2	0.42 fg	2093 a-i
Cropland Genetics 3428 B2RF	0.45 c	2106 a-i	Phytogen 367 WRF	0.47 a	1848 hij
Deltapine 0912 B2RF	0.40 g	1830 ij	Phytogen 375 WRF	0.43 e	1855 g-j
Deltapine 0920 B2RF	0.43 e	1812 ij	Phytogen 499 WRF	0.46 ab	2300 abc
Deltapine 1028 B2RF	0.47 a	2209 a-f	Phytogen PX 3122-40 WRF	0.45 c	2366 a
Deltapine 1034 B2RF	0.45 bc	2357 ab	Phytogen PX 4339-15 WRF	0.43 ef	2093 a-i
Deltapine 1133 B2RF	0.46 ab	2225 a-e	Phytogen PX 4339-6 WRF	0.43 e	2296 a-d
Deltapine MON 11R112	0.44 d	2035 b-i	Phytogen PX 4339-CB WRF	0.44 d	2176 a-g
Deltapine MON 11R124	0.44 d	1930 e-j	Phytogen PX 4433-14 WRF	0.43 ef	1878 g-j
DynaGro CT 11212 B2RF	0.44 d	1952 e-j			

[z]Turnout (%) = ratio of lint to total seed cotton yield.
[y]Means of each variable column followed by the same letter are not significantly different according to Fisher's protected least significant difference (LSD) test ($P \leq 0.05$).
[x]Disease intensity data are calculated means, but letters differentiating means were calculated using rank transformations.

As was noted above at WG1, significant differences in target spot intensity, % turnout, and seed cotton yield were noted between mid- and late season flex cotton varieties screened in WG2. When compared with Phytogen 499, which suffered nearly 80% defoliation and heavy leaf spotting on the remaining leaves, similarly high target intensity ratings were also recorded for Deltapine 1044, Americot 1511, Phytogen PX 5322-11, Phytogen 5403-05, and Deltapine MON 11R136. In contrast, Phytogen 375, Americot NG 0012, Croplan Genetics 3787, Deltapine 1048, Deltapine 1137, Deltapine 1252, Deltapine MON 11R159, and Fiber Max 1944 had as indicated by disease ratings of 5.1 to 5.7 between 25 and 40% defoliation. Turnout (%) ranks were equally high for Americot 1511, Deltapine 1252, and Phytogen 499, while Phytogen PX 5322-11, Phytogen PX 5409-03, Phytogen 375, and FiberMax 1944 had similarly low turnout ratios. Americot 1511, Croplan Genetics 3787, Deltapine 1048, Deltapine 1050, Deltapine 1137, Deltapine 1252, Deltapine MON 11R136, Deltapine MON 11R159, DynaGro 2610, Phytogen PX 5322-11, Phytogen PX 5277-02, Phytogen PX 4339-CB, Phytogen PX 4339-6, Phytogen PX 4339-15, Phytogen 499, Phytogen 565, and Phytogen PX 5403-05 yields were similarly high as compared with cotton varieties with the lowest yield such as Americot NG 0012, Phytogen 375, Deltapine 1044, All-Tex Nitro 44, and FiberMax 1944.

Table 5. Mid- and full-season flex cotton varieties and experimental lines compared for their reaction to target spot, % turnout and lint yield in an irrigated study at the Wiregrass Research and Extension Center (WG2).

Cotton variety	Disease Intensity[z]	Turnout (%)[y]	Lint yield lb/A
All-Tex Nitro 44 B2RF	5.8 c-g[xw]	0.42 g	1907 c-f
Americot 1511 B2RF	6.7 abc	0.46 a	2340 a
Americot NG 0012 B2RF	5.1 h	0.44 de	1623 f
Croplan Genetics 3787 B2RF	5.1 h	0.44 d	2001 a-e
Deltapine 1044 B2RF	6.7 ab	0.42 g	1809 def
Deltapine 1048 B2RF	5.4 e-h	0.44 d	2139 a-d
Deltapine 1050 B2RF	6.0 b-f	0.45 bc	2174 abc
Deltapine 1137 B2RF	5.5 d-h	0.44 d	2180 abc
Deltapine 1252 B2RF	5.3 fgh	0.45 ab	2199 abc
Deltapine MON 11R136 B2RF	6.1 a-e	0.42 g	2060 a-d
Deltapine MON 11R159 B2RF	5.7 d-h	0.44 cd	2064 a-d
DynaGro 2610 B2RF	5.5 c-f	0.43 ef	2120 a-d
FiberMax 1944 GLB2	5.5 d-h	0.41 h	1968 b-f
Phytogen 375 WRF	5.1 h	0.41 h	1709 ef
Phytogen 499 WRF	7.4 a	0.45 ab	2093 a-d
Phytogen 565 WRF	5.9 b-f	0.42 g	2157 abc
Phytogen PX 4339-15 WRF	5.9 b-f	0.43 f	2215 abc
Phytogen PX 4339-6 WRF	5.8 c-g	0.42 g	2171 abc
Phytogen PX 4339-CB WRF	6.0 b-f	0.43 f	2296 ab
Phytogen PX 5277-02 WRF	6.2 b-f	0.43 f	2270 ab
Phytogen PX 5322-11 WRF	6.1 a-d	0.40 h	2280 ab
Phytogen PX 5403-05 WRF	6.0 a-d	0.44 d	2037 a-e
Phytogen PX 5409-03 WRF	5.8 c-g	0.40 h	2004 b-e

[z]Target spot intensity was assessed on October 9 using leaf spot scoring system (1 to 10 scale).
[y]Turnout (%) = ratio of lint to total seed cotton yield.
[x]Means in each column followed by the same letter are not significantly different according to Fisher's protected least significant difference (LSD) test ($P \leq 0.05$).
[w]Disease intensity data are calculated means, but letters differentiating means were calculated using rank transformations.

Discussion

As noted in 2011 (Hagan et al., 2012), cotton varieties differ considerably in their susceptibility to target spot. Overall, disease intensity was often greater on commercial mid- and full season flex cotton varieties in the 2012 as compared with the 2011 trial (Hagan et al., 2012).

Previously, Hagan et al., (2012) reported that Phytogen 499 and to a lesser extent Phytogen 375 and Phytogen 565 were assigned significantly greater target spot ratings than a number of other commercial flex cotton varieties. Here, Phytogen 499 again had among the greatest target spot-related leaf spotting and defoliation levels ranging from 65 to nearly 85% premature defoliation. In addition, disease intensity ratings on Phytogen 375 matched that on Phytogen 499 in the two studies at the Gulf Coast Research and Extension Center but had among the lowest leaf spot and defoliation levels at the Wiregrass Research and Extension Center. In two of three trials, Phytogen 565 had intermediate disease intensity ratings similar to those previously reported (Hagan et al., 2012). Among the remaining commercial flex varieties, Deltapine 1044 had target spot intensity ratings similar to Phytogen 499 in two trials as compared with one trial for Americot 1511, DynaGro 2570, FiberMax 1740, and Stoneville 5458. In both trials that included Phytogen PX 4339-CB and Phytogen PX 5322-11, disease ratings for both of the latter experimental lines matched those reported for Phytogen 499. Other experimental lines that proved as susceptible to target spot as Phytogen 499 in one field trial included Deltapine MON 11R136, Phytogen PX 3122-40, Phytogen PX 4339-15, Phytogen PX 4433-14, and Phytogen PX 5277-02.

While the mid- and full-season cotton varieties All-Tex Nitro 44, Croplan Genetics 3787, DynaGro 2610, Deltapine 1048, Deltapine 1050, Deltapine 1137, Deltapine 1252, and FiberMax 1944 suffered less target spot-incited leaf spotting and premature defoliation at both study sites when compared with Phytogen 499, defoliation levels, as indicated by disease ratings of 5.1 to 6.3, ranged from 25 to over 50%. While target spot ratings were higher on Deltapine 1048, Deltapine 1050, and Deltapine 1137 in 2012 than 2011, Hagan et al. (2012) also noted that disease intensity was lower on all the above varieties as compared with Phytogen 499. Experimental mid-and full season lines with lower disease ratings than Phytogen 499 in GC1 and WG2 studies included Deltapine MON 11R159, Phytogen PX 4339-6, and Phytogen PX 5409-03. Defoliation levels on the latter three varieties were comparable to those observed for the above mid- and full-season varieties. With a few exceptions such as DynaGro 2570, Phytogen PX 3122-40, Phytogen PX 4339-CB, Phytogen PX 4433-14, most of the early flex varieties and experimental lines had lower target spot ratings than later maturing Phytogen 499 standard. In Georgia variety trial, target spot severity was lower on Deltapine 1034 than later maturing Deltapine 1048 and Deltapine 1050 (Kemeriat *et al*. 2011).

Yields and target spot intensity may not necessarily be closely linked. In three of four studies, Phytogen 499, the variety with the highest disease ratings, also has among the highest yields, while some varieties with among the least leaf spotting and defoliation had mediocre yields. Results suggest that many varieties may have some tolerance to target spot as indicated by the relatively good yields produced despite defoliation levels in excess of 50%. Maturity group may also influence final disease intensity as the early flex varieties tend to have lower target spot ratings.

Overall, sizable differences in the susceptibility of cotton varieties and experimental lines to target spot were observed in several dryland and irrigated studies at two locations in South Alabama. Unfortunately, several commercial varieties with high yield potential proved to be highly susceptible to target spot, while others displayed partial resistance or tolerance to this disease. The relationship between yield response and target spot intensity requires closer examination as the yield of some heavily defoliated varieties such as Phytogen 499 were comparable to those suffering noticeable less damage.

Literature Cited

Campbell, H. L., A. K. Hagan, K. L. Bowen, and S. P. Nightengale. 2012. Corynespora leaf spot: a new disease in Alabama cotton. Phytopathology 102:S4.18.

Chiteka, Z. A., D. W. Gorbet, F. M. Shokes, T. A. Kucharek, and D. A. Knauft. 1988. Components of resistance to late leaf spot in peanut. 1. Levels of variability-implications for selection. Peanut Sci.15:25-30.

Clara, F. M. 1935. A new disease of cotton (*Gossypium* sp.) in the Philippines. Phillippine J. Agr. 6:217-225.

Donahue, M. 2012. Cotton leaf spot severe. University of Florida, IFAS Extension, Santa Rosa Co. http://santarosa.ifas.ufl.edu/blog/2012/08/24/cotton-leaf-spot-severe/.

Edmisten, K. 2012. Target leaf spot found in North Carolina cotton. Southeast Farm Press August 23, 2012. http://southeastfarmpress.com/cotton/target-leaf-spot-found-north-carolina-cotton.

Fulmer, A. M., J. T. Walls, B. Dutta, V. Parkunan, J. Brock, and R. C. Kemerait, Jr. 2012. First report of target spot caused by *Corynespora cassiicola* on cotton in Georgia. Plant Dis. 96:1066. (http://dx.doi.org/10.1094/PDIS-01012-0035-PDN).

Hagan, A. K., H. L. Campbell, K. Glass, and S. Nightengale. 2012. Yields and reaction of cotton varieties to Corynespora leaf spot in Alabama, 2011. Plant Disease Management Reports 6:FC091. http://www.plantmanagementnetwork.org/pub/trial/PDMR/reports/2012/FC091.pdf

Jones, J. P. 1961. A leaf spot of cotton caused by *Corynespora cassiicola*. Phytopathology 51:305-308.

Kemerait, R. C., Jr., F. H. Sanders, G. H. Harris, J. E. Woodward, S. N. Brown, R. J. Byrne. 2011. Assessment and management of foliar diseases affecting cotton in Georgia and Texas. 2011 Proc. Beltwide Cotton Conferences:287-292.

Lakshmanan, P., R. Jeyarajan, and P. Vidhyasekaran. 1990. A boll rot of cotton caused by *Corynespora cassiicola* in Tamil, Nadu, India. Phytoparasitica 18(2):171-174.

Stone, W. J. and J. P. Jones. 1960. Corynespora blight of sesame. Phytopathology 50:263-266.