ON-FARM EVALUATION OF LIBERTY LINK AND PHYTOGEN WIDESTRIKE COTTON VARIETIES MANAGED WITH IGNITE-BASED HERBICIDE SYSTEMS IN GEORGIA

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Abstract

Due to the widespread existence of glyphosate-resistant Palmer amaranth, cotton producers in Georgia have been forced to explore alternative herbicide systems to maintain weed control and maximize cotton yields. One alternative involves the use of residual herbicides along with topical applications of glufosinate (Ignite). These very effective systems can be implemented on Liberty Link cotton cultivars, which have excellent tolerance to Ignite. Phytogen cotton cultivars with the WideStrike trait also have a gene that confers tolerance to Ignite; however, tolerance from this trait is less consistent and cotton injury can occur. Research conducted in 2010 and 2011 assessed variety performance of both Liberty Link and Phytogen WideStrike cultivars in large plot, on-farm trials where Ignite-based herbicide systems were implemented. In 2010, FM 1773 LLB2, FM 1845 LLB2, PHY 375 WRF, and PHY 565 WRF were evaluated in four locations. In 2011, those four varieties along with ST 4145 LLB2, PHY 499 WRF, and PHY 367 WRF were evaluated in seven locations. Variety performance, with respect to lint yield, varied between locations but few consistent differences between varieties were present except that higher yields from PHY 499 WRF were observed in 2011. Fiber quality differences were evident between varieties, specifically FM 1845 LLB2 and FM 1773 LLB2 had longer fiber length than other varieties and strongest fiber strength along with PHY 565 WRF, and FM 1845 LLB2 had highest fiber uniformity. This research indicates that variety selection based upon yield potential would favor PHY 499 WRF, and selection from other varieties evaluated in this study should be based upon other factors, including fiber quality.

Introduction

The existence of glyphosate-resistant Palmer amaranth has forced producers in Georgia to seek effective herbicide systems which maintain weed control and maximize cotton yields. Herbicide systems utilizing topical applications

of glufosinate (Ignite) along with residual herbicides have proven to be very effective.

Liberty Link (LL) cotton cultivars have a gene which imparts excellent tolerance to Ignite and no injury is noted with overtop application of glufosinate. WideStrike technology was developed by Dow AgroSciences for lepidopteron insect resistance. In addition to two genes for insect resistance, WideStrike cotton also contains a gene which imparts tolerance to Ignite. However, the level of tolerance is less than that in Liberty Link cotton. Some injury, usually minor, is observed when Ignite is applied overtop of WideStrike cotton.

Dow AgroSciences is not promoting the use of Ignite on Phytogen WideStrike cotton. However, growers are utilizing these systems on both LL and Widestrike cotton varieties. Therefore, research is needed to evaluate the yield potential of commercial varieties with both technologies in situations where Ignite-based systems are utilized. This study examined performance of several varieties with respect to lint yield and fiber quality in on-farm situations where producers used ignite- based systems for weed control.

Materials and Methods

In this study FM 1773 LLB2, FM 1845 LLB2, PHY 375 WRF, and PHY 565 WRF were evaluated in four locations during 2010. In 2011, those varieties along with ST 4145 LLB2, PHY 499 WRF, and PHY 367 WRF were evaluated in five locations. All sites were on-farm commercial fields, and varieties were planted in strips. Weed control consisted of Ignite-based systems with multiple Ignite applications made at the cooperating grower's discretion. A randomized complete block design with three replications was implemented. Cotton was harvested with commercial pickers and samples were sent to the UGA Microgin to determine gin turnout and lint yield and fiber quality was assessed by the USDA Classing office in Macon, GA.

Variety performance data, including lint yield and fiber quality, was determined and data analysis was conducted using the proc mixed procedure in SAS. Two analyses were used, one comparing the four varieties (FM 1845 LLB2, FM 1773 LLB2, PHY 375 WRF, and PHY 565 WRF) in all nine locations, another comparing seven varieties (FM 1845 LLB2, FM 1773 LLB2, PHY 367 WRF, PHY 367 WRF, PHY 499 WRF, PHY 565 WRF, and ST 4145 LLB2) in the five 2011 locations. Significant effects were separated using Fisher's Protected LSD at $P = 0.1$.

Results

Although there was no statistical difference in average lint yields from the four varieties grown in all nine locations, a significant location by variety interaction existed (Table 1). PHY 375 WRF, FM 1773 LLB2, and FM 1845 LLB2 had yields which were not statistically different from the highest variety in seven of nine locations, PHY 565 WRF was not different from the highest yielding variety in four of nine locations.

Analysis lint yield of the seven varieties evaluated in 2011 revealed a significant variety effect and no significant location by variety interaction (Table 2). Averaged across all five locations, PHY 499 WRF produced yields which were significantly higher (at least 77 lbs/A) than all other varieties. Yields produced by other varieties were similar, although PHY 375 WRF and FM 1845 LLB2 were higher than PHY 565 WRF.

There were some significant differences in fiber quality that were observed between varieties. In both analyses, FM 1845 LLB2 and FM 1773 LLB2 had significantly longer fiber length than all other varieties (2011 data shown in Table 2; data not shown for all location analysis). With regards to fiber strength, FM 1845 LLB2 and FM 1773 LLB2 were the strongest, but PHY 565 WRF had similar strength compared to FM 1773 LLB2 in both analyses and PHY 499 WRF was also similar to FM 1773 LLB2 in 2011. In the four variety comparison, uniformity from FM 1845 LLB2 was significantly higher than other varieties (data not shown). In 2011, FM 1845 LLB2, PHY 499 WRF, and PHY 565 WRF had the highest uniformity.

Table 1. Lint yield of four varieties in nine trials conducted during 2010 and 2011.[1]

Variety	Location									Average
	Worth	Evans	Appling	Evans	Jefferson	Effingham	Beckley	Early	Effingham	
	2011	2011	2011	2010	2010	2010	2010	2011	2011	
	(lbs/A)									
PHY 375 WRF	341	790 A	765 B	1019 A	1015 AB	1076 B	1261 A	1266	1319	984
FM 1773 LLB2	329	764 A	850 A	920 D	1117 A	1234 A	1149 B	1176	1266	978
FM 1845 LLB2	325	827 A	849 A	940 C	1126 A	942 C	1118 AB	1182	1297	956
PHY 565 WRF	343	686 B	733 B	975 B	927 B	1209 A	1056 B	1192	1271	932

[1]Means within a location followed by the same letter are not significantly different at P = 0.1.

Table 2. Lint yield and fiber quality of seven varieties averaged across five trials conducted in 2011.[1]

Variety	Lint Yield	Gin Turnout	Fiber Quality Parameters			
			Fiber Length	Fiber Strength	Micronaire	Uniformity
	(lbs/A)	(%)	(inches)	(g/tex)	(units)	(%)
PHY 499 WRF	973 A	39.5 A	1.13 C	33.28 B	4.7	83.3 AB
PHY 375 WRF	896 B	38.0 B	1.12 C	30.62 D	4.6	82.0 E
FM 1845 LLB2	896 B	35.0 D	1.18 A	34.84 A	4.7	83.8 A
FM 1773 LLB2	877 BC	34.0 E	1.19 A	33.90 AB	4.8	83.1 BC
PHY 367 WRF	871 BC	37.2 C	1.14 BC	32.04 C	4.5	82.2 DE
ST 4145 LLB2	860 BC	35.4 D	1.14 BC	31.64 CD	4.5	82.2 DE
PHY 565 WRF	845 C	36.6 C	1.15 B	33.44 B	4.6	83.2 ABC

[1]Means with a column followed by the same letter are not significantly different at P = 0.1.

Conclusions

The results of this study demonstrate relative similarities in variety performance with regard to lint yield between WideStrike and Liberty Link varieties, with the exceptions of PHY 499 WRF's higher yields in 2011 and the somewhat inconsistency of PHY 565 WRF. With respect to fiber quality, some varieties appear have better characteristics than others. Although more investigation is warranted, this study indicates that PHY 499 WRF may be superior in yield potential to other varieties evaluated in this study, and that significant differences in other varieties may only be related to fiber quality.