



On-Farm Evaluation of Liberty Link and Phytogen WideStrike Cotton Varieties Managed with Liberty-Based Herbicide Systems in Georgia



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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 (Liberty) along with residual herbicides have been very effective and widely adopted. Liberty Link® (LL) cotton cultivars exhibit excellent tolerance to Liberty and no injury is noted with overtop application of glufosinate. The 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 glufosinate. However, the level of tolerance is less than that in Liberty Link cotton and some minor injury, is observed following over-the-top Liberty applications to Widestrike cotton. Dow Agrosciences is not promoting the use of Liberty on Phytogen Widestrike cotton. However, growers are utilizing these systems on both LL and Widestrike cotton varieties. This study examined performance of several varieties with respect to lint yield and fiber quality in on-farm situations where producers used Liberty-based systems for weed control.

MATERIALS AND METHODS:

In this study FM 1845 LLB2, ST 4145 LLB2, PHY 375 WRF, PHY 499 WRF and PHY 565 WRF were evaluated in 5 locations during 2011. In 2012, those varieties along with FM 1944 GLB2 and ST 5445 LLB2 were evaluated in 11 locations during 2012. All sites were on-farm commercial fields, and varieties were planted in strips. Weed control consisted of Liberty-based systems with multiple topical Liberty applications made at the cooperating grower's discretion. A randomized complete block design with three replications was implemented. Cotton was harvested, gin turnout was determined at the UGA Microgin and fiber quality was assessed at a USDA Classing office.

Variety performance data regarding lint yield and quality, were analyzed using the proc mixed procedure in SAS. Two analyses were used, one comparing the five varieties (FM 1845 LLB2, PHY 375 WRF, PHY 499 WRF, PHY 565 WRF and ST 4145 LLB2) in 16 locations over 2 years, another comparing seven varieties (the previously mentioned along with FM 1944 GLB2 and ST 5445 LLB2) in 11 locations during 2012. Significant effects were separated using Fisher's Protected LSD at P = 0.1.

RESULTS:

Data analysis from the five variety comparison in 2011 and 2012 revealed differences in yield potential and fiber quality among the varieties evaluated. With regards to yield, PHY 499 WRF was superior to all other varieties and had top yields (not significantly different from the highest yielding variety) in all 16 trials, regardless of environment (Table 1). Overall yields from PHY 565 WRF, FM 1845 LLB2, and PHY 375 WRF were similar but lower than PHY 499 WRF, yet FM 1845 LLB2 appeared to produce top yields more consistently than PHY 565 WRF or PHY 375 WRF. Fiber quality varied between varieties, but FM 1845 LLB2 had superior fiber length and strength to other varieties, and along with PHY 499 WRF and PHY 565 WRF highest uniformity. When averaged across all locations in 2012, PHY 499 WRF again produced yields statistically higher (92 lbs/A) than all other varieties evaluated (Table 2). This variety was also extremely consistent, producing above

Table 1. Performance of five varieties in 16 trials during 2011 and 2012.¹

| Variety | Lint Yield | Top Variety ² (based on trial average yield) | | | | Fiber Quality Parameters | | | |
|--------------|------------|---|-----------------------------|--------------|----------------|--------------------------|----------|------------|------------|
| | | All Locs. | Less than 1000 ³ | 1000 to 1250 | More than 1250 | Length | Strength | Micronaire | Uniformity |
| | (lbs/A) | ----- | (% of Trials) | ----- | | (inches) | (g/tex) | (units) | (%) |
| PHY 499 WRF | 1,243 A | 100 | 100 | 100 | 100 | 1.15 C | 32.2 B | 4.6 A | 83.5 A |
| PHY 565 WRF | 1,115 B | 25 | 0 | 40 | 33 | 1.17 B | 32.4 B | 4.4 B | 83.3 A |
| FM 1845 LLB2 | 1,096 B | 44 | 40 | 40 | 50 | 1.22 A | 33.4 A | 4.6 A | 83.6 A |
| PHY 375 WRF | 1,071 B | 13 | 20 | 20 | 0 | 1.14 D | 29.9 D | 4.3 B | 82.4 B |
| ST 4145 LLB2 | 991 C | 0 | 0 | 0 | 0 | 1.15 CD | 30.9 C | 4.4 B | 82.7 B |

¹ Means within a column followed by the same letter are not significantly different at P = 0.1.
² Frequency of a particular variety producing yields not significantly different from highest yielding variety.
³ Trials with average yield less than 1000 lbs/A (5 trials), 1000 to 1250 lbs/A (5), higher than 1250 lbs/A (6).

Table 2. Performance of seven varieties across 11 locations in 2012.

| Variety | Lint Yield | Above Avg. ² | Top Variety ³ | Gin Turnout | Fiber Quality Parameters | | | |
|--------------|------------|-------------------------|--------------------------|-------------|--------------------------|----------|------------|------------|
| | | | | | Length | Strength | Micronaire | Uniformity |
| | (lbs/A) | (%) | (%) | (%) | (inches) | (g/tex) | (units) | (%) |
| PHY 499 WRF | 1,366 A | 100 | 83 | 40.8 A | 1.16 D | 31.7 B | 4.5 AB | 83.6 A |
| FM 1944 GLB2 | 1,274 B | 75 | 58 | 37.8 C | 1.21 B | 32.6 A | 4.4 ABC | 82.8 B |
| PHY 565 WRF | 1,238 BC | 67 | 8 | 38.7 B | 1.18 C | 32.0 AB | 4.3 CD | 83.4 A |
| FM 1845 LLB2 | 1,186 CD | 33 | 8 | 36.3 D | 1.23 A | 32.8 A | 4.6 A | 83.6 A |
| ST 5445 LLB2 | 1,173 CD | 33 | 17 | 38.5 B | 1.18 C | 32.6 A | 4.6 A | 82.5 B |
| PHY 375 WRF | 1,151 D | 17 | 0 | 38.4 B | 1.15 E | 29.6 D | 4.1 D | 82.6 B |
| ST 4145 LLB2 | 1,051 E | 0 | 0 | 35.1 E | 1.15 DE | 30.4 C | 4.4 BC | 82.7 B |

¹ Means within a column followed by the same letter are not significantly different at P=0.1.
² Frequency in which a variety produced yields higher than the trial average.
³ Frequency of variety producing yields statistically similar to highest yielding variety in each trial.

average yields in all 11 locations, and top yields in 83% of trials. The next two varieties, FM 1944 GLB2 and PHY 565 WRF produced similar yet lower yields compared to PHY 499 WRF, which were above the trial average in similar number of locations, but FM 1944 GLB2 a top yielding variety in 58% of the locations. The other five varieties produced top yields less than 18% of the time.

Table 3. Lint yield of seven varieties in 11 trials during 2012.¹

| Variety | Loc. 1 | Loc. 2 | Loc. 3 | Loc. 4 | Loc. 5 | Loc. 6 | Loc. 7 | Loc. 8 | Loc. 9 | Loc. 10 | Loc. 11 | Average |
|--------------|---------------|--------------|----------------|----------------|-----------------|----------------|-----------------|----------------|------------------|----------------|-----------------|----------|
| PHY 499 WRF | 798 a | 995 a | 1,275 a | 1,381 a | 1,274 ab | 1,376 a | 1,319 ab | 1,353 c | 1,578 abc | 1,958 a | 1,714 a | 1,366 a |
| FM 1944 GLB2 | 759 ab | 829 c | 1,039 c | 1,083 c | 1,372 a | 1,383 a | 1,303 ab | 1,494 a | 1,650 a | 1,423 c | 1,682 ab | 1,274 b |
| PHY 565 WRF | 635 c | 916 b | 1,132 b | 1,245 b | 1,169 bc | 1,280 b | 1,281 ab | 1,266 e | 1,435 cd | 1,711 c | 1,541 cd | 1,238 bc |
| FM 1845 LLB2 | 651 c | 830 c | 1,004 c | 1,080 c | 1,231 b | 1,187 c | 1,366 a | 1,318 d | 1,471 bc | 1,322 d | 1,590 bc | 1,186 cd |
| ST 5445 LLB2 | 626 c | 843 c | 904 d | 976 d | 1,047 cd | 1,259 b | 1,115 d | 1,434 b | 1,611 ab | 1,435 c | 1,653 ab | 1,173 cd |
| PHY 375 WRF | 585 c | 898 b | 1,041 c | 1,088 c | 1,096 cd | 1,205 c | 1,243 bc | 1,308 d | 1,271 e | 1,467 c | 1,460 d | 1,151 d |
| ST 4145 LLB2 | 670 bc | 787 d | 836 e | 1,109 c | 992 d | 1,074 d | 1,151 cd | 1,141 f | 1,275 de | 1,186 e | 1,337 e | 1,051 e |
| Loc. Average | 675 | 871 | 1,033 | 1,138 | 1,169 | 1,252 | 1,254 | 1,331 | 1,470 | 1,500 | 1,568 | 1,205 |

¹ Means within a column followed by the same letter are not significantly different at P=0.1. Locations with in blue bold print indicate irrigated location. Lint yields in red bold indicate yield not significantly different from highest yielding variety in each trial.

Fiber quality parameters varied, but a comparison of the top two yielding varieties indicated FM 1944 GLB2 had longer fiber length, higher strength, similar micronaire, but lower uniformity than PHY 499 WRF.

In 2012 a location interaction was significant with regards to lint yields and individual location analyses indicated yield potential of FM 1944 GLB2 was related to environment (Table 3). Specifically, in four trials with the lowest yields, PHY 499 WRF significantly outperformed FM 1944 GLB2. In seven trials with average yields higher than 1,150 lbs/A the two varieties produced similar yields in five locations, and each outperforms another in two locations.

CONCLUSIONS:

This work indicates that PHY 499 WRF has excellent yield potential and consistency, and ability to outperform other LL and Widestrike varieties across a wide range of environments when managed with a Liberty-based herbicide system. In 2012, the performance of FM 1944 GLB2 was competitive with PHY 499 WRF in high yield environments, yet showed inconsistencies in trials with yields that were at or below 1000 lbs/A. There were differences among other varieties with regard to yield, however selection of varieties other than PHY 499 WRF and FM 1944 GLB2 would likely be based on other factors.

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