DO COTTON VARIETIES WITH VARIOUS TRANSGENIC TRAITS NEED TO BE EVALUATED IN SEPARATE TRIALS USING DIFFERENT HERBICIDE PROGRAMS?

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Introduction

Many new cultivars are now offered for sale with fewer years of public testing than most growers, consultants, and university personnel need for proper evaluation. Proper field testing of varieties will become even more important during the next few years with the development and release of numerous new Roundup Ready Flex, Glytol, Liberty-Link, Widestrike 3, Dicamba, Enlist and Bollgard II varieties. New cotton varieties are currently tested in South Carolina by Clemson University personnel in what are referred to as Official Variety Trials (OVTs). These OVT trials contain numerous varieties that are entered as paid entries by seed companies interested in testing their germplasm in South Carolina, and are grown side-by-side in the same field using uniform management practices. The primary objective of these trials is to give growers and unbiased, side-by-side comparison of varieties offered for sale in South Carolina by evaluating these varieties for maximum genetic yield potential and fiber quality.

One issue that continually arises with OVT testing from the cotton community is that these varieties should be evaluated under similar management system that they will be grown commercially. However, incorporating various management systems into OVT trials greatly reduces the number of varieties that can be compared side-by-side and eliminates direct comparisons of varieties. Currently in South Carolina, Clemson University personnel conduct OVTs on the research stations as conventional trials because there are paid entries with no transgenes, as well as straight LL and varieties stacked with several herbicide resistant traits.

Many university researchers feel that as long as OVTs are maintained weed-free, there is no difference in the genetic yield potential of transgenic varieties sprayed or not sprayed with glyphosate or glufosinate. Since many new varieties with differing herbicide and insecticide traits will soon be released commercially, it may become necessary to separate them into their respective management systems in order to properly evaluate new varieties. However, there is very little scientific evidence to support/negate this hypothesis and should be further investigated.

Materials and Methods

Ten cotton varieties (ST 6182 GLT, ST 4946 GLT, PHY 499 WRF, PHY 444 WRF, PHY 312 WRF, PHY 333 WRF, DP 1553 B2XF, DP 1538 B2XF, DP 1522 B2XF, and NG 3406 B2XF) were planted in a split-block design (blocked by weed control program) with four replications. Plots consisted of two rows, 40 feet in length. Weed control programs (Main Plots) consisted of three separate programs: 1) a conventional herbicide program currently used on the experiment stations for OVTs; 2) a glyphosate-based program used by most growers growing B2RF varieties on their farms; and 3) a Liberty-based program used by most growers growing LL cotton varieties. All other pest management and agronomic practices were uniform across the entire test and were in accordance with Extension recommendations. Plots were harvested with spindle type cotton pickers modified for small plot research. A seed cotton grab sample was collected from each plot, air dried, weighed and ginned. A subsample of lint was collected for HVI fiber quality analysis.

Summary

No significant herbicide system x variety interactions were found for lint yield, fiber length, fiber strength, fiber uniformity, or fiber elongation in 2015 (Table 1) or 2016 (Table 2). All ten varieties responded similarly when grown using a conventional herbicide system (similar to what is used in most OVT experiment station locations), glyphosate based herbicide systems (similar to what is used by growers with OVT locations), or glufosinate based herbicide systems. There were minor interactions detected with gin turnout and micronaire in 2015 (Table 1), but meaningful trends were hard to determine and may have been a function of the harsh environmental conditions during the growing season. These interactions for gin turnout and micronaire were not detected in 2016 (Table 2). No differences were found among herbicide systems for any of the parameters measured in 2015 or 2016 (Tables 1 and 2).

Table 1. Lint yield, gin turnout, and fiber properties of 10 different varieties grown using three different herbicide systems at the Pee Dee Research & Education Center located in Florence, SC in 2015.

Parameter	Lint Yield	Gin Turnout	Fiber Length	Fiber Uniformity	Fiber Strength	Fiber Elongation	Micronaire
	(lb/acre)	*(%)*	*(in.)*	*(%)*	*(g/tex)*		
Herbicide System (Herb.)							
CONVENTIONAL	1441	46.7	1.14	82.5	27.7	7.9	4.5
GLYPHOSATE BASED	1494	47.1	1.15	82.8	27.8	7.8	4.6
GLUFOSINATE BASED	1516	46.7	1.15	82.9	28.2	7.5	4.6
LSD (0.05)	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Variety (Var.)							
PHY 499 WRF	**1581**	46.4	1.12	**83.2**	**29.9**	8.0	4.8
ST 6182 GLT	**1574**	**49.8**	1.16	**82.4**	27.3	7.2	4.5
DPL 1522 B2XF	**1554**	45.8	1.15	**83.1**	**29.0**	**8.7**	**5.1**
PHY 312 WRF	**1510**	46.6	1.15	**82.5**	27.3	7.3	4.6
PHY 333 WRF	**1490**	47.3	1.17	**82.8**	27.7	6.7	4.5
ST 4946 GLB2	**1472**	45.1	1.14	**83.4**	**29.2**	7.4	4.8
DPL 1553 B2XF	**1447**	46.7	1.16	**82.6**	27.8	8.0	4.3
DPL 1538 B2XF	**1438**	47.6	1.09	**81.8**	26.7	**8.8**	4.6
PHY 444 WRF	1386	47.1	**1.20**	**82.7**	26.7	6.9	4.0
NG 3406 B2XF	1381	46.0	1.12	**82.5**	27.3	8.2	4.6
LSD (0.05)	*145*	*0.7*	*0.02*	*NS*	*1.1*	*0.6*	*0.2*
Herb. x Var. (LSD=0.05)	*NS*	*1.2*	*NS*	*NS*	*NS*	*NS*	*0.3*

Table 2. Lint yield, gin turnout, and fiber properties of 10 different varieties grown using three different herbicide systems at the Pee Dee Research & Education Center located in Florence, SC in 2016.

Parameter	Lint Yield	Gin Turnout	Fiber Length	Fiber Uniformity	Fiber Strength	Fiber Elongation	Micronaire
	(lb/acre)	*(%)*	*(in.)*	*(%)*	*(g/tex)*		
Herbicide System							
CONVENTIONAL	976	43.1	1.13	83.9	31.4	7.7	4.4
GLYPHOSATE BASED	849	43.0	1.14	84.1	32.0	7.8	4.4
GLUFOSINATE BASED	955	43.0	1.15	84.2	31.8	7.5	4.3
LSD (0.05)	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*
Variety							
PHY 333WRF	**1038**	43.2	1.16	**84.7**	31.1	6.5	4.2
PHY 499WRF	**1020**	43.6	1.12	84.3	**34.9**	8.4	**4.6**
ST 6182GLT	**1015**	**46.1**	1.15	83.7	30.6	6.8	4.4
PHY 312WRF	**964**	41.9	1.16	**85.2**	32.4	7.3	4.3
DPL 1522B2XF	**963**	41.9	1.14	83.7	32.0	**8.9**	**4.6**
ST 4946GLB2	**960**	40.0	1.13	84.1	33.2	7.5	4.4
NG 3406B2XF	**943**	41.4	1.11	83.2	29.9	8.0	4.2
PHY 444WRF	914	43.7	**1.20**	**85.5**	32.7	6.8	3.8
DPL 1538B2XF	906	44.5	1.09	83.0	30.0	8.1	**4.6**
DPL 1553B2XF	544	43.7	1.13	83.1	30.5	8.1	**4.5**
LSD (0.05)	*103*	*0.7*	*0.02*	*1.1*	*1.2*	*0.4*	*0.1*
Herb. x Var. (LSD= 0.05)	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*