EFFECTS OF FOLIAR APPLICATIONS OF ARY-0469-001 ON FIRST-POSITION BOLL PRODUCTION COMPONENTS OF FLEX AND LIBERTY LINK CULTIVARS: MATURE SEEDS PER BOLL AND LINT MASS PER SEED

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Abstract

Growth of individual bolls is initiated over several weeks; therefore, a one-time foliar application of a growth-enhancing agrochemical would unlikely affect the whole population of bolls equally. A study was conducted in 2008 at the Texas AgriLife Research and Extension Center at Corpus Christi to investigate whether the cultivars FM9063 B2F and FM832 LL responded differently to foliar applications of Arysta LifeScience North America Corporation's ARY-0469-001. These cultivars were subjected to two application rates of this agrochemical late in the season. Results from this study showed significant although only minor effects of the foliar application of ARY 0469-001 on mature seeds per boll and lint mass per seed. ARY 0469-001 increased the number of mature seeds in FM9063 B2F and the lint mass per seed in FM832 LL. These results also indicate that this agrochemical may alleviate stress conditions during boll growth and that this effect may be limited to fruits at early stages of development at the time of application.

Introduction

Growth of individual bolls is initiated over several weeks; therefore, a one-time foliar application of a growth-enhancing agrochemical would unlikely affect the whole population of bolls equally.

A study conducted in 2005 showed significant effects of a nitro-phenolate based-agrochemical on yield components of bolls growing on a limited number of intermediate sympodia (Fernandez and Correa, 2007a, b). The cotton cultivar used in this 2005 study was FM832 LL. The study was repeated in 2006 using the cultivar FM9063 B2F, but no significant effects were detected (unpublished data). The question arose whether these two cultivars exhibited a different response to the growth-enhancing agrochemical tested.

In 2008, a study was conducted to investigate whether these two cultivars responded differently to foliar applications of Arysta LifeScience North America Corporation's ARY-0469-001. This paper presents data on two primary yield components of first-position bolls, namely then number of mature seeds per boll and average lint mass per boll.

Materials and Methods

The study was conducted at the Texas AgriLife Research and Extension Center at Corpus Christi, Nueces Co. Soil type at the experimental site is a Victoria Clay (VcA). The upland cotton cultivars FM9063 B2F and FM832 LL were planted to a plant population of 50,000/A on 38" row spacing with a 4-row Monosem NG+ vacuum precision planter on March 19, 2008. General production management practices followed recommendations from the Texas AgriLife Extension Service. Fertilizer and a selective herbicide for pre-emergence control of annual grasses and broadleaf weeds were applied broadcast and incorporated in the topsoil before planting. Fertilization rate was 44 lbs ac^{-1} of P_2O_5 and 110 lbs ac^{-1} of N.

Due to lack of adequate rainfall, supplemental irrigation was applied during the growing season using an above-ground drip system. No rainfall events occurred from planting to first-square. Cumulative rainfall from first-square to first open boll in all studies was 2.5 inches (89% of normal). Cumulative rainfall from first-bloom to first-open boll was 2.7 inches in all studies (60% of normal). Irrigation was applied on April 22 (1.24 inches), May 29 (1.91 inches), June 9 (1.44 inches), and June 19, (1.5 inches).

Primary phenological dates for FM9063 B2F were: emergence on March 26, first square on April 22, first bloom on May 28, and first open boll on July 9, while those for FM832LL were: emergence on March 26, first square on April 30, first bloom on June 2, and first open boll on July 13.

Experimental treatments consisted of two cultivars (FM9063 B2R and FM832 LL) treated at mid-to-late bloom with two rates of the agrochemical ARY 0469-001 (5 and 10 oz/A). Experimental treatments also included an untreated check (UTC) for each cultivar.

Foliar treatments of ARY 0469-001 were applied on June 17, 2008. At the time of treatment application, FM9063 B2F plants had 19.5 main stem nodes, were 26.8, first sympodia was at mainstem node 7.0, and bloom was at main stem node 16.8, while FM832 LL plants had 19.3 main stem nodes, were 30 inches tall, first sympodia was at main stem node 6.0, and bloom was at main stem node 17.0. Treatments were applied at a volume rate (water plus product) of 20 gallons $acre^{-1}$ with a four-row plot sprayer (Model 3220-GC 2wd Lee Spider Spray-Trac, Lee Company, Inc., Idalou, TX). Treatments, including untreated checks (UTC), were arranged in a split-plot design with four replications, where cultivars were randomly assigned to main plots and ARY 0469-001 treatments were randomly assigned to sub-plots. Experimental plots were four rows wide and 75 ft long.

At the time of treatment application, 20 plants per plot (including the UTC plots) were tagged at the sympodium exhibiting a first-position bloom. This procedure would allow for the comparison of first-position bolls of same age across all treatments.

Upon plant defoliation, first-position bolls in 10 sympodia (the one with the tag and nine below the tag) of the 20 tagged plants were individually harvested and grouped per sympodia. Data collected at harvest included the number of bolls and seed cotton per sympodium, and number of tagged plants harvested. Seed cotton per sympodium was ginned and lint and ginned seeds weighed. Ginned seeds were then acid-delinted for separating, counting, and weighing mature and immature seeds. With these data, first-position boll retention and average seed cotton mass, as well as total number of seeds and number of mature seeds per boll and average lint mass per seed were calculated.

Experimental data was organized and processed using Microsoft Excel X for Mac® software (1985-2001 Microsoft Corporation). Statistical analyses of data, including analysis of variance, Fisher's Protected Least Significant Difference (LSD) at 1, 5, and 10% levels of probability, and contrast of means to test the probability (P) of wrongly rejecting the null hypothesis of the difference between a treatment and the untreated check, were performed using SuperANOVA® software version 1.11 (1989-1991 Abacus Corporation, Inc., Berkeley, CA).

Results and Discussion

Across sympodia, first-position bolls of untreated FM832 LL had 2.9 more mature seeds than untreated FM9063 B2F (Table 1). Differences in mature seeds per boll were significantly in favor of FM832 LL in sympodia 3, 4, 8, and 10; 4.2, 3.5, 8.2, and 6.0, respectively. The greater number of mature seeds per boll exhibited by FM832 LL could be probably related to a greater relative supply of photosynthates due to a lower fruit retention (shown in companion poster) and/or a greater photosynthetic capacity.

The effect of ARY 0469-001 on the number of mature seeds per boll was minimum and limited to sympodia 10 of cultivar FM9063 B2F (Table 1). Both rates of application (5 and 10 oz/A) increased 6.9 and 4.2 the number of mature seeds per boll, respectively. This increase in number of mature seeds per boll opposed the decrease in boll retention in this sympodium 10 as reported in the companion poster.

Lint mass per seed exhibited little variation between the untreated checks of both cultivars and among sympodia within each cultivar (Table 2). Across sympodia, lint mass per seed was 72.3 mg in untreated FM9063 B2F and 70.0 mg in untreated FM832 LL. Lint mass per seed in sympodium 4 was significantly higher in the untreated FM9063 B2F than in untreated FM832 LL.

The effect of ARY 0469-001 on lint mass per seed was also minimum and limited to sympodium 9 of cultivar FM832 LL (Table 2). Lint mass per seed was increased 10.5 and 10.2% over the untreated check by the 5 and 10 oz/A rates, respectively.

Results from this study showed significant although only minor effects of the foliar application of ARY 0469-001 on mature seeds per boll and lint mass per seed, but supports the initial concept the these two cultivars respond differently to this agrochemical. ARY 0469-001 increased the number of mature seeds in FM9063 B2F and the lint mass per seed in FM832 LL. These results also indicate that this agrochemical may alleviate stress conditions during

boll growth and that this effect may be limited to fruits at early stages of development at the time of application. More studies are needed to further understand the effects of this agrochemical on cotton.

Table 1. Effects of foliar applications of ARY-0469-001 on number of mature seeds per first-position boll per sympodium in cultivars FM9063 B2F and FM832 LL.

Variable: *Mature Seeds per First-Position Boll per Sympodium*

		Sympodium								
Cultivar	**Treatments**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
	(Mean Values)									
FM9063 B2F	ARY-0469-001 5 oz/A	21.7	22.5	23.5	22.9	27.2	25.7	23.3	23.9	19.0
	ARY-0469-001 10 oz/A	23.2	23.5	22.7	25.1	24.4	28.1	20.2	18.1	16.3
	UTC	24.6	23.3	23.0	25.3	27.4	26.2	20.1	25.1	12.0
	(P values of contrasts against UTC)									
	ARY-0469-001 5 oz/A	0.2309	0.7443	0.7222	0.3753	0.9485	0.8747	0.2822	0.8536	0.0087
	ARY-0469-001 10 oz/A	0.5554	0.9248	0.7754	0.9420	0.2526	0.5405	0.9595	0.3154	0.0820
FM832 LL	ARY-0469-001 5 oz/A	25.7	28.3	28.5	26.7	28.0	26.6	26.8	23.1	18.7
	ARY-0469-001 10 oz/A	24.4	29.5	26.5	30.7	26.4	26.1	23.4	25.3	16.2
	UTC	26.2	27.5	26.5	28.4	29.1	26.1	28.3	23.0	18.1
	(P values of contrasts against UTC)									
	ARY-0469-001 5 oz/A	0.8232	0.7376	0.1601	0.5236	0.6496	0.8719	0.5974	0.9770	0.7743
	ARY-0469-001 10 oz/A	0.4322	0.4099	0.9567	0.4076	0.2828	0.9888	0.1079	0.6450	0.4238
	(P values of contrasts between cultivars' UTC)									
	FM9063 B2F vs. FM832 LL	0.4996	0.0931	0.0196	0.2642	0.4858	0.9851	0.0129	0.9893	0.0186

Table 2. Effects of foliar applications of ARY-0469-001 on average lint mass per seed in first-position bolls per sympodium in cultivars FM9063 B2F and FM832 LL.

Variable: *Liint Mass per First-Position Boll per Sympodium (mg)*

		Sympodium								
Cultivar	**Treatments**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
	(Mean Values)									
FM9063 B2F	ARY-0469-001 5 oz/A	72.8	71.1	71.6	73.5	73.2	72.1	65.7	71.6	74.8
	ARY-0469-001 10 oz/A	69.3	69.9	76.3	71.7	71.7	67.6	62.5	67.0	69.4
	UTC	69.6	73.7	74.3	74.8	74.0	68.9	66.7	70.5	85.7
	(P values of contrasts against UTC)									
	ARY-0469-001 5 oz/A	0.3041	0.2729	0.3827	0.6742	0.7352	0.5452	0.7985	0.7699	0.0868
	ARY-0469-001 10 oz/A	0.9269	0.1162	0.5140	0.2994	0.3651	0.8162	0.2905	0.1982	0.0165
FM832 LL	ARY-0469-001 5 oz/A	69.1	70.8	68.3	73.6	68.2	66.8	70.4	76.8	78.7
	ARY-0469-001 10 oz/A	70.1	70.4	68.4	71.4	70.2	58.6	60.5	76.6	76.0
	UTC	67.3	72.4	67.2	71.2	71.9	68.5	65.5	69.5	76.6
	(P values of contrasts against UTC)									
	ARY-0469-001 5 oz/A	0.5638	0.4734	0.7080	0.4063	0.1601	0.7472	0.2149	0.0477	0.7192
	ARY-0469-001 10 oz/A	0.3727	0.3908	0.6802	0.9439	0.4967	0.0854	0.2143	0.0232	0.9288
	(P values of contrasts between cultivars' UTC)									
	FM9063 B2F vs. FM832 LL	0.4603	0.5793	0.0346	0.2326	0.4039	0.9515	0.7533	0.4440	0.1452

References

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