EFFECTS OF EARLY-SEASON SQUARE LOSS AND MEPIQUAT CHLORIDE APPLICATION ON DPL NUCOTN 33B AND 5415

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Abstract

In 1996, the interaction between DPL 33b and DPL 5415 cotton cultivars, early square loss, and mepiquat chloride application was investigated in a field study at St. Joseph, LA. There was a three-way interaction with respect to yield. DPL 33b appeared to have more vegetative vigor than it's recurrent parent, DPL 5415. Although early square loss resulted in a decrease in yield, a compensatory growth response was detected.

Introduction

The introduction of transgenic Bt cotton varieties to the market place has ignited a multitude of theory and experimentation. The unique toxin and delivery system allows season long control of certain insect pests without affecting beneficial and secondary pest populations (Deaton, 1995). Therefore, pest management schemes might be altered to use beneficial insects and plant compensation to a greater degree than previously possible. Research has demonstrated the ability of the cotton plant to tolerate some level of early square loss due to insect damage with respect to yield (Sadras, 1995 and Ihrig, 1996). However, other plant characteristics, such as plant height and maturity, may be negatively impacted by excessive early square loss (Holman, 1994). The use of plant growth regulators to ameliorate the detrimental effects of excessive early square loss has also been investigated (Cook and Kennedy, 1994 and Holman, 1996). However, it is not known whether the new transgenic varieties will exhibit the same response to these factors as their recurrent parents. Kerby and colleagues (1995) indicated that NuCOTN varieties had a higher first-position boll retention and a greater final plant height over their recurrent parents. Thus, they concluded that the NuCOTN cultivars had a higher vigor than the parent varieties. This increased vigor could lead to significant agronomic problems under conditions of high fertility, adequate soil moisture, and excessive early square loss. Therefore, the primary objective of this study was to document the effect of early square loss and mepiquat chloride application on DPL NuCOTN 33b and it's recurrent parent DPL 5415.

Materials and Methods

DPL NuCOTN 33b and DPL 5415 cotton seeds were planted on May 5,1996 at the Northeast Research Station, St. Joseph, LA. The experimental design was a factorial with three factors; cultivar, early insect protection, and mepiquat chloride use arranged in the field as a randomized complete block with four replications. The early insect protection consisted of three applications of Legend (cyfluthrin and imidacloprid at 0.033 and 0.043 lb ai/A) beginning at pin-head square and ending a few days after first flower. Care was taken to minimize drift to other plots. Mepiquat chloride was applied with a CO_2 backpack sprayer to the appropriate plots in two 4 oz/A applications at first flower and ten days later. Thus, there were eight treatments (2 x 2 x 2) in the study. Experimental plots were 4 rows wide (40 in. rows) by 45 feet in length.

All measurements were taken on plants in the middle two rows of each plot. First-position square retention was recorded weekly from match-head square to first flower on 10 plants per plot. Beginning at first flower, the number of nodes above a first-position white flower (NAWF) was recorded weekly from ~20 plants per plot. The NAWF values were then used to assess plant maturity by regressing the values over time in order to calculate the number of days from planting to NAWF=5.0 (Bourland et al., 1991). Plots were harvested mechanically with a spindle picker on October 2, 1996. Finally, COTMAP (Bourland and Watson, 1990) was used to map 10 plants per plot at the end of the season in order to analyze final plant structure and boll distribution.

Discussion

Variable early season insect control resulted in a range of first-position square retention from 82 % to 49 % at first flower (Table 1.). Averaged across cultivars and mepiquat chloride treatments, square retention in the early protected plots was 73 % compared to 54 % in the unprotected plots. Insect counts revealed a moderately high population of tarnished plant bugs (*Lygus lineolaris*) and a lower population of lepidopteran pests at match-head square (data not shown). Although the insecticide treatments applied were highly efficacious, the early population of these insect pests were able to remove a significant number of squares before control was obtained, which resulted in the lower than desired square retention (< 80 %) in the protected plots.

With regards to yield, the three-way interaction was significant. The DPL 33b with early insect protection and mepiquat chloride application was the highest yielding treatment producing 3760 lb seedcotton/A. DPL 33b, early insect protection, and mepiquat chloride application all tended to increase yield. Early insect control and mepiquat chloride treatment also tended to result in an earlier crop, as measured by days from planting to NAWF=5. Internode

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length taken at the end of the season did indicate that DPL 33b did exhibit more vigorous vegetative growth than DPL 5415 (Figure 1.). All of the treatments having internode lengths greater than 2 inches could indicate that the amount of mepiquat chloride could have been increased either through another application or a higher rate. Although the unprotected plots produced a lower yield, boll retention at some positions was actually higher (Table 2.), indicating that some compensation for early square loss did occur.

Summary

In 1996, variable early insect control resulted in a range of first-position square retention from 73 % to 54 %. There was a three-way interaction between cultivar, early insect control, and mepiquat chloride application with regard to seedcotton yield. In general, DPL 33b, early insect control, and mepiquat chloride treatment increased yield. Early insect control and mepiquat chloride also resulted in an earlier crop. DPL 33b did have longer internode lengths than DPL 5415 at the end of the season, indicating more vigorous vegetative plant growth than it's recurrent parent. Plant mapping data revealed a higher percentage of bolls in extra-axillary and monopodial positions in the unprotected plots, which is likely the result of plant compensation for excessive loss of first-position squares.

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Table 1. Effect of early square loss on seedcotton yield and maturity (days from planting to NAWF=5.0) of DPL 33b and DPL 5415 with and without mepiquat chloride (M.C.).

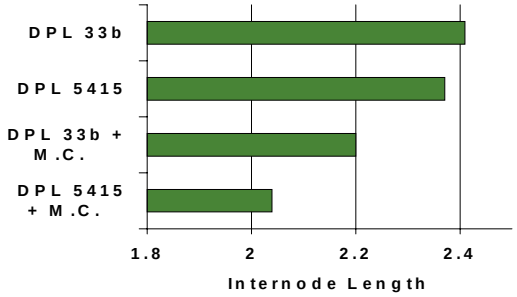
			Square Retention †	Yield	Maturity
Cultivar	Insect Control	M. C.	% 1st Position	lb/a	Days to NAWF=5
5415	Y	Y	68	3038	74
33b	Y	Y	82	3761	75
5415	N	Y	54	3259	82
33b	N	Y	59	3194	85
5415	Y	N	67	3289	79
33b	Y	N	75	3578	83
5415	N	N	49	2621	88
33b	N	N	55	3259	92
L S D (0.05)††			9	318	5

† Square retention was recorded at first flower.

†† The LSD values were calculated using the MS_e from the three-way interaction.

Table 2. Effects of early square lodd due to isect damage on percentage boll retention on monopodia and at extra-axillary and outer(>2) sympodial positions.

Treatment	Extra-Axillary	Monopodia	Outer Positions (>2)
	----------%----------		
Protected	1.8	9.3	11.6
Unprotected	3.3	18.5	15.1
LSD (0.05)	1.5	8.9	4.2 (NS)



† Two 4 oz/a applications of mepiquat chloride (M.C.) were applied to the appropriate treatments at first flower and 10 days after the initial treatment.

Figure 1. Average intermode length of DPL 33b and DPL 5415 with and without mepiquat chloride at St. Joseph, LA.