

Effect of PIX (Mepiquat Chloride) on the Growth, Development, and Yield of Pima S-7 (P-69) and Deltapine (90) Cotton

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Abstract

Plant Growth Regulators (PGR's) are used in cotton production to reduce excessive vegetative growth. This study was conducted to determine the effect of mepiquat chloride (PIX) on growth, and yield of Pima S7 and Deltapine 90 cotton. Single and multiple applications of PIX were conducted over the growing season. Plant mapping measurements were performed 13 times. Seed cotton yield estimates were obtained with a mechanical picker. Analysis of the mapping data showed that vigor index for control and PIX treated Pima and Deltapine plants was linear for the first 9 weeks, then leveled off as flowering and boll set occurred. PIX treated Pima plants were approximately 5cm shorter than the control after the 9th week. Heights of PIX treated Deltapine were similar to the controls. The number of nodes above white bloom in the PIX treated plants was not modified. PIX treatment of Pima cotton reduced the seed cotton yield compared to controls but yield of PIX treated Deltapine was similar to the controls.

Introduction

Plant growth regulators (PGR) are used in cotton production to control excessive vegetative growth. This excessive vegetative growth takes away from the reproductive development of cotton especially during the bloom stage. PGRs provide a tool by which growers can control cotton growth at critical stages during crop development. For several years, PIX has been incorporated into the management scheme for cotton production. Also, numerous scientific experiments have been conducted in a variety of locations across Arizona to test the activity of PIX on cotton. The results of the PIX research from both growers and scientists showed that the action of PIX is quite variable from year to year and from location to location. The results have not shown consistency in terms of predictability.

The aim of this research was to use plant mapping to determine the effect of PIX on growth, development and yield of Pima S-7, a new Pima cotton variety, and Deltapine 90 cotton.

Materials and Methods

Cotton varieties used in this study were Pima P-69 (S-7) (*Gossypium barbadense*) obtained from Dr. E. Turcotte and Deltapine 90 (*Gossypium hirsutum*). One border of each cotton variety was planted on April 12, 1991. Throughout the season the cotton crop was managed similar to commercial plantings. The treatments were arranged in a randomized complete block design with four replications. Plots were four rows wide and 30 ft. long. Single and multiple treatment applications of PIX were performed on the following dates: (a) July 5, 1991, at 1/2 pint per acre (b) June 13, 1991, July 5, 1991, and August 5, 1991 at 1/4 pint, 1/4 pint, 1/4 pint per acre, respectively. PIX was

applied with tractor mounted sprayer with fan jet nozzles. Approximately 20 gallons of liquid per acre were applied. Tractor speed was 1.5 mph and tank pressure was 40 psi.

Plant mapping measurements were conducted on June 4, 12, 24; July 1, 11, 18, 25; August 8, 15, 29; and September 12, 1991. Yield estimates were obtained by harvesting the two 30 ft long center rows of the 4 row plots with a mechanical picker on October 23, 1991.

Results and Discussion

Plant vigor index (plant height versus node number) was used in this study to determine the effect of PIX on growth and development of cotton over the growing season. Node number indicates the physiological age of a plant and is generally only slightly reduced by PIX. In contrast, plant height is reduced easily by PIX because internodal growth is very sensitive to PIX treatment. Figure 1 and 2 shows vigor index graphs for Pima and Deltapine. The vigor index for both species was linear from June 4 to July 25, 1991 or about 8 weeks, but then leveled off when flowering and boll set occurred on the plants. Pima cotton treated with single application of one half pint per acre (treatment 8) or three applications of one-fourth pint per acre (treatment 9) were shorter in height and their vigor index was reduced as compared to controls beginning on July 18, 1991 and remaining until end of the growing season (Figure 1). Pima plants in treatment 8 were about 5cm shorter than the controls. PIX in treatment 8 or 9 did not cause a consistent reduction of the vigor index or heights of Deltapine cotton as compared to controls (Figure 2). From August 8 to September 30, 1991, PIX did cause a slight decrease in plant heights and vigor index of plants in treatment 8.

Analysis of number of nodes above white bloom data, showed no major differences among the PIX treatments and the control in either Pima or Deltapine cotton. Nodes above white bloom were used to determine how PIX influenced the balance between vegetative and reproductive growth over the growing season. PIX did not affect the balance.

The plant mapping data showed that PIX affected the fruit retention on Pima cotton. Control plants retained about 73% of their square whereas plants in both PIX treatments retained only 58% of their squares. However, PIX treated plants retained more of their open mature bolls (39%) than the controls which retained only 26% of their open mature bolls. This indicates that control lost more fruiting structures such as squares than PIX treated plants. In Deltapine cotton, the percentages of square and open boll retention of the PIX treated plants was similar to controls.

Table 1 shows the seed cotton yield of Pima S-7 and Deltapine 90 treated with single and multiple applications of PIX. The seed cotton yield appears to be lower in the PIX treated Pima cotton than the control by about 500 pounds per acre. Yield results from Deltapine 90 cotton showed no differences between the PIX and control plants.

Summary

Pima cotton treated with PIX exhibited about 5cm reduction in height as compared to controls. With Deltapine 90, PIX treated and control plants were similar. Nodes above white bloom in both PIX treated and control plants were similar for both species. Pima cotton treated with PIX retained more open mature bolls than the controls whereas Deltapine 90 treated plants were similar to the controls. This study indicated that Pima S-7 is more sensitive to PIX than Deltapine 90.

Table 1. Yield characteristics of Short staple (Deltapine 90) and Pima S-7 cotton treated with single and multiple applications of PIX at Maricopa Agricultural Center, 1991.

Treatment	Seed Cotton Yield (Pounds per acre)
Pima	
1/2 pint/acre (1 application)	4705
1/4 pint/acre (3 applications)	4530
Control	5053
Deltapine 90	
1/2 pint/acre (1 application)	4966
1/4 pint/acre (3 applications)	4878
Control	4792

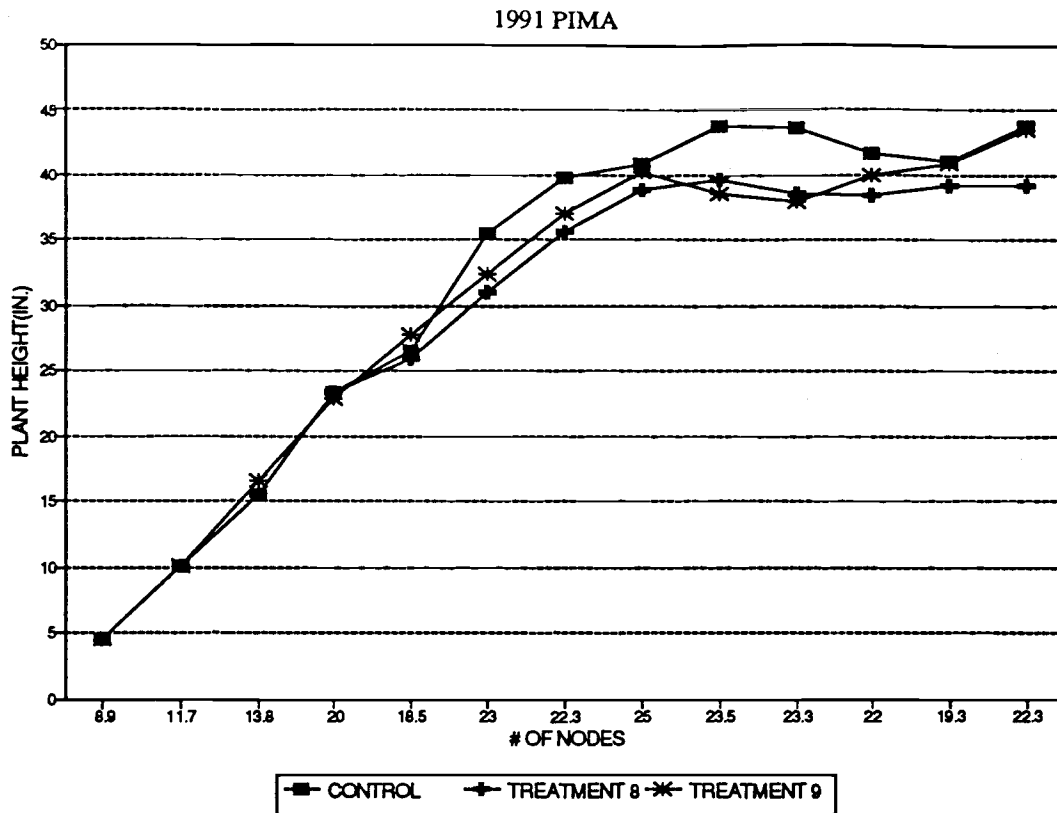


Figure 1 Vigor index (height versus node number) of Pima S-7 cotton treated with single application of 1/2 pint per acre (treatment 8) and three applications of 1/4 pint per acre (treatment 9).

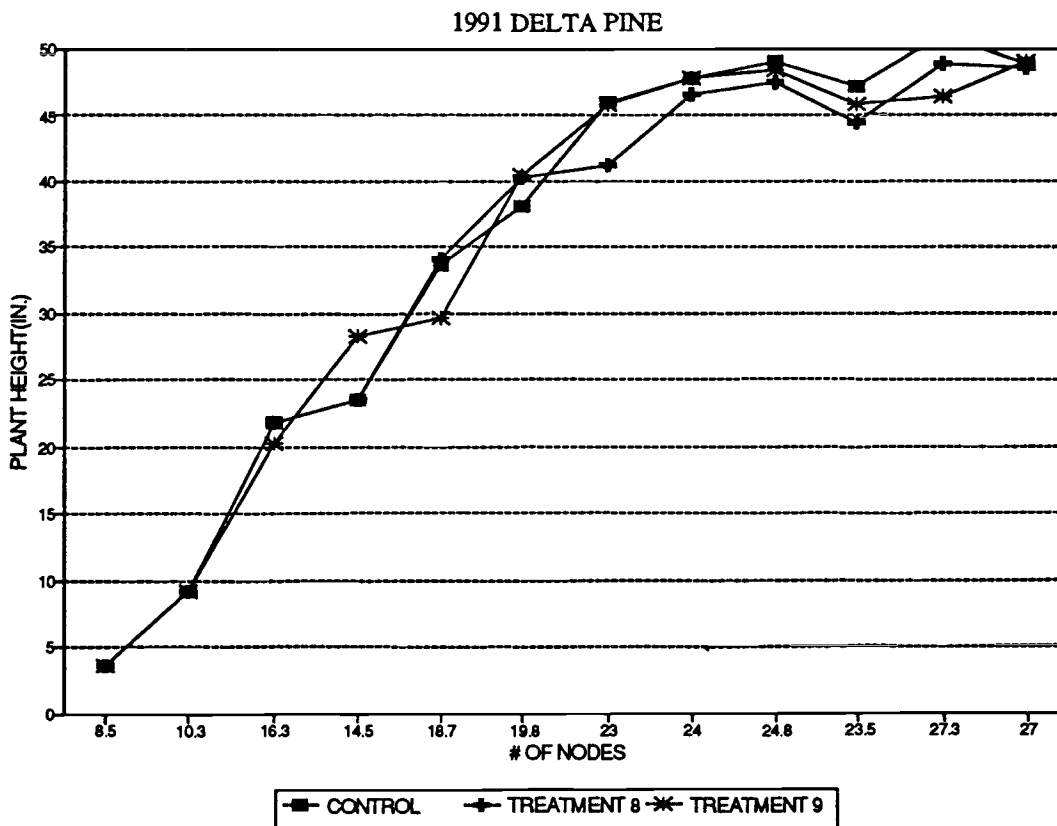


Figure 2 Vigor index (height versus node number) of Deltapine 90 cotton treated with single application of 1/2 pint per acre (treatment 8) and three applications of 1/4 pint per acre (treatment 9).