

Preplant Micronutrient Fertilizers for Cotton

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Abstract

Micronutrient fertilizers including zinc, boron, copper, and manganese in their sulfate forms were broadcast applied and incorporated preplant to determine their effects on lint yield of upland cotton.

Introduction

Micronutrients are essential elements that are required in smaller quantities for normal plant nutrition. Their role is equally as effective since deficiencies in micronutrients can cause economically significant crop yield and quality losses. Elements classified as micronutrients include zinc, iron, copper, manganese, boron, molybdenum, and chlorine. Zinc, iron, boron, manganese, and copper can form somewhat insoluble oxides that may not be readily available to plants growing in the calcareous, alkaline soils of the desert Southwest.

Zinc and boron deficiencies can effect earliness by delaying flowering and fruiting of cotton plants. Furthermore, zinc deficiencies can be created by excessive phosphorus fertilization. Zinc has been reported to increase fruit retention of cotton grown on Mohave Valley soils. The role of copper in cotton plant nutrition is less clear, but reportedly alfalfa hay tonnage has been increased by copper applications on Mohave Valley soils. The effects of micronutrient fertilizer applications on cotton lint yield have not been researched for the desert Southwest.

Materials and Methods

Field experiments were conducted during 1998 in Mohave Valley (located in southwestern Mohave County) to determine the effects of preplant micronutrient fertilizer applications on upland cotton lint yield. The experiment was conducted on Mohave and 4-B farms in Mohave Valley. Six treatments included 15 lb/acre applications of zinc, boron, manganese, or copper fertilizer in the sulfate forms, all four micronutrients combined in one application, and a check plot. Each plot was a full field and treatments were replicated four times in randomized complete blocks. Each block included six 20 acre treatments within one section. Upland cotton varieties included Deltapine 33B, Deltapine 688 B/RR, Deltapine 458 B/RR, and Stoneville 4740 Bt/BXN. Tester strips of each variety were used to standardize micronutrient fertilizer treatment yields within each block.

Micronutrient fertilizers were broadcast applied and incorporated preplant. Cotton was planted between April 15 and 27. Plant growth measurements to determine height to node ratios and fruit retention levels were taken on June 19, July 14, July 24, August 3, August 18, September 3, and September 16 at 1058, 1704, 1985, 2246, 2670, 3139, and 3469 heat units after planting. Cotton petiole and leaf blade samples were taken at monthly intervals from June through September. Cotton was harvested from December 20 through January 5. Lint yields were calculated from gin receipts issued by Mohave Valley Cotton Gin for each field.

Results and Discussion

Cotton lint yields during 1998 were disappointing in this study, as well as for the rest of Arizona. An April 1 freeze required later than optimal planting dates in Mohave Valley. The late April planting dates, coupled with a late June monsoon detrimental to fruit retention resulted in poor yields on this farm. Although these fields were harvested late in December, cool fall temperatures were not conducive to setting a top crop.

Preplant micronutrient fertilizer applications did not result in a significant increase in cotton lint yields on this farm during 1998, compared to unfertilized check plots (Table 1). Micronutrient fertilizer applications also had no significant effect on lint quality/HVI analyses including grad, length, micronaire, and strength (data not shown). Although fruit retention at positions one and two were relatively high, little fruit was set beyond the second position, and plant vigor was low throughout the growing season (Figures 1-2). Fertility was not the primary factor limiting cotton lint yield on this ranch as explained earlier. These experimental fields will be followed through the 1999 cotton growing season to determine the effects of the six micronutrient fertilizer treatments on subsequent lint yield and quality.

Acknowledgment

The valuable cooperation, land, and resources provided by Paul Artz and Chip Sherrill of Mohave/4-B Farms is highly appreciated.

Table 1. Effect of preplant micronutrient fertilizer applications on upland cotton lint yield. Fertilizers were applied in the sulfate forms at 15 lbs material/acre.

Micronutrient Applied	Lint Yield (bales/acre)
None	1.49 a
Zinc (Zn)	1.99 a
Boron (B)	1.85 a
Copper (Cu)	1.38 a
Manganese (Mn)	1.86 a
Zn + B + Cu + Mn	1.52 a

Means within the same column followed by the same letter are not significantly different at the 0.05 level of probability, according to Duncan's Multiple Range Test.