

LATE-SEASON APPLICATIONS OF PGR-IV TO REMEDIATE FRUIT SHED AND ENHANCE MATURITY AND YIELD

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Abstract

Plant growth regulators (PGRs) are widely used in cotton to control growth and enhance yield (Cothren, 1995). In recent years, PGR-IV has been successfully used to promote growth and enhance yields. PGRs are usually applied as foliar sprays during squaring and early flowering. However, little is known about applications made during mid-flowering. Field observations with late applications of 4 oz./acre of PGR-IV applied four weeks after flowering have shown enhanced boll opening and increased yield. Subsequent field plot research in Arkansas and Texas in 1994 to 1996 have shown that mid- to late-flowering applications of PGR-IV have the potential to enhance maturity and yield. However, the results have been inconsistent and further research is needed. Field plot research in Arkansas has indicated the potential of using PGR-IV during late-flowering to accelerate growth and boll retention to make up for excessive high shedding early. However, these preliminary results need to be further evaluated.

Introduction

The growth regulator PGR-IV has been shown to enhance the growth and yield of cotton (Oosterhuis, 1995). Numerous physiological responses have been attributed to PGR-IV including enhanced root growth and nutrient uptake, and more efficient carbohydrate translocation (Oosterhuis and Zhao, 1995; Cadena and Cothren, 1996). The compound is usually applied as a foliar spray during squaring and early flowering, and sometimes as an in-furrow or seed treatment at planting. However, little is known about applications made during mid flowering.

Early Field Observations

Field observations of producer fields in southeast Arkansas in 1994 provided some evidence of earlier maturity and increased yield from late flowering applications of PGR-IV. In these studies, the fields were split for a single late-season application of 4 oz./acre of PGR-IV applied 4 weeks after first flower and records made of boll opening, boll weight

and yield. Clear photographic evidence was obtained of greatly enhanced boll opening from the late application of PGR-IV. Lint yield was significantly increased from 1038 lb./acre to 1140 lb./acre and this was associated with increased harvestable boll number and upper canopy boll weight.

Replicated Plot Research

Arkansas

In Arkansas, studies were conducted in Fayetteville, Marianna and Rohwer 1994-1996. In 1994 at Fayetteville, applying PGR-IV @ 4 oz./acre at 3 weeks after 50 percent first flower significantly increased yield from 551 lb/acre to 606 lb/acre. In 1995 at Marianna, applying PGR-IV @ 4 oz./acre at 4 weeks after first flower increased yield from 1118 lb/acre to 1178 lb/acre, although the difference was not significant. In a similar study in 1995 in Fayetteville, a 4 oz./acre application of PGR-IV at 4 weeks after first flower increased yield from 908 lb./acre to 1015 lb./acre, the difference being nonsignificant. In 1996 at Rohwer, applying PGR-IV @ 4 oz./acre at 3 weeks after first flower had no significant effect on yield; i.e. the control was 1297 lb./acre and the late PGR-IV treatment was 1286 lb./acre. In a similar study in 1996 in Fayetteville, a 4 oz./acre application of PGR-IV at 4 weeks after first flower increased yield from 993 lb./acre to 1096 lb./acre, the difference being nonsignificant.

The use of PGR-IV as a remedial application when excess boll shedding has occurred, e.g. from insects or overcast weather, was tested in Arkansas in 1994-1996. In 1994, in Fayetteville, all bolls were removed from the middle three main-stem fruiting nodes at three weeks after first flower to simulate insect damage, and PGR-IV was applied a week later at 4 oz./acre. The selective shedding treatment decreased lint yield from 603 lb./acre in the control to 551 lb./acre. The application of PGR-IV resulted in a yield of 606 lb./acre indicating that the remedial action of PGR-IV enhanced growth and yield under the excess shedding situation. In 1994 in Marianna, all bolls smaller than 1 inch in diameter were removed weekly for four weeks after first flower to simulate insect damage, and PGR-IV was applied at 4 weeks after first flower at 4 oz./acre. The boll removal treatment decreased yield from 1118 lb./acre in the control to 1064 lb./acre, and the remedial application of PGR-IV had no affect with a yield of 1067 lb./acre. In 1996 in Fayetteville, small bolls were again removed weekly for four weeks after first flower to simulate insect damage, and PGR-IV was applied at 4 oz./acre at 4 weeks after first flower. The boll removal treatment decreased yield from 993 lb./acre in the control to 901 lb./acre, and the remedial application of PGR-IV increased yield to 1167 lb./acre. Hence two out of three years the remedial application of 4 oz./acre PGR-IV made up for the decreased yield from excess boll "shed" by enhancing boll growth of upper canopy bolls.

Texas

In Corpus Christi, Texas, mid-flowering applications of 4 oz./acre of PGR-IV enhanced boll retention higher in the canopy. However, this increased retention did not result in increased yield due to drought usually encountered in that area during boll filling. Under these dry conditions, an earlier application of PGR-IV at one week after flowering caused a significant yield increase. Under irrigated conditions the late flowering application of PGR-IV has the potential to increase yield due to increased boll retention in the upper canopy.

In College Station, Texas, a trend for increased yield was observed with 2 oz/A of PGR-IV applied at pinhead square, early flowering, and early flower plus two weeks. Single and multiple applications of either 2 or 4 oz/A of PGR-IV at early flower plus two weeks, early flower plus 4 weeks, and early flower plus 6 weeks, or combinations thereof, did not significantly affect yield.

Conclusions

These studies indicate that mid- to late-flowering applications of PGR-IV have the potential to enhance maturity and yield. However, the results have been inconsistent and further studies are needed. Perhaps of

more interest is the possibility of using PGR-IV during mid- to late-flowering to accelerate growth and boll retention to make up for excessive shedding of fruit earlier in the season. This also needs additional research to confirm the preliminary results and refine the timing of the PGR-IV application.

References

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