# RYZUP® ON COTTON: REPORT ON TRIALS, 1994-96

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## Abstract

RyzUp®, a naturally occurring plant growth regulator product containing gibberellic acid (GA3), can be an effective production tool for cotton growers. Early-season foliar applications of RyzUp can increase leaf surface area, thereby enhancing the photosynthetic potential of young cotton plants. Greenhouse and growth chamber studies were done in 1994, followed by field tests during the 1995 and 1996 growing seasons, to determine the optimum timing of application and the most effective dosage rate. Yield results from Texas indicate that a single application at the 3-5 leaf stage is more effective than either a single application at the 5-7 leaf stage or two sequential applications beginning with the 3-5 leaf stage and ending with the 5-7 leaf stage. Also, banded applications at 2-4 fl oz/A were as effective as a broadcast application at 6 fl oz/A. RyzUp may be tank-mixed with early-season foliar insecticides or fertilizers, and the product may be effectively used to promote rapid plant recovery from hail or wind damage.

## Introduction

Research was initiated in 1994 to determine if RyzUp (4% gibberellic acid, GA3) could be used as a tool to help build the basic framework for a healthy, vigorous cotton crop by enhancing early-season growth and leaf canopy development. One of the limiting factors affecting cotton development is the slow pace at which leaf area accrues during the period of seedling emergence to the seventh true-leaf stage. This lag phase of growth can have a negative impact on photosynthetic capacity and the entire crop cycle. An un-interrupted growth pattern through the early phases of cotton development would be ideal, and the use of RyzUp has the potential for achieving this desired effect.

Extensive testing was conducted under both greenhouse and growth chamber conditions, as well as in small-plot, fully replicated field trials during the 1994, 1995, and 1996 seasons. Some large-scale grower demonstration trials were also conducted. Key objectives of these trials included the determination of: (a) the optimum rate range, (b) the most efficacious timing for application, and (c) compatibility of RyzUp with insecticides and fertilizers typically used during the early-season period. In addition, trials were done to evaluate the effect of applying RyzUp to young cotton that had been damaged by hail or damaged by wind.

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## Materials and Methods

Greenhouse and growth chamber experiments were conducted in 1994 to evaluate the effect of foliar applications of RyzUp when applied at the 3-5 leaf stage. Results from these studies indicated that RyzUp had positive effects on leaf expansion and enhanced overall photosynthetic rates; however, there was concern that the 3-5 leaf stage may be too early to be "piggy-backed" with standard insecticide or foliar fertilizer applications in the field. Objectives for 1995 included: (a) testing of RyzUp in combination with insecticides and foliar fertilizers, (b) comparisons of treatment rates of 2, 4, and 6 fl oz/A at the 3-5 vs. 5-7 leaf stage, and (c) evaluation of sequential applications of RyzUp at 2 fl oz/A at the 3-5 and 5-7 leaf stages. A similar protocol was conducted in 1996, again in small-plot, replicated trials, but without insecticide or fertilizer tank-mixes. Standard commercial and research ground equipment was used to apply the test mixtures which generally included a spray adjuvant, Penetrator Plus, to enhance uptake. Trials were done on representative cotton varieties in the respective regions. Parameters that were routinely measured included leaf area, plant height, plant mapping , and final harvested yield. Lint quality was also evaluated in a few selected trials.

## Results and Discussion

Data presented in Tables 1 through 8 are from research reports submited to Abbot Laboratories.

### Greenhouse Trials

Applications of RyzUp® at 2 fl oz/A to several varieties of cotton were made when the third true leaf was 3-5 cm wide at approximately 21 days after planting (Hansen et al, 1996). Within two weeks after treatment, statistically significant increases in height, leaf area and leaf fresh weight were noted. Photosynthesis per unit area in treated plants remained unchanged or slightly lower than controls, but net photosynthesis increased due to the significantly greater leaf area. Treatment effects were noted only in leaves that were expanding at the time of application.

### Field Trials--1995

Most of the trials were done with applications at the 5-7 leaf stage. In those trials which included applications at 3-5 leaf stage, there was an increase in yield compared to the 5-7 leaf application, to the sequential application regimen, and to the untreated check. Indeed, there was evidence that the sequential applications were detrimental to yield, except in one demonstration trial (Table 1) in which an application at 3-5 leaves followed by one at 5-7 leaf stage had a slight numerical advantage over the single application at the

earlier timing. Both treatments more than doubled the yield over the untreated check.

Two trials were done in 1995 where treatments were made to young cotton with leaf damage. One was in Ft. Stockton, TX (Table 2) where HS26 cotton experienced a significant loss of leaf surface area due to hail damage (estimated at 25-50% leaf loss), and the second was in a Texas High Plains trial (Table 3) to HS26 cotton that was damaged by wind. In the Ft. Stockton trial, a single application of 2 fl oz RyzUp/A was more effective (i.e., a 12.7% yield increase) than the double application. The High Plains trial showed that an application at the 3-5 leaf stage gave a 22.3% yield increase over the untreated check and a 38.8% increase vs. a Pix treatment. Results in both trials were statistically significant.

**Field Trials--1996**

RyzUp applications at the 3-5 leaf stage were generally more favorable than those at 5-7 leaves or with the sequential applications at the 3-5 plus 5-7 leaf stage. There was one exception (Table 4) where the later timing was numerically more effective. In other trials (Tables 5, 6, 7, and 8), the early timing tended to improve yields.

Due to more favorable weather patterns, opportunities to evaluate RyzUp on cotton with a high degree of leaf damage were lacking in 1996, compared to the previous year. However, one observation was made in the High Plains under commercial growing conditions whereby RyzUp was applied to hail-damaged cotton which resulted in: (a) more rapid recovery of the crop, (b) allowed for a crop to be made without having to replant, and (c) yield differences in favor of RyzUp® were noted (Dan Krieg, personal communication).

## Conclusions

1. RyzUp can be an effective tool for the promotion of early-season growth in cotton.

2. RyzUp can be used to expand leaf area and increase the overall photosynthetic rate of early-season cotton. Data support the hypothesis that effective management of early-season cotton growth can improve lint yields.

3. Yield data suggest that a single application of RyzUp at the 3-5 leaf stage is more favorable than a later timing of 5-7 leaves. Two sequential applications at 3-5 and 5-7 leaf stages generally were not as effective as the single 3-5 leaf application.

4. Rapid recovery from hail or wind damage and the avoidance of replanting is a viable use for RyzUp on cotton during the early-season period.

## References


Gray, K. 1995. Evaluation of RyzUp on hail damaged cotton in west Texas, 1995. Experimental Summary No. 16166, Abbott Laboratories, N. Chicago, IL.

Hake, K., and K. Stair. 1995. Effect of RyzUp plant growth regulator on lint yield and plant development. *In* Proceedings of 1996 Beltwide Cotton Conferences, Vol. 2, pgs. 1152-53.

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Table 1. Efficacy study with RyzUp® in the Rio Grande Valley of Texas, 1995--F. Krupala, South Texas Ag. Research, Raymondville, TX

| Treatment | Lint Yield (lbs)/A |
|---|---|
| RyzUp @ 3-5 leaf stage | 773 a |
| RyzUp @ 3-5 + 5-7 leaf stages | 802 a |
| Check | 316 b |

RyzUp at 2.5 fl oz/A (banded); var. DPL50; P = 0.05

Table 2. Efficacy study with RyzUp® to demonstrate recovery from hail damage at Ft. Stockton, TX, 1995--K. Gray, Abbott Laboratories, San Angelo, TX

| Treatment | Lint Yield (lbs)/A |
|---|---|
| RyzUp @ 3 fl oz/A | 649 a |
| Check | 565 b |

Var. HS26; P = 0.05

Table 3. Timing study with RyzUp® on wind-damaged cotton seedlings, 1995--Dr. K. Hake, Texas Agricultural Extension Service, Lubbock, TX

| Treatment | Lint Yield (lbs)/A |
|---|---|
| RyzUp @ 3-5 leaf stage | 982 a |
| RyzUp @ 5-7 leaf stage | 825 b |
| RyzUp @ 3-5 + 5-7 leaf stages | 845 b |
| Pix @ 5-7 leaf stage | 710 b |
| Check | 803 b |

RyzUp at 2 fl oz/A (broadcast); var. HS26; P = 0.05

Table 4. Timing study with RyzUp®, 1996--Dr. T. Cothren, TX A & M University, College Station, TX

| Treatment | Lint Yield (lbs)/A |
|---|---|
| RyzUp @ 3-5 leaf stage | 770 b |
| RyzUp @ 5-7 leaf stage | 953 a |
| RyzUp @ 3-5 + 5-7 leaf stages | 963 a |
| Check | 843 ab |

RyzUp at 2 fl oz/A (broadcast); var. DPL50; P = 0.05

Table 5. Timing study with RyzUp®, 1996--Dr. J. Landivar, Texas Agricultural Research and Experiment Station, Corpus Christi, TX

| Treatment | Lint Yield (lbs)/A |
|---|---|
| RyzUp @ 3-5 leaf stage | 1061 a |
| RyzUp @ 5-7 leaf stage | 1001 a |
| RyzUp @ 3-5 + 5-7 leaf stages | 911 b |
| Check | 1017 a |

RyzUp at 2 fl oz/A (banded); var. DPL50; P = 0.05

Table 6. Timing study with RyzUp®, 1996--Dr. S. Livingston, Texas Agricultural Extension Service, Corpus Christi, TX

| Treatment | Lint Yield/A (lbs) |
|---|---|
| RyzUp @ 3-5 leaf stage | 371 |
| RyzUp @ 5-7 leaf stage | 285 |
| RyzUp @ 3-5 + 5-7 leaf stage | 282 |
| Check | 271 |

RyzUp at 2 fl oz/A (banded); var. DPL50; test conducted in Hidalgo Co., TX (Rio Grande Valley); differences not statistically significant.

Table 7. Timing study with RyzUp®, 1996--Dr. T. Gerik, Texas A & M University Blacklands Research Center, Temple, TX

| Treatment | Lint Yield (lbs)/A |
|---|---|
| RyzUp @ 3-5 leaf stage | 1183 |
| RyzUp @ 5-7 leaf stage | 986 |
| RyzUp @ 3-5 + 5-7 leaf stage | 968 |
| Check | 1084 |

RyzUp at 4 fl oz/A (broadcast); var. DPL50; differences not statistically significant.

Table 8. Demonstration study with RyzUp®, 1996--Dr. J. Lightner AgroSynergetics, Inc., Harlingen, TX

| Treatment | Lint Yield/A (lbs) |
|---|---|
| RyzUp @ 3-5 leaf stage | 1067 a |
| RyzUp @ 5-7 leaf stage | 784 b |
| Check | 933 a |

RyzUp at 2 fl oz/A (broadcast); var. DPL 5409; P = 0.05