

Plant Growth Regulator Studies at the Safford Agricultural Center, 1993

L.J. Clark and E.W. Carpenter

Abstract

Results from several tests both on the Safford Agricultural Center and off are reported on in this paper. Methanol, Cytokin, X-Cyto, Temik and Amplify-D treatments results are included and discussed.

Introduction

There are several products that fit the category of plant growth regulators or crop protectants, the most recent of which is methanol. They are meant to supply the plant with something that it needs during times of stress, alter its physiology, for the better, or protect it from external attacks. There is always high interest in which of these really work and how and when they should be applied. This study was designed to answer some of those questions.

In addition to the experiments performed on the Safford Agricultural Center, two other experiments from on-farm testing in Cochise county will also be reported here.

Materials and Methods

Both long and short staple fields were planted and made available for this study. The crop histories are included below to define the cultural practices. It should be noted that the short staple field was planted more than a month later than the long staple field, but the treatments were applied the same date for each field. This allowed us to look at applications at different physiological times for the crops, but is confounded by the fact that the two cultivars *Hirsutum* and *Barbadense* may respond differently to the treatments. Further information is given in Table i.

Crop history - long staple:

Previous crop: Cotton

Planting date: 1 April 1993

Rate: 25 pounds per acre

Soil type: Grabe clay loam

Herbicide: Treflan applied pre-plant and incorporated

Fertilizer: 108 pounds of urea side dressed 11 June and 16 August

Insecticide: Two applications of pyrethroids, one application of organophosphate

Irrigation: Furrow, watered up + 7 irrigations (24.6 inches) + 6.3 inches of rain

Harvest dates: 3 November and 24 November

Crop history - short staple:

Previous crop: Wheat

Planting date: 10 May 1993

Rate: 25 pounds per acre

Soil type: Grabe clay loam/Pima silty clay loam variant

Herbicide: Treflan applied pre-plant and incorporated

Fertilizer: 108 pounds of urea side dressed 11 June and 16 August

Insecticide: Two applications of pyrethroids, one application of organophosphate

Irrigation: Furrow, watered up + 7 irrigations (25.9 inches) + 6.3 inches of rain

Harvest dates: 3 November and 24 November

Plots were harvested with a modified two-row cotton picker which collected cotton from each plot in a large bag. Weights were then obtained by weighing the bags on a hanging scale.

Information on the Temik plots on the Curry farm and on the Amplify-D plots in the Robbs farm are found in reference 1.

Results and Discussion

The results of the methanol study are found in Tables 1a and 1b. No statistically significant differences were seen between treatments in any of the parameters measured. Yields were lower than the check where methanol or methanol and Sol-U-Gro were applied. HVI data were taken from only one sample per treatment, so statistical analysis could not be made, but something interesting to look at is the fiber length. The methanol plots had shorter fiber than the check on long staple cotton and longer fiber than the check on the short staple cotton. This should be studied further in subsequent tests.

The Cytokin study results are found in Tables 2a and 2b. In the long staple test, there were no significant differences in the yields at the 5% level of probability, perhaps because of the high variability between plots. The average values from the four replications look like there may have been a slight increase in yield from the cytokin and a much greater one from the Sol-U-Gro. Maturity, as measured by percent 1st pick, was significantly higher where Cytokin was applied. Fiber length on the long staple seemed to decrease with Cytokin. No noteworthy effects were seen in the short staple cotton.

Results of the study on X-Cyto are found in Tables 3a and 3b. There were no statistically significant yield differences in the two tests even though it looks like there should have been in the case of the long staple cotton. Again, yield variability between replicates affected this trial. Large plant height differences indicate that something was taking place and should be looked at again. Unfortunately the fiber sample from the long staple plot was lost, but the short staple sample looks like X-Cyto lengthened the fiber.

The results of the Temik study on the Safford Agricultural Center are found in Tables 4a and 4b. The effects that one looks for in a Temik trial is suppression of early season insects, such as lygus, and suppression of detrimental effects from nematodes. Lygus are not typically a problem at the site of this test and a soil analyses done in 1992 by Dr. Mike McClure, U or A Plant Pathologist, indicated that nematodes are not a problem at this site either. There were no significant differences in any of the parameters measured in this experiment. It is interesting to note, however, that the highest yields were found in the 20 pound per acre treatment with both long and short staple cotton. Results of the Temik study on the Ed Curry farm in Cochise county are found in the box below. Nematodes have been found to be present in the fields in the Pearce-Sunsites area, so it was anticipated that Temik would have a positive effect.

Treatments	Seed cotton yield (lbs/ac)
Check	1290.6 a
5 lbs/ac Temik applied at planting	1274.6 a
15 lbs/ac Temik side-dressed 16 June 93	1470.4 a
5 lbs at planting + 15 lbs side-dressed	1474.4 a
Average	1377.5
LSD(05)	194.6
CV(%)	14.4

Even though the yields are not significantly different at the 5% level, they are at the 7% level. In other words, we can be 93% sure of the results. The fact that the Temik applied at planting did not increase yields would indicate that early insects were probably not a factor affecting yield. The 200 pound increase in seed cotton from the side-dressed application of Temik indicates that it helped to suppress late insects and/or nematodes.

The last material to be discussed is Amplify-D, which is used as a seed treatment to enhance emergence under stressful conditions. This test was implemented on the Robbs farm north of Kansas Settlement in Cochise county with replicated plots the running the full length of the field. The plots were located adjacent to the variety trial so weights and measurements were made the same as in that test. Weather was an obstacle this season in this area with air temperatures dropping into the 30's as late as the 8th of June. The results of this trial are found in the following block.

Treatments	Yield	Plant Height	Plant Population
Check	409.4 a	42.3 a	25219 a
Amplify-D seed treatment	377.2 a	43.2 a	20061 a

The field received hail damage during the season to aggravate things further. The results indicate that mother nature dished out more that Amplify-D could fix.

References

1. Clark, Lee J. 1994. Short staple variety trials in Cochise county, 1993. Cotton, A College of Agriculture Report, The University of Arizona, Tucson, AZ. (In this publication)

Acknowledgements

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Table i. Treatment and crop development information for the plant growth regulator study at the Safford Agricultural Center, 1993.

Treatment	Dates of application	Long staple (Pima S-6) Planted 1 April 1993		Short staple (DP 90) Planted 10 May 1993	
		Heat ¹ units	Developmental stage	Heat ¹ units	Developmental stage
Methanol ²	8 July	1568	1st boll	1202	1st flower
	22 July	1895	Boll loading	1529	1st boll
	10 Aug	2365	Past peak square	1999	Peak square
	23 August	2684	Approaching cutout	2319	Past peak square
	9 Sept	3063	Cutout	2697	Approaching cutout
Cytokin ³	15 July	1749	Boll setting	1383	Early bloom
	4 August	2212	Past peak square	1846	Boll setting
	19 August	2587	Approaching cutout	2221	Past peak square
X-Cyto ⁴	15 July	1749	Boll setting	1383	Early bloom
	4 August	2212	Past peak square	1846	Boll setting
	19 August	2587	Approaching cutout	2221	Past peak square
Temik ⁵	8 July	1565	1st boll	1202	1st bloom

1. Heat units (86/55°F) after planting.
2. Twenty-five percent (25%) solution applied at 26 gallons per acre.
3. Eight ounces applied in 26 gallons per acre.
4. Four ounces applied in 26 gallons per acre.
5. Granules side dressed at the treatment rates.

Table 1a. Yield and other agronomic data for methanol treatments on long and short staple cotton at the Safford Agricultural Center, 1993.

Methanol Treatment	Lint Yield	Percent Lint	Percent 1st Pick	Plant Height	Plant Population
Long staple cotton (Pima S-6)					
Check	601 a	38.4	77.9 a	32.3 a	18606 a
25% Methanol	582 a	37.2	79.1 a	34.5 a	23143 a
5 lbs/ac Sol-U-Gro	650 a	37.3	80.6 a	33.8 a	19967 a
25% Methanol+ 5 lbs/ac Sol-U-Gro	564 a	37.6	76.8 a	34.3 a	28363 a
Average	599.4	37.6	78.6	33.7	22520.0
LSD(05)	205.4	--	3.96	5.62	9490.0
CV(%)	27.1	--	5.0	9.4	36.5
Short staple cotton (DPL 90)					
Check	1346 a	38.5	86.9 a	32.3 a	68297 a
25% Methanol	1311 a	35.2	86.3 a	34.0 a	63759 a
5 lbs/ac Sol-U-Gro	1269 a	36.1	86.6 a	30.0 a	68524 a
25% Methanol + 5 lbs/ac Sol-U-Gro	1272 a	34.7	89.4 a	31.8 a	68070 a
Average	1299.4	36.1	87.3	32.0	67162.8
LSD(05)	79.7	--	4.18	4.03	12088.6
CV(%)	11.5	--	3.15	10.1	10.1

Table 1b. HVI data for methanol treatments on long and short staple cotton at the Safford Agricultural Center, 1993.

Treatment	Mike	Length	Strength G/T	Uniformity	Trash	Color Grade	Trash Grade
Long staple cotton (Pima S-6)							
Check	41	140	41.9	87	--	4	--
25% Methanol	42	134	40.8	87	--	4	--
5 lbs/ac Sol-U-Gro	43	135	41.6	87	--	3	--
25% Methanol+ 5 lbs/ac Sol-U-Gro	43	133	43.1	87	--	3	--
Averages	42.25	135.50	41.85	87.00	--	3.50	--
Short staple cotton (DP 90)							
Check	48	110	29.5	82	6	31	3
25% Methanol	45	116	30.5	84	5	21	4
5 lbs/ac Sol-U-Gro	50	112	30.1	84	8	31	3
25% Methanol+ 5 lbs/ac Sol-U-Gro	48	115	30.4	84	7	31	4
Average	47.75	113.25	30.13	83.50	6.50	28.50	3.50

Table 2a. Yield and other agronomic data for Cytokinin treatments on long and short staple cotton at the Safford Agricultural Center, 1993.

Cytokinin Treatment	Lint Yield	Percent Lint	Percent 1st Pick	Plant Height	Plant Population
Long staple cotton (Pima S-6)					
Check	563 a	37.7	73.7 c	35.5 a	23598 a
8 oz/ac Cytokinin	590 a	37.3	81.3 ab	33.0 a	21556 a
5 lbs/ac Sol-U-Gro	657 a	37.2	76.7 bc	34.0 a	26547 a
8 oz/ac Cytokinin + 5 lbs/ac Sol-U-Gro	672 a	36.9	83.4 a	35.5 a	26321 a
Average	620.6	37.3	78.8	34.5	24505.4
LSD(05)	194.6	--	6.18	4.78	7307.2
CV(%)	24.8	--	8.2	11.4	32.0
Short staple cotton (DPL 90)					
Check	1534 a	35.9	90.1 a	33.8 a	64894 a
8 oz/ac Cytokinin	1434 ab	34.8	89.7 a	31.5 a	69659 a
5 lbs/ac Sol-U-Gro	1284 b	32.4	88.4 a	32.5 a	72155 a
8 oz/ac Cytokinin + 5 lbs/ac Sol-U-Gro	1533 a	36.6	90.8 a	36.8 a	70339 a
Average	1445.9	34.9	89.8	33.6	69262
LSD(05)	183.7	--	3.19	4.95	10111.3
CV(%)	13.2	--	2.95	11.1	8.8

Table 2b. HVI data for Cytokinin treatments on long and short staple cotton at the Safford Agricultural Center, 1993.

Treatment	Mike	Length	Strength G/T	Uniformity	Trash	Color Grade	Trash Grade
Long staple cotton (Pima S-6)							
Check	41	140	41.9	87	--	4	--
8 oz/ac Cytokinin	42	136	39.8	87	--	4	--
5 lbs/ac Sol-U-Gro	41	138	41.9	87	--	3	--
8 oz/ac Cytokinin + 5 lbs/ac Sol-U-Gro	44	134	41.7	86	--	4	--
Average	31.75	102.00	30.85	65.00	0.00	2.75	0.00
Short staple cotton (DP 90)							
Check	45	116	31.1	84	7	31	2
8 oz/ac Cytokinin	44	117	31.8	83	5	31	3
5 lbs/ac Sol-U-Gro	47	116	31.2	84	5	31	3
8 oz/ac Cytokinin + 5 lbs/ac Sol-U-Gro	45	117	30.3	83	7	31	4
Average	45.25	116.50	31.10	83.50	6.00	31.00	3.00

Table 3a. Yield and other agronomic data for X-Cyto treatments on long and short staple cotton at the Safford Agricultural Center, 1993.

X-Cyto Treatment	Lint Yield	Percent Lint	Percent 1st Pick	Plant Height	Plant Population
Long staple cotton (Pima S-6)					
Check	601 a	38.4	77.9 a	32.3 b	18606 a
4 oz/ac X-Cyto	802 a	38.4	77.9 a	39.0 a	18606 a
Average	701.5	38.4	77.9	35.6	18605.9
LSD(05)	246.6	--	5.41	2.72	10174.9
CV(%)	26.6	--	3.71	12.9	42.6
Short staple cotton (DP 90)					
Check	1346 a	38.5	86.9 a	32.3 a	68297 a
4 oz/ac X-Cyto	1448 a	36.0	88.4 a	32.0 a	72835 a
Average	1397.0	37.3	87.6	32.1	70566.3
LSD(05)	345.3	--	9.13	6.67	6012.7
CV(%)	11.1	--	3.37	8.56	5.78

Table 3b. HVI data for X-Cyto treatments on long and short staple cotton at the Safford Agricultural Center, 1993.

Treatment	Mike	Length	Strength G/T	Uniformity	Trash	Color Grade	Trash Grade
Long staple cotton (Pima S-6)							
Check	41	140	41.9	87	--	4	--
4 oz/ac X-Cyto	--	--	--	--	--	--	--
Average	--	--	--	--	--	--	--
Short staple cotton (DP 90)							
Check	48	110	29.5	82	6	31	3
4 oz/ac X-Cyto	47	118	29.6	84	6	31	3
Average	47.50	114.00	29.55	83.00	6.00	31.00	3.00

Table 4a. Yield and other agronomic data for Temik treatments on long and short staple cotton at the Safford Agricultural Center, 1993.

Temik Treatment	Lint Yield	Percent Lint	Percent 1st Pick	Plant Height	Plant Population
Long staple cotton (Pima S-6)					
Check	498 a	35.8	83.6 a	37.3 a	27455 a
5 lbs/ac Temik	530 a	36.8	80.8 a	34.0 a	22917 a
10 lbs/ac Temik	472 a	36.7	79.8 a	32.3 a	25867 a
20 lbs/ac Temik	561 a	39.5	79.7 a	34.3 a	30632 a
Average	515.2	37.2	81.0	34.4	26717.6
LSD(05)	126.1	--	6.42	5.07	8637.4
CV(%)	34.7	--	9.7	13.5	33.8
Short staple cotton (DPL 90)					
Check	1467 a	35.2	88.5 a	36.8 a	63986 a
5 lbs/ac Temik	1444 a	35.7	90.5 a	32.0 a	65121 a
10 lbs/ac Temik	1467 a	35.8	87.5 a	31.5 a	60583 a
20 lbs/ac Temik	1543 a	37.0	89.9 a	31.5 a	74651 a
Average	1480.3	35.9	89.1	32.9	66085.0
LSD(05)	149.9	--	6.77	5.48	15049.1
CV(%)	8.8	--	4.88	12.6	14.6

Table 4b. HVI data for Temik treatments on long and short staple cotton at the Safford Agricultural Center, 1993.

Treatment	Mike	Length	Strength G/T	Uniformity	Trash	Color Grade	Trash Grade
Long staple cotton (Pima S-6)							
Check	44	136	40.6	86	--	3	--
5 lbs/ac Temik	42	135	40.8	87	--	4	--
10 lbs/ac Temik	44	137	40.7	86	--	4	--
20 lbs/ac Temik	44	137	39.5	87	--	4	--
Average	43.50	136.25	40.40	86.50	--	3.75	--
Short staple cotton (DP 90)							
Check	45	116	31.1	83	15	31	3
5 lbs/ac Temik	47	116	30.9	84	7	31	4
10 lbs/ac Temik	45	116	31.3	84	11	31	4
20 lbs/ac Temik	47	120	30.0	84	7	31	3
Average	46.00	117.00	30.83	83.75	10.00	31.00	3.50