THREE YEARS EXPERIENCES WITH A NEW PGR-*Bacillus Cereus* (BC)

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Abstract

Plant mapping techniques and 3 years of data are employed to investigate differences in PGR treatments. The results of approximately 70 additional tests over 2 years are summarized.

Introduction

This report is comprised of two sections. The first reports the results of three years of tests conduced by the authors on a new PGR. These tests included extensive plant mapping and were designed to develop an understanding of how the material worked or how to utilize it most effectively (in addition to measuring differences between treatments).

The second section summarizes approximately seventy tests located throughout the cotton producing states in the U.S. and 3 foreign countries.

Treatments

The treatments investigated were:

MC - a 4.2% solution of mepiqate chloride, i.e. PIX or MEPICHLOR PILL.
MFXMB94 - where:
MFX - Micro Flo Experimental
M - rate of MC
B - rate of new active or additive
94 - first year studied
Specifically:
MFX2294 -(22) - a 2.1% solution of MC plus 2.0 grams of BC.
MFX2494 -(24) - a 2.1% solution of MC plus 4.0 grams of BC.
MFX4294 -(42) - a 4.2% solution of MC plus 2.0 grams of BC.
MFX4494 - (44) - a 4.2% solution of MC plus 4.0 grams of BC.
CH - untreated check.

Relative rates of test treatments are summarized in Table 1.

Section I

These tests were conducted on commercial cotton grown by producers known to routinely use MC. They did not include the traditional untreated check treatment. They compared the new formulation(s), MFXMB94, to MC. MFXMB94 was formulated such that it could be applied ounce for ounce in the same manner as the standard treatment, MC.

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The protocol was simple. Growers were provided with the test materials and instructed to apply them at the same rate (ounce for ounce) and on the same date to adjacent portions of a selected field or adjacent fields. The MC rate was a grower decision. Data was taken over time from sample units of 10 row feet from nontraffic rows.

1994 tests. Trials were conducted in Mississippi and Tennessee. Location 1 was in Mississippi near Flora in Madison County. Location 2 was near Alamo, TN. in Crockett County. Test parameters and results are reported in Table 2. Yields that are significantly different (5%) are denoted by *.

Results were similar at both locations. The plants treated with MFX2294 grew faster (more MSN/unit of time) than those treated with MC. In addition they exhibited unusual growth as secondary branches (vegetative) originating from the same MSN as the dominant or primary fruiting branch (an indication of vigor). Fruit on these extra vegetative branches (same MSN as fruiting branch) were labeled "Extra".

By mid July the mapping forms indicated some potential earliness for MFX2294 v. MC. For example, at Location 1, MFX2294 had 248 fruiting sites (FS) per 10 plants (Positions 1 and 2) v. 218 for MC. Both had 75% fruit retention, indicating similar insect pressure. The number of green bolls favored MFX2294, 55 v. 38. In the MFX2294 treated plants, the blooming and squaring were further up the mainstem.

On the final mapping date, the cut-out position was recorded and only bolls or their absence was mapped at or below the cut-out position. The results are summarized in Table 3.

At the Mississippi site, Position 1 and 2 open bolls favored MFX2294 by 1,146 to 730, and percent set was estimated at 55 for MFX2294 v. 47 for MC. Open bolls on Position 3 and wider, and on vegetation branches favored MFX2294. Total bolls (open bolls and green bolls) favored MFX2294 in all categories. The Tennessee data is similar to the Mississippi data except crop maturity was less advanced. These data indicated increased earliness with a yield increase. Sums that are significantly different are denoted by *.

1995 tests. In 1995 both locations were in Mississippi. Location 1 was near Mayersville in Issaquena County. Location 2 was near Onward in Sharkey County. Test parameters and results are reported in Table 4.

In 1995, both tests were on replanted cotton. There was no meaningful rainfall after early July. By July 12 MFX2294 had more MSN than MC. On July 27, the height of the bloom was more than one MSN higher for MFX2294 and

still the number of MSN from bloom to terminal favored MFX2294.

Summary mapping data for early August is given in Table 5.

On 8-1-95, MFX2294 "wins" 7 of 7 comparisons at both locations. The bloom is higher for MFX2294 (more potential bolls) and the number of MSN from bloom to terminal continues to favor MFX2294.

At Location 1, MFX2294 grew slightly longer than MC and cut-out at a higher MSN. At Location 2, where the drought was more severe, cut-out timing and position were similar for each treatment, but percent boll set favored MFX2294.

1996 tests. In 1996, both locations were in Sharkey County, Mississippi. Location 1 was near Rolling Fork and Location 2 was near Onward (same farm as 1995). A third treatment, MFX2492, was included. Test parameters and results are reported in Table 6.

Due to a known field gradient existing at Location 1, the yields reported in Table 6 for Location 1 are block averages not designed (experimentally) for comparison. Table 7 reports the block yields. MC-E v. 24-E, 24-W v. 22-E, and 22-W v. MC-W are the pairs to be compared.

The 1996 growing conditions were a normal start, followed by a "mild" drought. Temperatures were slightly below normal. Harvest weather was unusually favorable.

Mapping data indicated marked difference between treatments. Even before bloom, MFX2294 and MFX2494 had more MSN than MC. After bloom, the bloom moved up the plant in MFX2294 and MFX2494 faster than in MC, and the nodes above the bloom remained larger for 22 and 24 than MC until cut-out. Because of the differences in the rate of growth, 22 and 24 cut-out earlier (3-4 days), at a higher MSN, and with a yield increase relative to MC.

Table 8 reports the average MSN per treatment for 3 sampling dates.

Yield as a function of MSN. Data (20 observations) from the 3 years of testings was used to estimate a linear relation between MSN (at mid-bloom) and yield (Lbs. on lint/a.). The F statistics (9.64, 1, 18) was significant and R square indicated that 35 percent of the variation in yield was explained by the variability in MSN. The estimate of the intercept was not significant. The estimate of the slope, 58.97, was significant.

An additional MSN by mid-bloom is estimated to result in a yield increase of approximately 60 pounds of lint.

Section II

During 1995 and 1996, approximately 70 tests comparing some or all of the 6 treatments described earlier (see section labeled "TREATMENTS") were conducted. Most of these tests were of the typical small plot replicated type. And most were conducted at state or federal cotton research units. The various 2-way comparisons of interest are summarized in Tables 9 and 10.

When chi-square has 1 df, z is estimated as the square root of chi-square. We want to test: N1 > N2 (a one-tailed test). z can be a one-tailed test. Tabular values for the probability of a larger z (P), are given with more “precision” than similar chi-square values. Treatments 22, 42, & 44 differ from CH and MC.

Table 1. Relative rates of treatments, MS and TN PGR studies, 1994-96.

Treatment	MC	Additive
MC (40)	2x	0x
22	1x	1x
24	1x	2x
42	2x	1x
44	2x	2x
CH	0x	0x

Table 2. Test parameters and yields, MS and TN PGR tests, 1994.

	Location 1	Location 2
Variety	DPL 50	404
Dry/irr	dry	irr.
Application dates	6-17, 7-20	7-2, 26, 8-1, 12
Oz/app (broadcast)	4, 8	4, 4, 4, 8
Yield (lbs. of lint/a.)		
MC	987	885
MFX2294	1,166*	988*

Table 3. Summary Results, last mapping date, MS and TN PGR tests, 1994.

	Location 1		Location 2	
Treatment	MC	22	MC	22
Sampling date	-21	-21	5	5
No. Of plants	80	80	80	80
Position 1 & 2				
FS	2272	2282	1804	1944
Open bolls	730	1,146*	454	732*
Green bools	730	1146	454	732*
% set	47	55*	48	57*
Wider positions				
Open bolls	123	290*	12	55*
Green bools	160	67*	131	187
Extra bolls	18	83*	10	29

Table 4. Test parameters and yields, PGR tests, MS, 1995.

	Location 1	Location 2
Variety	SG125	SG501
Dry/irr	dry	dry
Application dates	6-23, 7-10, 18, 26	6-17, 23, 7-11, 18, 27
Oz/app. (broadcast)	6, 6, 8, 8	6, 6, 8, 8, 8
Yield (Lbs. Lint/a.)		
MC	797	774
MFX2294	933*	851*

Table 5. Summary results, mapping data, PGR test, MS, 8-1-95.

	Location 1		Location 2	
Treatment	MC	22	MC	22
FS/10 plants	232	268	232	256
Bolls/10 plants	78	96	83	103
Av. hgt. of bloom	13.7	14	14.3	15.6
Av. hgt. of square*	17.4	18.6	16.7	18.5
Difference	3.7	4.6	2.4	2.9
VB W bolls	18	24	12	17
Extra bolls	11	26	10	25

* No. of MSN

Table 6. Test parameters and yields, PGR tests, MS, 1996.

	Location 1	Location 2
Variety	SG501	SG501
Dry/irr	irr	dry
Application dates	6-10, 20, 30, 7-11, 8-3	6-8, 20, 7-4, 13
Oz/app. (broadcast)	4, 8, 8, 6, 6	4, 8, 8, 6
Yield (Lbs. Lint/a.)		
MC	977	1049*
MFX2294	979	1146
MFX2494	1044	1145

Table 7. Estimated yields, Location 1, PGR test, MS, 1996.

Treatment	Yield
MC - E	1034
24-E	1055
24 - W	1032
22-E	1005
22 - W	953
MC - W	920

Table 8. Estimated average MSN, PGR tests, MS, 1996.

	7-07	7-21	8-07
Location 1			
MC - E	14.7	17.6	21
24- E	15.7	18.9	22.4
24 - W	15.9	18.8	20.5
22 - E	15.4	18.9	21.5
22 - W	15.5	18.6	21.1
MC - W	14.6	17.4	19.2
Location 2			
MC	15.6	18.9	19.1
24	16.3	20.6	21.8
22	16.6	20.1	21.6

Table 9. Selected treatments versus CHECK, PGR tests, 1995-96.

Treatment	MC	MFX-2294	MFX-2494	MFX-4294	MFX-4494
N1	31	45	16	19	42
N2	20	15	10	7	17
Chi-square	2.37	15	1.385	5.538	10.59
z	1.54	3.87	1.18	2.35	3.25
P	0.0618	.0001*	0.119	.0094*	.0006*

where: N1 = number of time tr. yield > CH. yield
N2 = number of time CH. yield > tr. yield
P = probability of a larger z

Table 10. Selected treatments versus MC, PGR tests, 1995-96.

Treatment	MFX-2294	MFX-2494	MFX-4294	MFX-4294
N1	56	19	22	44
N2	16	15	10	21
Chi-square	22	0.47	4.5	8.14
z	4.71	0.685	2.12	2.85
P	.0000*	0.2483	.0170*	.0022*

where: N1 = number of times tr. yield > MC yield
N2 = number of times MC yield > tr. yield