# CHAPERONE ON COTTON, A THREE YEAR STUDY Joe Townsend Townsend Ag. Consulting, Inc. Lula, MS

### Abstract

Three years of Chaperone tests on the Westside Farm of Mr. John Mc Kee gave significant yield increases each year. The three year average yield increase was 12.2% for the 5 ounce rate applied early bloom, and 12.6% for the 10 ounce rate applied early bloom. The number of bolls harvested was also significant for all three years of the study. In 2003 plant sap nitrate was monitored after application, and elevated nitrate levels were shown for the Chaperone treatments. A caged boll-worm efficacy trial was also conducted in 2003. First instar bollworms were caged on blooms in Delta Pine 555 cotton. Mortality was checked 72 hours after the larvae were placed in the blooms. This process was continued to give mortality at 5, 10, 15, and 21 days following the Chaperone treatment. An increase in mortality was noted. However, the increase may not be enough to allow the increased mortality to be a factor in making pest management decisions in Bt cotton.

#### **Introduction**

A three year study of Chaperone was conducted from 2001-2003 on Westside Farms, Friars Point Mississippi. The variety used for the study was Paymaster 1218 all three years. For 2001 and 2002 the cotton was planted the first week of May, but in 2003 the cotton was planted the last week of May. The cotton was row irrigated all three years. The 2002 crop received approximately 24 inches of rain between defoliation and harvest due to one hurricane and one tropical depression. Yield was definitely affected by the rain. The 2003 crop produced record yields. In 2003 plant sap nitrate was measured, and a caged bollworm mortality study was conducted on Bt cotton.

#### **Materials and Methods**

In 2001 the plots were 4 rows by 32 feet in length, replicated four times in a randomized complete block design. Treatments were as follows:

- 1) untreated check
- 2) Chaperone 5 ounces per acre
- 3) Chaperone 10 ounces per acre
- 4) Chaperone 20 ounces per acre.

All treatments were applied by back pack sprayer at early bloom. Ten gallons per acre of spray was applied at 45 psi. The same spray set up was also used in 2002 and 2003. Cotton was hand harvested and seed cotton weighed. In the center two rows of each plot 13.8 row feet were harvested. The number of bolls picked was also recorded. This was also the harvesting method used in 2002 and 2003. Yield is reported as lint cotton, determined by gin turnout for the entire field. In 2001 and 2002 37% turnout was used and 39% for 2003.

Treatments applied in 2002 were as follows:

- 1) Untreated check
- 2) Chaperone 10 ozs/acre applied mid-bloom
- 3) Chaperone 5 ozs/acre applied mid-bloom
- 4) Chaperone 10 ozs/acre applied match head square and mid-bloom
- 5) Chaperone 5 ozs/acre applied match head square and mid-bloom

The protocol for 2003 was the same as for 2002. Yield data was taken the same as in 2002. In addition, plant sap nitrate levels were checked on August 8, 13, and 20. This was 9, 16, and 23 days following the early bloom treatment of Chaperone. Petioles were taken from the 5<sup>th</sup> node down from the terminals between 8:00 A. M. and 9:30 A. M. on each date. A Cardy meter was used to determine plant nitrate levels given as nitrate nitrogen and measured in parts per million. As a result of the rapidly declining nitrate levels 100 pounds per acre of ammonium sulfate was applied by air to the test as well as to the remainder of the field in which the test was located.

A test for bollworm mortality in Bt cotton treated with Chaperone was also conducted in 2003. On September 9 five ounces per acre of Chaperone was applied with a back pack sprayer applying 10 gallons of finished spray per acre. The cotton was Delta Pine 555, which was planted the last week in May. Cotton blooms were infested two days later with day old bollworm

larvae, and small gauze sacks placed over the infested blooms and secured to the plants. Seventy-two hours later mortality was checked. This process was repeated to get mortality at 5, 10, 15, and 20 days following treatment. Shipment of the larvae was delayed by a day on the last infestation period, and the mortality was checked at 21 days rather that the preferred 20 days. Approximately 40 larvae were caged in four locations of both treated and non-treated cotton at each infestation period. Many larvae were lost in the bags, and were not recovered at the time of mortality determination. Data given considers only the larvae found, whether they were alive or dead.

# **Results and Discussion**

Results of the 2001 harvest are given in Tables I and II and III. Yield from the 20 ounce rate of Chaperone was significantly greater than the untreated check. The number of bolls harvested was significantly greater for the 10 and the 20 ounce rates of Chaperone. There was no significant difference in the grams of seed cotton per boll in any of the treatments. The 5 ounce rate of Chaperone produced 6% more bolls and a 5% greater yield. The 10 ounce rate of Chaperone produced 11% more bolls, and 14% greater yield. The 20 ounce rate produced 17% more bolls, and 17% greater yield. The average yield increase of the Chaperone treatments over the untreated check was an 11.1% increase in bolls picked, and a 13.8% greater yield. The grams of seed cotton per boll was determined, and the Chaperone treatments had an average of 4.6% more seed cotton per boll, or 0.19grams of seed cotton per boll more that the untreated check. All treatments and all parameters measured showed an advantage for the use of Chaperone in 2001.

Results from the 2002 harvest are given in Tables IV, V, and VI. The mean number of bolls harvested for the Chaperone treatments was 21% greater than the untreated check, and the yield was 10.2% greater than the untreated check. The added benefit of the additional match head square application gave a 9% heavier seed cotton weight per boll, and an additional 5% greater yield than the bloom treatment only. Yield was significantly greater in bolls harvested as well as yield.

Results of the Harvest for 2003 is given in Tables VII, VIII, IX, and X. The cotton chosen for this test was chosen at the particular location because of its soil type, history of production, and its ability to be row watered. For 2002 and 2003 multi-spectral images were taken by air, and the images changed to give seven management zones of cotton within the field. These images are basically a measure of bio-mass. The test location was for all of the 2002 growing season and the 2003 growing season was in the seven classes for biomass, and was some of the most productive cotton on the farm. The 2003 season was record breaking for yield, and the data in Table VIII indicates the high level of production. Also, the cotton was hand picked, and weighed in the field the same date it was picked. All the Chaperone treatments were significantly greater than the untreated check for bolls harvested, as well as yield. The combined Chaperone treatments yielded 15% more bolls, and 13% more lint. The match head square treatments in this test did not give an increase in yield over the early bloom treatments. I have no other explanation for the extremely high yields except for the fact that it was an excellent growing season.

Results of the plant sap nitrate monitoring are given in Table VII, and Figure I. The nitrate levels declined across time quite rapidly, but the Chaperone treated cotton maintained a greater level of nitrate than did the untreated check. On August 8 the nitrate levels were significantly greater than the untreated check; with the exception of the five ounce treatment at match head square and early bloom. On August 8 the Chaperone treatments had 16% more nitrate than the untreated check. On August 13 and 20 the levels were 11% and 6% greater in the Chaperone treatments. There was no visible difference in plant color in any of the treatments during the time the petioles were being sampled.

Results of the bollworm mortality test are given in Table XI. An increase in bollworm mortality was shown for all dates, but the mortality increase at the level noted would be difficult to use in making a treatment recommendation for control of bollworms.

The three year averages in yield with the Chaperone treatments give an average yield increase of 12.2% for the five ounce rate, and a 12.6% yield increase at the 10 ounce rate.

# **Conclusions**

The number of bolls produced as well as cotton yield was significantly increased by the use of Chaperone for all three years of this study. In one out of the two years in which a match head square application was applied a subsequent yield increase was noted, but in 2003 there was no advantage to the addition of this treatment. The differences between rates were slight except in the 2001 test in which the 20 oz. per acre rate was applied. The 20 ounce rate gave a significant yield increase. In 2001 there was a yield difference between rates, with the higher rates producing more cotton. The yield increases for the three year study gave a 12.2 % yield increase at the five ounce rate, and a 12.6% increase at the ten ounce rate.

The petiole nitrate samples taken during the 2003 growing season showed increased nitrate levels in the Chaperone treated cotton. The increased levels of nitrate held for 23 days following treatment at the early bloom stage.

The caged bollworm mortality study showed increased bollworm mortality at all four times of measurement. However, the differences were slight at 15 and 21 days. Mortality increases were not considered to be enough to make a difference in the decision for control measures of the larvae. However, the test was a late season test, and applications made earlier in the season may give significantly improved control of the bollworms. Cotton yields were improved for all three years of the Chaperone test by an average of 12%.

Table 1.	Chaperone	2001	Lint	Yield
Per Acre.				

Treatment	
Untreated check	1073 lbs b
Chaperone 5 ozs	1194 lbs ab
Chaperone 10 oz	1249 lbs aby
Chaperone 20 oz	1299 lbs a

Numbers followed by the same letter within a column are not significantly different ( $p \le 0.05$ ) Numbers followed by the letter y are significantly different ( $p \le 0.01$ ) according to LSMEANS, PDIFF option

Table 2. Chaperone	2001	Seed	Cot-
ton Grams Per Boll.			

Treatment	
Untreated check	4.93 a
Chaperone 5 ozs	5.24 a
Chaperone 10 oz	5.14 a
Chaperone 20 oz	4.97 a
Numbers followed by	the same letter
within a column are n	ot significantly
different ( $p \le 0.05$ )	

Table 3. 2001 Levels of Significance.

Treatment	Yield	Boll #	Boll Weight
Chaparone5ozs	0.2	NS	NS
Chaperone 10 ozs	0.08	0.12	NS
Chaperone 20 ozs	0.03	0.02	NS
	LSD 247.5	LSD 44.5	LSD 7.6
	C.V. 10.5	C.V. 9.5	C.V. 7.6
	Pr > F	Pr > F	Pr > F
Rep	0.0881	0.1653	0.0442
Trt	0.1415	0.0907	0.6560

Table 4. 2002 Chaperone test, bolls harvested, grams of seed cotton per boll, and lint cotton per acre.

	<b>Bolls picked</b>	Gms sc/boll	Lint/acre
Untreated check	220	5.97	1068
Chaparone10ozs bloom	279	5.09	1159
Chaperone 5 ozs bloom	288	4.95	1163
Chaperone 10ozs MHS and bloom	272	5.37	1192
Chaperone 5 ozs MHS and bloom	268	5.67	1240

Table 5. 2002 Levels of Significance.

Treatment	Yield	Boll #	Boll Weight
Chaparone10ozs bloom	0.2126	0.0198	0.2322
Chaperone 5 ozs bloom	0.1915	0.0007	0.1066
Chaperone 10ozs bloom and MHS	0.0963	00438	0.7542
Chaperone 5 ozs bloom and MHS	0.0267	00678	0.4927
	LSD 148.23	LSD 37.01	LSD 0.6522
	C.V. 9.49	C.V. 10.27	C.V. 9.13
	Pr > F	Pr > F	Pr > F
Rep	0.0092	O.2198	O.0.367
Trt	0.2194	0.0624	0.1649

Table 6. Chaperone 2002 Grams Seed Cotton Per Boll.

Treatment	
Untreated check	5.97 ab
Chaparone10ozs bloom	5.09 b
Chaperone 5 ozs bloom	4.95 ab
Chaperone 10ozs bloom and MHS	5.37 b
Chaperone 5 ozs bloom and MHS	5.67 a

Numbers followed by the same letter within a column are not significantly different ( $p \le 0.05$ )

Numbers followed by the letter y are significantly different ( $p \le 0.01$ ) according to LSMEANS, PDIFF option

Table 7. Plant Sap Nitrate Levels August 8, 13 and 28, 2003.

Treatment	August 8	August 13	August 28
Untreated check	2200a	1460a	676a
Chaparone10ozs bloom	2620ay	1548a	704a
Chaperone 5 ozs bloom	2640ay	1674a	710a
Chaperone 10ozs bloom and MHS	2620ay	1708a	732a
Chaperone 5 ozs bloom and MHS	2600a	1680a	742a

Numbers followed by the same letter within a column are not significantly different ( $p \le 0.05$ )

Numbers followed by the letter y are significantly different ( $p \le 0.01$ ) according to LSMEANS, PDIFF option

Table 8. Chaperone 2003 Lint Cotton Yield Per Acre.

Treatment	
Untreated check	1683 a
Chaparone10ozs bloom	1941 ay
Chaperone 5 ozs bloom	1944 ay
Chaperone 10ozs bloom and MHS	1926 ay
Chaperone 5 ozs bloom and MHS	1947 ay

Numbers followed by the same letter within a column are not significantly different ( $p \le 0.05$ ) Numbers followed by the letter y are significantly differ-

numbers followed by the letter y are significantly different ( $p \le 0.01$ ) according to LSMEANS, PDIFF option

Table 9. Chaperone 2003 Bolls Harvested.

Treatment	
Untreated check	394 b
Chaparone10ozs bloom	454 a
Chaperone 5 ozs bloom	464 a
Chaperone 10ozs bloom and MHS	466 a
Chaperone 5 ozs bloom and MHS	467 a
Numbers followed by the same letter w	vithin a col-
umn are not significantly different ( $p \le 0$ ).	.05)
Numbers followed by the letter y are	significantly
different ( $p \le 0.01$ ) according to LSMEA	ANS, PDIFF
option	

Table 10. 2003 Levels of Significance 2003.

Treatment	Yield	Boll #	<b>Boll Weight</b>
Chaparone10ozs bloom	0.11	0.1	NS
Chaperone 5 ozs bloom	0.10	0.003	NS
Chaperone 10ozs bloom and MHS	0.13	0.0029	NS
Chaperone 5 ozs bloom and MHS	0.10	0.0026	NS
	LSD 419.15	LSD 43.86	LSD 0.715
	C.V. 12.7	C.V. 723	C.V. 9.8
	Pr > F	Pr > F	Pr > F
Rep	0.75	0.788	0.05071
Trt	0.3768	0.0113	0.9833

Table 11. Cotton Bollworm mortality at 5, 10, 15 and 21 days following Chaperone treatment. 2003.

	Days After Treatment			
	5	10	15	21
Chaperone	47%	29%	6%	5%
Untreated	29%	16%	3%	3%



Figure 1. Plant Nitrate Levels at 9, 16 and 23 Days Following Chaperone Treatment.