2003 BELTWIDE COTTON CONFERENCES, NASHVILLE, TN – JANUARY 6-10

# COMPARATIVE ANALYSIS BETWEEN TRANSGENIC COTTON VARIETIES AND THEIR RECURRENT PARENTS

**J. González-García, A.J. Obando-Rodríguez, S. Delgado-García, and S. Guerrero-Morales**
**Facultad de Ciencias Agrícolas y Forestales**
**Universidad Autónoma de Chihuahua**
**Delicias, Chihuahua, México**

## Abstract

The performance of Bollgard and non-bollgard varieties based on lint yield/ha was examined in variety trials conducted from 1998-2002 in Chihuahua, Méx. A total of 126 comparisons between Bollgard or Bollgard Roundup Ready varieties and their recurrent parents were made using the variety trial data. The data set was acquired from FCAyF trials, county extension trials and consultant trials. All trials were grown using conventional management for insect and weed control. Comparisons were made across and within years for Delicias-Meoqui, Jiménez, and Ascención-Nuevo Casas Grandes regions. A dollar return per ha for the Bollgard varieties over and above the non-Bollgard varieties was figured using the base loan rate of $0.5165. Bollgard varieties produced a 91-lb yield increase over the non-Bollgard varieties when averaged across all years and location. Yield differences within years for the entire region varied from a low of 18-lb/ha in 1999 to high of 196-lbs/ha in 2000. The dollar returns per ha for the Bollgard varieties over and above the non-Bollgard varieties varied from a low of $9.30/ha in 1999 to high of $101.24/ha in 2000 with an average dollar return per ha of $47.10.

## Introduction

Cotton varieties containing the Bollgard gene have been widely accepted on a significant number of cotton hectares across the Chihuahua State. Numerous studies evaluating the yield and economic performance of Bollgard varieties compared to conventional varieties have been conducted and reported in the Beltwide Cotton Conference Proceedings (González et al., 2001, 2000, 1999; Olivas et al., 1999). In all but a few of these studies the Bollgard varieties offered an increased yield and/or lower insect control cost resulting in an economic advantage to the Bollgard cotton varieties. However, some cotton producing areas have been reluctant to adopt this technology presumably due to a lack of economic returns. One such area is the Chihuahua State. The objective of this study was to evaluate the yield performance of Bollgard or Bollgard Roundup Ready cotton varieties compared to their recurrent parents in the Chihuahua State, México and to determine if differences in yield provide economic advantage and incentive to use the Bollgard technology.

## Materials and Methods

Yield data was collected from variety trials conducted en Chihuahua State from 1998-2002. The data collected includes FCAyF trials, county extension trials and consultants trials. The trial types included large plot strip trials, large plot replicated and small plot replicated trials. All trials were grown using conventional insect and weed control.

Individual comparisons were made with Bollgard or Bollgard Roundup Ready varieties and their recurrent parents within individual trials. Data from the following varietal families were included in the comparisons: DP50, DP20, DP5409, DP5690, DP90, DP33B, DP35B, DP90B,DP5415, DP451BR, PM1560, PM1560BR, PM1220, PM1220B, SG125, SG125BR, SG501, ST474. Yield comparisons were made for each of the five years and across all years for the entire Chihuahua State. These same comparisons were also made for the three distinct growing areas within the State. The three areas include Delicias-Meoqui, Jiménez, and Ascención-Nuevo Casas Grandes regions. The base loan price of $0.5165 was used to calculate gross revenue per ha.

## Results and Discussions

### Chihuahua State

The Bollgard varieties consistently out yielded the conventional varieties. The yield difference varied from a low of 18 lb/ha in 1999 to a high of 196 lb/ha in 2000. When averaged across all years the Bollgard varieties had a 91 lb/ha yield adventage over their recurrent parents (Table 1). The dollar return per ha over and above the recurrent parents was a low of $9.30/ha in 1999 to a high of $101.24/ha in 2000. With an average across all years of $47.10/ha (Table 5).

### Delicias-Meoqui Region

In this area the Bollgard varieties out yielded their recurrent parents in all years except 2001. In 2001 the recurrent parents out yielded the Bollgard varieties by 24 lb/ha. The yield difference ranged from a low of 24 lb/ha in 2001 to a high of 222 lb/ha in 2000. When averaged across all years the Bollgard varieties had a 69 lb/ha yield advantage over their recurrent par-

ents (Table 2). The dollar return per ha over and above the recurrent parents was a low of -($12.40)/ha in 2001 to a high of $114.66/ha in 2000 with an average across all years of $39.89/ha (Table 5).

**Jiménez Region**

In the Jiménez area the Bollgard varieties consistently out yielded their recurrent parents. The yield difference ranged from a low of 40 lb/ha in 1998 to high of 246 lb/ha in 2000. When averaged across all years the Bollgard varieties had a 100 lb/ha yield advantage over their recurrent parents (Table 3). The dollar return per ha over and above the recurrent parents was a low of $20.66/ha in 1998 to a high $127.06/ha in 2000. The average across all years was $52.27 (Table 5).

**Ascención-Nuevo Casas Grandes Region**

In this important area the Bollgard varieties out yielded their recurrent parents in all years except 1999. In 1999 the recurrent parents out yielded the Bollgard varieties by 88 lb/ha. The yield difference across years varied from a low of (88) lb/ha in 1999 to a high of 262 lb/ha in 2002. When averaged across all years the Bollgard varieties out yield their recurrent parents by 96 lb/ha (Table 4). The dollar return per ha over and above the recurrent parents was a low of -($45.46)/ha in 1999 to a high of $135.32 in 2002. The average for all years was $55.78/ha (Table 5).

## Summary

The Bollgard varieties had a consistent yield advantage in each year and across all years in Chihuahua State, México when compared to their recurrent parents. However the degree of yield advantage varied from year to year and location to location. Within years or locations the yield advantage was not enough to cover the cost of the technology for every comparison made but across multiple locations or years the yield advantage alone produced enough additional revenue to cover the cost of the technology.

## References

González-García, J., A.J. Obando-Rodríguez, J.M. Olivas-García, J.E. Magaña-Magaña, and A. Martínez. 1999. Agronomic evaluation of transgenic cotton varieties in Delicias, Chih., Méx. Proceedings of the Beltwide Cotton Conference. Volume 1:596-598.

González-García, J. A.J. Obando-Rodríguez, S. Delgado-García, J.A. Anchondo-Nájera, J.E. Magaña-Magaña, and R. Torres-Ginez. 2000. Análisis of a second-year evaluation of transgenic cotton varieties in Delicias, Chihuahua, México. Proceedings of the Beltwide Cotton Conference. Volume 1:501-501.

González-García, J., J.e. Magaña-Magaña,, and E. Barrón Del Val. 2001. Análisis of Bollgard cotton in Chihuahua, México. Proceedings of the Beltwide Cotton Conference. Volume 1:426-426.

González-García, J. J.E. Magaña-Magaña, A.J. Obando-Rodríguez, and A. Segovia-Lerma. 2002. Ascensión, Chihuahua, Méx. A potential region for Bt cotton production. Proceedings of the Beltwide Cotton Conference. Atlanta, Georgia.

Olivas, J.M., J. González-García, A.J. Obando-Rodríguez, E. Magaña-Magaña, and J.G. Reyes-Salinas. 1999. Proceedings of the Beltwide Cotton Conference. Volume 2:1244-1245.

Table 1. Average lint yields (lb/ha) of Bollgard and non-Bollgard varieties for the Chihuahua State, México.

| Year | Bollgard | Non-Bollgard | Bollgard Advantage |
|---|---|---|---|
| 1998 | 1678 | 1600 | 78 |
| 1999 | 1116 | 1098 | 18 |
| 2000 | 2172 | 1976 | 196 |
| 2001 | 1914 | 1836 | 78 |
| 2002 | 1884 | 1798 | 86 |
| 98-02 | 1752 | 1662 | 91 |

Table 2. Average lint yields (lb/ha) of Bollgard and non-Bollgard varieties for Delicias-Meoqui, Chihuahua, Méx.

| Year | Bollgard | Non-Bollgard | Bollgard Advantage |
|---|---|---|---|
| 1998 | 1482 | 1442 | 40 |
| 1999 | 968 | 936 | 32 |
| 2000 | 1946 | 1724 | 222 |
| 2001 | 1332 | 1356 | (24) |
| 2002 | 2108 | 2034 | 74 |
| 98-02 | 1567 | 1498 | 69 |

Table 3. Average lint yields (lb/ha) of Bollgard and non-Bollgard varieties for Jiménez, Chihuahua, Méx.

| Year | Bollgard | Non-Bollgard | Bollgard Advantage |
|---|---|---|---|
| 1998 | 1508 | 1468 | 40 |
| 1999 | 952 | 904 | 48 |
| 2000 | 2318 | 2072 | 246 |
| 2001 | 1900 | 1782 | 108 |
| 2002 | 1634 | 1580 | 54 |
| 98-02 | 1662 | 1561 | 100 |

Table 4. Average lint yields (lb/ha) of Bollgard and non-Bollgard varieties Ascención-Nuevo Casas Grandes, Chihuahua, Méx.

| Year | Bollgard | Non-Bollgard | Bollgard Advantage |
|---|---|---|---|
| 1998 | 2112 | 1936 | 176 |
| 1999 | 1834 | 1922 | (88) |
| 2000 | 2102 | 1974 | 128 |
| 2001 | 2166 | 2104 | 62 |
| 2002 | 2674 | 2412 | 262 |
| 98-02 | 2178 | 2070 | 96 |

Table 5. Dollar ($) return per ha for Bollgard varieties compared to non-Bollgard varieties.

| Year | Del-Meo | Jiménez | Asc-NCG | Chih. |
|---|---|---|---|---|
| 1998 | 20.66 | 20.66 | 90.90 | 40.28 |
| 1999 | 8.52 | 24.80 | (45.46) | 9.30 |
| 2000 | 114.66 | 127.06 | 66.12 | 101.24 |
| 2001 | (12.4) | 60.94 | 32.02 | 40.28 |
| 2002 | 38.22 | 27.90 | 135.32 | 44.42 |
| 98-02 | 38.89 | 52.27 | 55.78 | 47.10 |

* Dollar return figured using the base loan price of $0.5165 times the yield difference per ha.
Del-Meo = Delicias-Meoqui region
Asc-NCG = Ascensión-Nuevo Casas Grandes region
Chih. = Chihuahua State