# USE OF THE BWACT AS A SYSTEM FOR ATTRACTION AND CONTROL OF BOLL WEEVILS IN CHIHUAHUA, MÉXICO

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## Introduction

One of the main cultivations of the region of Delicias, Chih., is the cultivation of cotton. This is considered a social cultivation since it demands a great quantity of manpower, for the preparation and development of the land. Presently the agricultural cycle P-V 1999, Chih., a surface of 7.403 acres (2,996 hectares) of cotton were planted in Chihuahua, with yields averaging 3.0 ton/ha (2.47 acres), as well as an average of 5.0 bales per hectare in the irrigation district 005. In addition the cotton production demands a strong attention especially in the determination of the populations and damages, as well as the economic thresholds of the pests of economic importance, as well as its control. One of the phytosanitary problems that requires great attention is without a doubt the presence of the Boll Weevil *Anthonomus grandis (Boh.)*.

Due to the phytosanitary problem of this crop, it is necessary to make use of Integrated Pest Management (IPM) programs, which is the reason why it is important to use different systems to reduce the populations and damages caused by the Boll Weevil. According to antecedents on the control of the Boll Weevil on this region, it has ended up that up to 20 insecticide applications were necessary for, which has caused an excessive use of insecticides, contaminating the environment and damaging the ecology. For this reason there has been the necessity to investigate and to validate new alternatives to make a good control of the Boll Weevil to reduce the populations from the beginning of the cotton season and also at the end of the crop.

## Objectives

Based on this, the Agricultural and Forest Sciences of the Autonomous University of Chihuahua, in coordination with Plato Industries, Inc. of Houston, Texas, set up a test to evaluate the biological effectiveness of the Boll Weevil Attract and Control Tube (BWACT) to reduce the populations and damages caused by the weevil as well as to reduce the number of applications of insecticides used for their control.

## Materials and Methods

The study of biological effectiveness was carried out in lands of respected farming cooperatives (these names are given in the description of the treatments), located in the District of Rural Development 013, during the months of April to September of 1999. For this purpose the cotton varieties DP 90, DP 5415 and Sure Grow 125 was used.

Information on the Boll Weevil Attaction and Control Tubes

| | |
|---|---|
| Name Commercial | Boll Weevil Attract and Control Tube |
| Name common | Grandlure + Malation |
| % in weight of the active ingredient | 0.56 + 37.27% |
| Equivalent in gram/liter or kg | 5.6 + 354 grams of a.i./kg |
| Pesticide type | Pheromone + insecticide |
| Presentation | Tube of biodegradable cardboard |

### Treatments

There were four treatments, each one in a lot belonging to different farmers producer. It was verified that those four lots presented similar evidence of the presence of populations of boll weevils over the last five years. The distance among treatments was not smaller than 2 kilometers in order to avoid possible overlapping of the treatments.

The BWACTs were installed on the periphery of the four cotton lots, from two to five meters outside of the plantation, depending on the space availability. Also, four Scout traps were placed per treatment (with 10 mg pheromone) to monitor the weevil populations and to evaluate the populational dynamics of weevils in the four lots and/or treatments.

### Treatment 1

It corresponds to the lot of Mr. Víctor Hugo Torres Guevara with a surface of 6 hectares. A single BWACT installation was done placing the tubes each 30 m on the periphery of the plantation and in each one of the corners a scout trap was placed. This treatment offered a barrier of protection, attraction and continuous control of the pest for 60 days, until the crop is up to 45-50 days of age. The variety DP 90 was used.

### Treatment 2

It was located in Mr. Benito Marmolejo's lot with a surface of 3 hectares. In this lot two BWACT installations were done. The first installation of the BWACT was made at a distance of 80 meters between the tubes. The second installation was made 30 days after placing the tubes 40 meters apart between them. This treatment offered a barrier of protection, attraction and continuous control of the pest for 90 days,

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protecting until 75-80 days of age of the crop. The variety used was DP 90.

**Treatment 3**

This treatment was located on Mr. Enrique Villa García's crop, which was fractioned in two sections, one of them with a surface of 7 hectares and the other one with 3 hectares. In this field the first BWACT installation was made by placing the tubes at a distance of 100 meters on the periphery of the two mentioned lots. The second installation of BWACTs was carried out 30 days after the first one, placing the tubes at a separation of 50 meters from one another. The third installation of BWACTs was carried out 30 days after the second installation, placing the tubes in the center of the previously installed tubes. In this way a barrier of BWACTs was placed every 25 m around the plantation. This treatment offered 120 continuous days of attraction and control of weevils, protecting the cultivation up to 105-110 days of age. The variety DP 5415 was used.

**Treatment 4**

This was located in Mr. Carlos Talamantes's cotton field, and since this was the control plot they didn't place the BWACTs and only four scout traps were placed to monitor the populations of weevils during the development of this trial. The variety used was Sure Grow 125.

## Evaluated Parameters

From the beginning of the BWACT installation in the selected lots the following variables were evaluated for each repetition and treatment:

1. Weekly captures of weevils in traps baited with boll weevil pheromone to determine the population dynamics of the weevil in the treatments evaluated.
2. Percentage of squares damaged by weevils. Weekly inspection at random of 200 selected squares per treatment and repetition starting at the beginning stage of square formation.
3. Number of bolls in the positions 1 and 2 (lower part of the plant) until 120 days of the age of the crop revising 10 plants at random in each treatment and repetition. Sampling was started at the formation of the bolls continuing every 8 days until 120 days of age of the crop.
4. Emergence percentage of weevils from the fallen squares on the ground with weevil damage. This data were quantified in 500 fallen squares on the ground (125 for each rep) with boll weevil damage.

## Results

Table 1. Tukey mean separation test (p </= 0.05) for the number of squares in cotton. Delicias, Chih., Mexico. 1999.

| | Treatments | | | | |
|---|---|---|---|---|---|
| DATE | 1 | 2 | 3 | 4 | DMSH |
| 23/06 | 0.70711 b | 1.2389 a | 0.7071 b | 0.7071 b | 0.1563 |
| 30/06 | 1.1024 b | 2.0032 a | 1.0992 b | 1.2612 b | 0.3364 |
| 07/07 | 1.5190 b | 2.1365 a | 0.9158 c | 1.5731 b | 0.4719 |
| 14/07 | 1.7434 b | 2.3896 a | 1.9635 ab | 1.4970 b | 0.5232 |
| 21/07 | 3.1586 a | 3.4486 a | 2.6480 a | 3.0250 a | 0.816 |
| 28/07 | 3.6723 ab | 3.8821 a | 3.1070 b | 3.5930 ab | 0.7304 |
| 04/08 | 3.6992 a | 3.8862 a | 3.3522 a | 3.5076 a | 1.0968 |
| 11/08 | 3.5087 a | 3.8496 a | 3.1406 a | 4.3389 a | 1.741 |
| 18/08 | 3.5031 a | 3.4180 a | 2.9975 a | 3.8816 a | 1.3641 |
| 25/08 | 3.4015 a | 3.4663 a | 3.4329 a | 4.4527 a | 1.1063 |
| 01/09 | 3.1416 a | 2.5597 a | 3.2447 a | 3.4155 a | 2.8125 |
| 08/09 | 2.5512 b | 0.7071 c | 3.3935 ab | 3.8427 a | 0.931 |
| 15/09 | 2.000 a | 1.8006 a | 3.1270 a | 3.1270 a | 1.8738 |

Same letter in array indicates no significant difference.

Table 2. Tukey mean separation test (p < 0.05) for the percentage of fallen squares on the ground with boll weevil damage. Delicias, Chih., Mexico 1999.

| | July 28 | | August 4 | | August 11 | |
|---|---|---|---|---|---|---|
| Treatment | Mean | | Mean | | Mean | |
| 1 | (29.92) | 5.5150 ta | (11.54) | 3.4696a | (6.20) | 2.5875 b |
| 2 | (7.85) | 2.8892 bc | (8.53) | 3.0044a | (4.14) | 2.1543 b |
| 3 | (0.165) | 0.8154 c | (0.35) | 0.9236b | (3.89) | 2.0948 b |
| 4 | (16.25) | 4.0927 ab | (2.69) | 1.7852ab | (26.15) | 5.1628 a |
| DMSH | 2.5315 | | 1.9519 | | 1.7167 | |
| | **August 18** | | **September 1** | | **September 8** | |
| **Treatment** | **Mean** | | **Mean** | | **Mean** | |
| 1 | (4.83) | 2.3079 b | (11.68) | 3.4898 ab | (27.57) | 5.298 a |
| 2 | (13.61) | 3.7563 ab | (13.47) | 3.7379 ab | (16.12) | 4.077 a |
| 3 | (7.99) | 2.9151 ab | (2.91) | 1.8457 b | (9.93) | 3.230 a |
| 4 | (28.19) | 5.3565 a | (29.61) | 5.4874 a | (32.28) | 5.725 a |
| DMSH | 2.4467 | | 2.8293 | | 3.7914 | |

Same letter in column indicates non significant difference. Numbers among parenthesis are the real percentages.

Table 3. Tukey mean separation test (p(0.05) for percentage of squares damaged by oviposición of boll weevil. Delicias, Chih., Mexico. 1999.

| | July 7 | | July 14 | | July 21 | |
|---|---|---|---|---|---|---|
| Treatment | Mean | | Mean | | Mean | |
| 1 | ( 4.51) | 2.2380 b | (13.04) | 3.6796 a | (3.80) | 2.0734 a |
| 2 | (21.04) | 4.6408 a | (13.81) | 3.7824 a | (7.47) | 2.8227 a |
| 3 | ( 0.36) | 0.9256 b | ( 0.36) | 0.9256 b | (2.93) | 1.8512 a |
| 4 | ( 7.76) | 2.8745 ab | (19.94) | 4.5210 a | (6.17) | 2.5819 a |
| DMSH | 2.0996 | | 2.5380 | | 27677 | |

| | July 28 | | August 4 | | August 11 | |
|---|---|---|---|---|---|---|
| Treatment | Mean | | Mean | | Mean | |
| 1 | ( 7.42) | 2.8137 ab | (15.47) | 3.996 a | (31.33) | 5.642 a |
| 2 | (10.16) | 3.2656 a | ( 4.88) | 2.320 a | ( 8.66) | 3.027 a |
| 3 | ( 0.63) | 1.0670 b | ( 4.95) | 2.335 a | ( 9.53) | 3.167 a |
| 4 | ( 4.47) | 2.2284 ab | ( 5.02) | 2.350 a | (26.52) | 5.198 a |
| DMSH | 1.8245 | | 3.1358 | | 51101 | |

| | August 18 | | August 25 | | September 1 | |
|---|---|---|---|---|---|---|
| Treatment | Mean | | Mean | | Mean | |
| 1 | (19.18) | 4.4362 ab | (29.07) | 5.4379 a | (20.20) | 4.550 a |
| 2 | ( 5.91) | 2.5312 b | (10.33) | 3.2902 bc | (12.49) | 3.604 a |
| 3 | (13.86) | 3.7893 ab | ( 3.33) | 1.9583 c | (29.92) | 5.515 a |
| 4 | (33.08) | 5.7948 a | (22.99) | 4.8167 ab | (22.77) | 4.842 a |
| DMSH | 2.6995 | | 2.0459 | | 41524 | |

| | September 8 | |
|---|---|---|
| Treatment | Mean | |
| 1 | (21.74) | 4.716 ab |
| 2 | ( 0 ) | 0.707 b |
| 3 | ( 7.95) | 2.907 ab |
| 4 | (29.57) | 5.484 a |
| DMSH | 4.4037 | |

Same letter in column indicates no significant difference. Numbers among parenthesis are real percentages.

## Conclusions

1. In general, the treatment of 3 (three BWACT installations at a distance between the tubes of 25 m which provides protection to the crop by 105-110 days) there was a smaller number of weevils captured in the pheromone baited traps.
2. In general, the treatments 1, 3 and 4 presented the same pattern as the number of squares and bolls in the positions 1 and 2 (lower part of the plant).
3. In relation to the percentage of punctured squares showing damage of weevil, the 3rd treatment offered greater protection to the crop. The control treatment (without BWACTs) turned out to be the most affected one. In this sense, one can say that the 3rd treatment offered was an average of 18.32% more protection to the crop than the control treatment.
4. The 3rd treatment offered greater protection to the crop relating to the percentage of squares damaged by oviposición and feeding of the weevils. Seemingly, the 1st treatment (a single installation of BWACTs at 30 m separation with protection for the crop for 45-50 days of age), and the 4th (control treatment without BWACTs), was more affected. The same was observed in feeding weevil damage. Comparing the treatments 3 and 4 on average the first of them offered greater protection to the crop by 12.36% and 13.80% for weevil oviposición and feeding respectively.
5. For the purpose of this investigation, we conclude that three installations of BWACTs per cultivation cycle (first installation at 100 m separation between the tubes, 30 days later a second installation placing the tubes at 50 m, and a third installation 30 days after the second installation placing the tubes every 25 m apart), this allowed a diminishing of the damage and attack of the weevil. It is believed that this treatment turned out to be the best and more efficient of those evaluated.
6. The installation of the BWACTs decreases the migrating weevil populations, notably as well as those ready to hibernate at the end of the crop cycle. For this reason, the BWACT is a very efficient and economically useful tool in Integrated Pest Management (IPM) programs in cotton.
7. It is suggested that the installation of the BWACTs should be carried out pre-planting watering on the properties or fields assigned for cotton cultivation.

## Reported Literature

Plato Industries, Inc. 1994. BWACT Brochure. Houston, TX. USA.

Manessi, G.O. 1998. Evaluation of the benefits obtained from the installation of BWACT tubes at planting in Paraguay. Plato Industries, Inc., Houston, TX. USA.