

**APPLIED RESEARCH WITH THE BWACT TO  
DETERMINE USE METHODS FOR THE  
PARAGUAYAN NATIONAL COTTON PROGRAM**

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**Abstract**

The methods of the boll weevil control in Paraguay have been substantially improved since development of a technological package that is more adapted to the biology and environment of the pest. In Latin American countries, USA types of IPM and eradication programs are very difficult to implement and a better way to control the boll weevils is to prevent economically damaging populations during the first 100 days of the crop. The conventional control, approach of repeated applications of insecticides has a high, unacceptable economic and ecological cost for the production systems of most Latin American countries.

In Paraguay studies were conducted with the Boll Weevil Attract & Control Tube (BWACT) as an alternative program to prevent economically damaging populations; the approach was to suppress the over all population at planting time and during the post-harvest. This paper presents results from field research that were used to further design the operating parameters of a National Boll Weevil Suppression Program.

The field results confirmed that:

- Recently manufactured BWACTs and BWACTs carried over from the previous year have similar efficacy and provide acceptable control for 6+ weeks.
- BWACTs positioned in the field border nearest the “down wind” overwintering sites attract 48% more weevils than other “down wind” positions.
- BWACT installations at stalk destruction instead of those at 50% boll opening remove the most weevils from the environment, thus providing a greater reduction of the overwintering population.

**Introduction**

The country of Paraguay has a National Plan of Reactivate Cotton (NPRC) and during the last three cotton crops the National Agronomic Institute (NAI) has conducted applied field and laboratory research to support the NPRC. Pheromonal based products, the boll weevil trap and the BWACT, are key components to the National Boll Weevil

Suppression Program and NAI has an ongoing research program to maximize their utilization.

In 1999, several studies were conducted; three are reported as follows:

- Field life efficacy of BWACTs. BWACTs carried over for one year were compared to recently manufactured BWACT. This study coincides with similar studies conducted in the United States (Villavaso et al. 1995) and Paraguay (Gomez 1998).
- Position BWACTs in the field border. USA studies (Cole 1997) reported that BWACTs installed in the cultivation border on the “up wind” side captured 16.86 times more weevils than BWACTs installed on the “down wind” border. Results obtained in Paraguay (Gomez 1998) illustrated 3.3 times more weevil attracted in the BWACTs installed on “up wind” of the crop, while at the end of cotton crop the “down wind” positions attracted about 3 times more weevils. The common sense explanation is that weevils move with the wind but upon detection of a pheromone site, they reverse direction and move to the source. Studies at the end crop were conducted to ascertain if BWACTs positioned near overwintering sites would attract more weevils than the “down wind” positions.
- Best time to install at the end of the crop. Studies were conducted with installations at 50% boll opening and at stalk destruction to determine which has the most impact on the boll weevil population. The data illustrated a lot of variability and the test will continue in the next crop.

**Objectives**

- To evaluate the performance characteristics of the BWACT.
- To obtain the best methodology for BWACT use the National Boll Weevil Program.

**Test 1.** Comparison of the field efficacy of newly manufactured and carried over from the last crop BWACTs.

The purpose of this study was to verify the efficacy of BWACTs that were carried over from last crop to “newly” purchased BWACTs.

**Methodology**

- The test method was to expose weevils to weathered BWACTs during a 45 day period of weathering.

- The test was conducted by NAI in Caacupé utilizing the Standard Bioassay Protocol as developed by the USDA-ARS-BWRL.
- Weevils were exposed for 30 seconds and 2 minutes to the BWACTs.
- Three repetitions were made.
- 30 “newly purchased” BWACTs and 30 “one year old” inventoried BWACTs were installed in the field for 45 days.
- Weevils were exposed at day 1, 15, 30 and 45 from the date of BWACT installation. After exposure the weevils were placed in holding containers at ambient temperature with cotton leaves, terminals and small squares.
- The % mortality was calculated at 24, 48 and 72 hours after exposure to the BWACTs.

The following photos illustrate the methodology used.

- Graph # 1
- Graph # 2

### Results

The following Graphs illustrate the attraction at different positions:

*Graph 1.* Average % weevil mortality at 24, 48, and 72 hours after exposure to “carried over” from last crop BWACTs.

- Graph # 3

*Graph 2.* Comparison of the average mortality of weevils, 24 hours after exposure to weathered BWACTs.

- Graph # 4

**Test 2.** Comparison of BWACT Installations at the end of the crop in relation to the predominant wind and overwintering sites.

### Objective

The purpose of this test was to determine the best BWACT position for attraction of weevils at the end of the crop, considering the predominant wind direction and overwintering sites.

### Methodology

- The test was installed after crop harvest but before stalk destruction in the state of Canindeyú (Yjhovoy) in April – May 1999.
- The BWACTs were coated with “glue” to facilitate counting of attracted weevils.

- The BWACTs were installed in fields of small cotton producers.
- 1 Treatment was in the “down-wind” position (Southwest in Paraguay) and the other Treatment was next to the closest “down wind” overwintering site.
- 6 repetitions per treatment and 8 observations were made during 2 months.
- 1 boll weevil trap per field was installed at 55 yards between trap and BWACT.
- Weather data was recorded.

- Graph # 5

### Results

The data is summarized in the following Graph:

*Graph 4.* Average number of weevils attracted to BWACTs installed “down wind” and at the nearest overwintering sites.

- Graph # 6

There was a 48% increase in attraction of weevils to BWACTs nearest the overwintering sites.

**Test 3.** Determination of the best time to install BWACTs at the end of the crop.

### Objective

The purpose of this study was to verify if there is a better time to install BWACTs at the end of the crop than in the moment of stalk destruction. It was decided to initiate the test at 50% open bolls.

### Methodology

- The test was established in 5 different cotton zones.
- In each zone there were 3 treatments with 4 repetitions.
- Treatment “A”. BWACTs installed at 50% open bolls.
- Treatment “B”. BWACTs installed at stalk destruction.
- Treatment “C”. No BWACTs, only stalk destruction.
- In the following crop, BWACTs were installed at planting.
- BWACTs were installed in fields that had good overwintering sites and large weevil populations.
- During the test, monitoring was done with 1 trap per field from 15 days before BWACT installation until planting of the following crop.
- Boll weevils attraction was calculated by using BWACTs covered with glue and boll weevil traps.

The following photo illustrates the capture of BWACT with “glue”.

→ Graph # 7

### Results

The data from this test is reported in the following Table:

→ Graph # 8

### General Conclusions

Based on results obtained under the conditions of Paraguay, we conclude the following points:

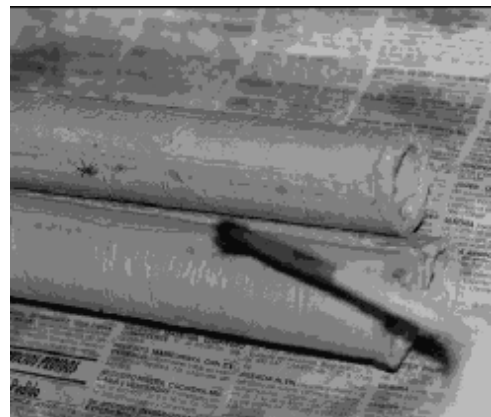
- The study comparing the efficacy of BWACTs carried over from the previous crop year, stored in field warehouses, illustrated that the BWACTs maintained their effectiveness and are acceptable for use. These results validated the manufacturers “shelf life” claim of 18 months.
- The study confirmed that “carry over” BWACTs may be used in the following crop.
- With the installation of BWACTs at the end of the crop, weevil attraction was increased by 48%, when BWACTs were installed next to overwintering sites.
- The results of the “position study” will be of value to and implemented in the National Program.
- The results from the study to determine the best time for BWACT installation at the end of crop illustrates that the installation at stalk destruction removed 82% more weevils than installations at 50% boll opening. However, this study will continue during the 1999/2000 and at plant of the 2000/2001 crop to collect more relevant information.

### Literature Cited

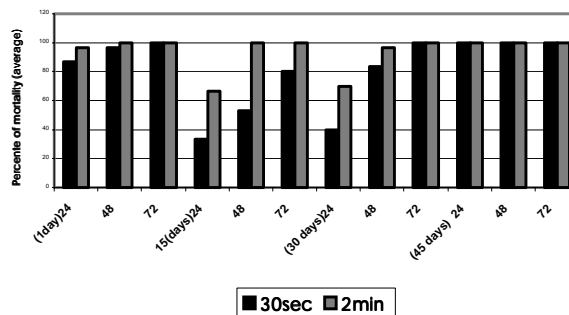
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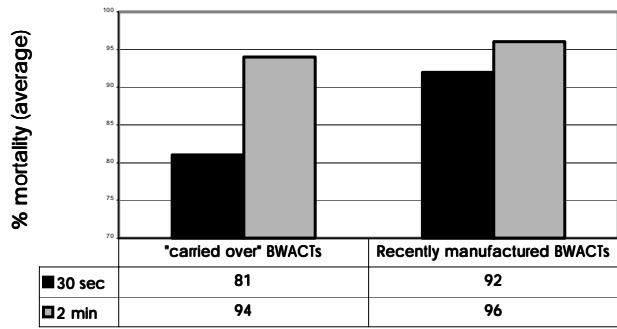
Graph # 1



Graph # 2



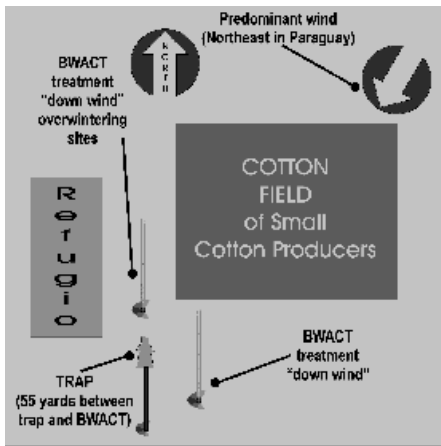
Graph # 3



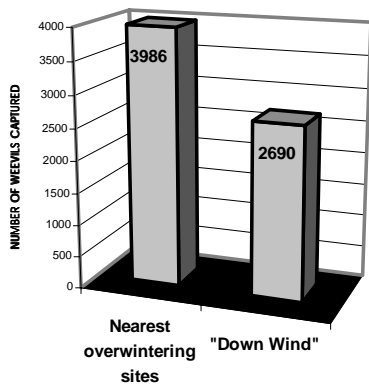
Graph # 4



Graph # 7



Graph # 5: DIAGRAM OF THE TEST



Graph # 6

TREATMENT	Weevils attracted to BWACTs	Weevils captured in traps in time of BWACT	Post BWACT	Total
Treatment "A":50% open bolls	19380 a*	6453b**	4855 a	30688
Treatment "B":at stalk destruction	35280 b	8133 ab	2850 a	46263
Only stalk destruction		9633 a	3483 a	13116
<i>2<sup>nd</sup> Installation (at planting)</i>				
Treatment "A":50% open bolls	4718 a*	1888 a		6606
Treatment "B":at stalk destruction	5632 a	1887 a		7519
Only stalk destruction		3919 a		3919

\*Test-T (0.10) - \*\* LSD (0.05)

Graph # 8