USE OF THE BOLL WEEVIL ATTRACT & CONTROL TUBE (BWACT) TO PREVENT BOLL WEEVIL ESTABLISHMENT IN ARGENTINA AND BOLIVIA

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Abstract

The paper provides information on the evolution of the **BWACT/TMP/TMB** and its use in boll weevil prevention and eradication programs in Argentina and Bolivia. The use of the **BWACT/TMP/TMB** in these two national programs has provided biological, operational and economical benefits, some of which are:

3.8 to 7.7 times greater attraction of weevils as compared to traps, 60 days minimum residual control of weevils (100 % mortality), 55 days pheromone liberation at an average of 1.1 mgs per day vs. 14 days at 0.7 mgs for traps, attraction and control of weevils that emerge between spray applications, attraction and control of weevils between crops, when they leave overwintering sites to forage for pollen and/or moisture, and program component costs of less than $0.15 per day to attract and kill weevils.

Both of these national programs are similar in design and components, and both have been successful in preventing and eradicating boll weevils. Accordingly, the cotton boll weevil has not become an established pest in either country.

Introduction

The Boll Weevil Attract and Control Tube (**BWACT**) has been evaluated and is being utilized in Latin American and USA IPM control, suppression, eradication and prevention programs. The **BWACT** Product, the first US EPA "reduced risk – reduced use" registration, is based on environmental friendly, economical and biologically effective technology. This paper provides information on the evolution of the product and its use in certain Latin American programs.

In the 1991 National Cotton Council's Beltwide Cotton Conference, the USDA, ARS, Boll Weevil Research Laboratory (BWRL) introduced the "Boll Weevil Bait Stick" (Bait Stick) to the US Cotton Industry (Smith et al., 1991). The "Bait Stick" was a new product based on unique, "attract and control" technology which utilized high doses of grandlure pheromone and a slow release formulation of an insecticide, feeding enticer and color attractant. It became available on an experimental basis in 1991/1992 for evaluations in the USA and Latin America to control, suppress and prevent infestations of the boll weevil.

The first large scale "Bait Stick" field tests in Latin America were conducted on about 1500 acres in several Nicaraguan cotton farms during the 1992/1993 crop season by G. H. McKibben (Research Entomologist, BWRL) and representatives of the Nicaraguan National Commission for Cotton (CONAL, Ministry of Agriculture and Livestock). The results from this 1992/1993 test formed the basis for a "country wide" Nicaraguan Program to use the Boll Weevil Attract and Control Tube (**BWACT**), a commercial prototype of the "Bait Stick" on all cotton acreage in the 1993/1994 cotton crop. This "country wide" test was an impressive success and the results were reported at the 1994 and 1995 Beltwide Conferences (McKibben et al, 1994; Daxl et al., 1995). The **BWACTs** used in the 1993/1994 Nicaraguan Program were equivalent to the "second," commercial prototype, which had an average attraction and control of 30 days. This was an approximate 35% improvement in attraction and control over the "Bait Stick" (1991-1992) and the "first" **BWACT** (1993) prototypes.

While the "Bait Sticks" and the first prototypes of the **BWACT** had many positive field test results, there were some negative results in 1991-1993 from certain tests in Texas and Oklahoma and this caused considerable confusion and controversy (Rummel et al., 1994). From a positive aspect, the negative Texas and Oklahoma results contributed to a focused concern which prompted significant product improvements in the **BWACT** [also known as the Tubo Mata Picudo (**TMP**) and Tubo Mata Bicudo (**TMB**) in Latin America]. These improvements were reported in the 1993 and 1995 Beltwide Conferences (McKibben et al., 1993; Plato and Plato, 1995). In 1995, the product improvements on **BWACT/TMP/TMB** were finalized and the EPA registration (originally granted in December, 1993) was amended to reflect the product improvements. Such improvements resulted in the current commercial product which is being used by cotton producers in the USA (Parvin 1995) and Latin America (Dos Santos 1996); this product has an effective, average pheromone liberation of 1.1 mg per day for 50 to 60 days (McKibben et al., 1993) and a slow release of the malathion insecticide for 60 days (Villavaso et al., 1996; Gómez 1997).

The appearance of the boll weevil in Brazil in 1983 and subsequently in Paraguay in 1991, caused the Argentine National Service of Plant Health [a department of Instituto Argentino de Sanidad y Calidad Vegetal (IASCAV)] and the cotton growers of Argentina (Cámara) to intensify the formation and implementation of a program to prevent the entry and establishment of the boll weevil in their cotton producing zones. In early 1993, IASCAV and the Cámara requested the USDA/ARS/BWRL and Plato Industries, Inc. (PII) to survey their borders with Brazil and Paraguay and to make a proposal for a boll weevil prevention program.

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In August 1993 a proposal was made by PII to IASCAV to establish a 750 mile barrier program adjacent to the Brazilian and Paraguayan borders. In 1994, the PII concept was partially incorporated by IASCAV into their modified program. During the last four years, the program has evolved and the **BWACTs** have become a major component in the IASCAV (now named SENASA) National Program to prevent the establishment of the boll weevil in an approximate 2,500,000 acres of cotton.

The SENASA Program has become the model for the Bolivian Program; in the 1995/96 crop cycle, the Bolivian cotton growers association (ADEPA) designed and implemented its Boll Weevil Detection and Prevention Program on its borders with Brazil and in its production zones near Santa Cruz, Bolivia.

The contents of this paper are specific to Argentina and Bolivia and to PII's understanding of their use of the **BWACT** as a component in their respective programs. The use of the **BWACT** in commercial IPM cotton insect control programs in Brazil, in the Paraguayan National Plan for Cotton Reactivation, the Bi-National Program of Argentina and Paraguay, and the Integrated Cotton Boll Weevil Management Project of Argentina, Brazil and Paraguay (Plato and Plato 1997) are not discussed herein. While these programs are of major importance and the **TMP/TMB** participates in important roles, they are not part of this paper.

Discussion

Argentina

The Argentine Program has been designed by the Department of Plant Health, Division of Plant Protection, Servicio Nacional de Sanidad y Calidad Agroalimentaria (SENASA); the administrative, political and technical directions are provided by Ings. Agr. Carlos Lehmacher, Diana Guillén and Eduardo Cosenzo. The SENASA national program personnel have technical people in each Province (equivalent to a state of the USA) who work with the agricultural authorities in each Province to implement the "National Program for the Prevention and Eradication of the Cotton Boll Weevil" (National Program). Their focus has been "to prevent" and "to eradicate" in the three border provinces (Corrientes, Formosa and Misiones) adjacent to Paraguay and Brazil. This has been successfully accomplished during the last four years of crop cycles (1993/94 – 1996/97) by a program consisting of: boll weevil traps for monitoring, **BWACTs** and insecticidal sprays (endosulfan and cypermethrin) for eradication and prevention, and stalk destruction for interruption of reproduction sites. During the 1997/1998 crop year, the program is planned to expand from the three provinces of Corrientes, Formosa and Misiones and incorporate the ten (10) other provinces which produce cotton in Argentina.

1993/94 to 1996/97 – Corrientes, Formosa and Misiones

The National Program was implemented in each province on a zone basis with three zones being: "red" for infested fields next to Paraguay – at 1 trap per 5 acres and 1 **BWACT** per acre., "green" for those fields next to the infested fields of the red zone – at one trap per 12.5 acres., and "yellow for those fields next to the green zone – at one trap per 50 acres.

The boll weevils migrated from Brazil and Paraguay in a Southeastern direction and the peak months of migration, based on trap captures, are April to August. Cotton fields were classified to be in the "Red" Zone when a weevil was captured. In the three provinces, about 8,000 traps were installed for monitoring. A representative history of the trap captures, number of traps and number of infested fields for 1994 through 1997 may be observed in Table 1.

In the crop cycle of 1994/95, 1995/96 and 1996/97, boll weevils in the "red zone" fields were eradicated by: installing **BWACTs** (average of 1 per acre per installation) at planting (October to December), at stalk destruction (March to May) and between crops (about 60 days after stalk destruction). spraying each field that became infested with boll weevils, with 3 to 4 applications on a 4 day interval and installing **BWACTs** adjacent to infested fields at an average of 1 per acre. practicing a thorough stalk destruction with shredders and/or burning.

In the 1996/1997 crop, only two fields in Formosa developed infestations and the weevils were eradicated with the above methodology. Migrating boll weevils were trapped in the provinces of Corrientes and Misiones but none were trapped in any fields containing cotton. All captures occurred during the peak migration months of April to August, which are basically opposite to the crop season (October to April). The "red – green – yellow" zone approach for trapping, **BWACTs** for prevention, **BWACTs** plus sprays for eradication and stalk destruction for elimination of reproductive sites has been successful year to date. **This program has kept the boll weevil from establishing in the border provinces, the "front door" to the cotton zones of Argentina, and spreading throughout the country.**

1997/98 to 2002-2003 – All Cotton Provinces of Argentina

In 1998 the aforementioned program for the above provinces is to be continued, but expanded in the adjacent ten (10) provinces with a monitoring and prevention program based on traps and **BWACTs.** The Argentines have decided on an expanded use of the **BWACT** because it:

is 3.8 to 7.7 times more efficient than a boll weevil trap in removing weevils from a population, requires less service to maintain (**BWACTs** –once per 55 days vs. traps at once per 14 days) is not vandalized to the extent of traps (20% to

75% loss), and has a similar cost compared to a "fully burdened" trap program.

The Program in the ten (10) adjacent provinces is planned to consist of:
training meetings on **BWACT** and trap installations at each cotton gin, cotton buying shed, the cotton seed warehouse, truck weigh station, province border crossing and the Brazil, Paraguay and Bolivia border crossings, year round **BWACT** and trap installations, and stalk destruction programs, emphasized and enforced by the state authorities.

The Argentine National Program has been successful year to date (YTD) to keep the boll weevil from becoming established; the YTD cost has been approximately $2,500,000 to protect about 2,500,000 acres of cotton. The budget is projected to be increased the next five years to ensure a continued success.

Bolivia

The cotton acreage in Bolivia is expanding and the 1997/1998 crop is projected to approximate 150,000 acres. Their production zones are located near Santa Cruz, adjacent to rivers, in valleys to facilitate irrigation. In 1993, the National Cotton Producers Association (ADEPA) worked within the political system and the ministry of agriculture to get several resolutions passed regarding: quarantine programs at border crossings, cotton free zones within 30 miles of the Brazilian and Paraguayan borders, mandatory destruction of cotton stalks, and monitoring and prevention programs with traps and **BWACTs** at cotton gins, seed houses, weigh stations and border crossings.

YTD the ADEPA Program, under the technical direction of Ing. Agr. Daniel Duran, has been successful; the boll weevil has not become established in Bolivia. During the 1996/1997 crop, there was a single infestation that occurred in an isolated farm about 150 miles from the Brazilian border, but 300 miles from Santa Cruz. This production operation was quarantined and the weevils were eradicated by massive spraying, trapping and **BWACT** installations. The spraying program was an "over kill" but the desired eradication was obtained.

The ADEPA program of monitoring, prevention and eradication of all weevil infestations has been successful. However, perseverance will be the "order of the day" until the weevils are eradicated in Paraguay and adjacent Brazilian production zones. Other than the above "single outbreak," there were no other captures or infestations in the production zones in Bolivia.

Summary

The use of the **BWACT** (**TMP** or **TMB**) in the boll weevil prevention and eradication programs of Argentina and Bolivia has provided biological, operational and economical benefits. The benefits are listed as follows:

3.8 to 7.7 times greater attraction of weevils as compared to traps, 60 days minimum residual control of weevils (100% mortality), 55 days pheromone liberation at an average of 1.1 mgs per day vs. 14 days at 0.7 mgs for traps,
attraction and control of weevils that emerge between spray applications,
attraction and control of weevils between crops, when they leave overwintering sites to forage for pollen and/or moisture and program component costs of less than $0.15 per day to attract and kill weevils.

The programs of both countries are similar in design and components. Both programs have been successful in preventing the establishment of the boll weevil in their respective cotton zones.

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Table 1. Boll Weevil Trap Captures in "Red Zone – Formosa, Argentina (1994-1997)

	Mar - May	Jun – Aug	Sep – Nov	Total
1994	0	353	93	446
1995	960	2671	129	3760
1996	752	1761	175	2688
1997	33	88	15	136

Year	**# Traps**	**# Fields**
1994	300	60
1995	1500	220
1996	2500	200
1997	30	2