INFLUENCE OF BIDRIN® XP II™ FOR CONTROL OF TARNISHED PLANT BUGS IN COTTON

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Abstract

The tarnished plant bug is a very significant insect pest of cotton. In 2011, US-EPA registered Bidrin® XP II™, a new premixture of dicrotophos and bifenthrin, for use in cotton. A vital component of developing a new product in production agriculture is evaluation by independent agricultural consultants in a commercial setting. Regional studies consisting of side by side demonstration trials were initiated to examine the effects of Bidrin® XP II™ on tarnished plant bug populations and other pests in cotton. During 2011 and 2012, 54 demonstration trials were conducted by independent crop consultants located in AR, LA, MO, MS, SC, TN, and VA. Numbers of surviving tarnished plant bugs and incidence of stink bug damage to cotton bolls were significantly lower with Bidrin XP II than comparison treatments, including premixtures (Endigo® and Leverage®) and combinations (acephate + pyrethroid and abamectin + pyrethroid). Results from 2011 and 2012 field trials demonstrate that Bidrin XP II is a useful tool for managing infestations of tarnished plant bug and other pests in cotton.

Introduction

The tarnished plant bug (TPB), *Lygus lineolaris* (Palisot de Beauvois) is a primary pest in cotton that consistently infests cotton and causes economic losses. Insecticides are a key tool for reducing the impact of TPB infestations in cotton. Bidrin XP II, a premix of dicrotophos (Bidrin®) and bifenthrin (Discipline®), pairs the well-established efficacy of Bidrin against pests with piercing and sucking mouthparts with the pyrethroid bifenthrin, known to be particularly active on Lepidopteran pests. This combination is a broad-spectrum tool for control of insects in mid to late season cotton.

Product assessment by crop protection professionals in commercial situations is a significant component of developing new products and technologies in agriculture. In 2011 and 2012, paired treatment demonstration trials were initiated across the mid-south region to examine the effects of Bidrin XP II on cotton infested with tarnished plant bugs and other pests, such as stink bugs, Lepidopteran pests, and spider mites. In each commercial-scale test, insecticide treatments were applied with commercial equipment, and insect counts and plant damage were assessed by licensed, independent crop consultants. Findings are reported.

Materials and Methods

Design

Each trial was established as a large scale, paired comparison of Bidrin XP II and an insecticide premixture or combination that is commercially registered and offered for sale. Each site was planted with a locally adapted variety. Trial locations are summarized in Table 1 and Table 2. Plant growth, weed, and pest management inputs were administered according to locally accepted practices, and both plots within each trial were treated identically.

Application

Applications of Bidrin XP II at a rate of 10.5 or 12.8 fl. oz. per acre were made with commercial equipment. Treatment began at or after first bloom and after reaching a threshold for TPB, and comparison treatments were applied on the same day at commercially recommended use rates.

Table 1. Summary of trial locations investigating Bidrin® XP II™ for control of tarnished plant bugs in demonstration cotton field trials, 2011.

Cooperator	County	State	Variety
A Drake Perrow	Calhoun	South Carolina	DPL 1050
Billy Beegle	New Madrid	Tennessee	ST 5458
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Billy Price, Jr.	Tallahatchie	Mississippi	DPL 0912
Blake Foust	Lee	Arkansas	DPL 0912
Bob Griffin	Lee	Arkansas	DPL 0912
Bruce Pittman	Leflore	Mississippi	Phytogen 367
Chuck Farr	Crittenden	Arkansas	DPL 0912
Chuck Farr	Mississippi	Arkansas	Phy 375
Clay Fletcher	St. Francis	Arkansas	DPL 0912
Dale Wells	Mississippi	Arkansas	Americot 1550
Danny Dunigan	Craighead	Arkansas	ST 5458 BTF
Danny Moore	Mississippi	Arkansas	DPL 0912
David Hydrick	Mississippi	Arkansas	ST 5458
David Hydrick	Mississippi	Arkansas	ST 5458
Dawn White	Williamsburg	South Carolina	DPL 1048
Dee Boykin	Yazoo	Mississippi	DP 1034 B2 RF
Eddie Dunigan	Craighead	Arkansas	ST 5458 BTF
Greg Applewhite	Southampton	Virginia	Phytogen 375
Greg Smith	Craighead	Arkansas	ST 5458 B2RF
Hank Jones	West Carroll	Louisiana	Phytogen 499
Heyward Owens	Southampton	Virginia	2570 B2RF
Jim Anderson	Tate	Mississippi	DPL 0912
Joe Townsend	Tallahatchie	Mississippi	Phytogen 367
Matt Robbins	Dunklin	Arkansas	DPL 0912
Michael Ray Johnson	Stoddard	Missouri	Stoneville 4858 BT2
Paul D. Wilson	St. Francis	Arkansas	AM 1550
Stoney Stonestreet	Quitman	Mississippi	DPL 0912
Tucker Miller	Quitman	Mississippi	DPL 0912
Ty Edwards	Montgomery	Mississippi	ST 5458
Virgil King	Holmes	Mississippi	DPL 0912

Table 2. Summary of trial locations investigating Bidrin® XP II™ for control of tarnished plant bugs in demonstration cotton field trials, 2012.

Cooperator	County, State	Location/Grower	Variety
Billy Bryant	Leflore	Missouri	ST 5288
Blake Foust	St. Francis	Arkansas	DPL 920
Bob Griffin	Lee	Arkansas	D+PL 912
Charles Denver	Chicot	Arkansas	DPL 0912
Chuck Farr	Crittenden	Arkansas	DPL 0912
Dale Wells	Mississippi	Arkansas	DPL 4145 LL
Danny Dunigan	Craighead	Arkansas	ST 5458
Danny Moore	Poinsett	Arkansas	DPL 0912
Dan Magee, Jr. T	Tensas Parish	Louisiana	ST 5288
David Dubard	Washington	Mississippi	Not provided
David Hydrick	Mississippi	Arkansas	Not provided
Eddie Cates	Poinsett	Arkansas	STV 5458 B27
Greg Smith	Mississippi	Arkansas	ST 5458 B2RF
Henry E. Dunigan	Craighead	Arkansas	ST 5458
Jason Grafton	Madison	Mississippi	Not provided
Joe Townsend	Tallahatchie	Mississippi	Phytogen 367
Lee Rogers	Dunklin	Missouri	Dynagrow 2570
Michael Ray Johnson	Stoddard	Missouri	Stoneville 4858 BT2
Paul D. Wilson	St. Francis	Arkansas	AM 1556
Robert Wells	Chicot	Arkansas	DPL 0912
Tom Davis	Poinsett	Arkansas	ST 4145
Victor Roth	Dunklin	Missouri	STV 5458
Willie Remore	Franklin	Louisiana	ST 5288B2RE

Field Observations

Counts of TPB, as numbers per 50 sweeps, were reported after treatment (post-count) in 2011 trials and before (pre-count) and after treatment in 2012. In six trials, TPB counts were reported per drop cloth, and counts were converted to per 50 sweeps using the ratios provided in *Multistate Evaluation of Tarnished Plant Bug Sampling Methods in Blooming Cotton*. Consultants provided observations on other pests including stink bugs (percent damaged "quarter sized" bolls), aphids (# per terminal), spider mites, and Bollworms if present.

Data Analysis

Data were analyzed across locations within each year, and significant differences were determined using a paired t-test. Three locations from the trials from 2012 were excluded from analysis due to incomplete insect counts.

Results and Discussion

Key Findings from 2011 Trials:

- Whether compared among trial locations (n=31), with Endigo (n=10), or with Leverage (n=5), Bidrin XP II averaged significantly lower numbers of tarnished plant bug (TPB) than the comparison treatment (Figure 1).
- At eleven locations that observed stink bug damage to cotton bolls, Bidrin XP II averaged significantly less damage than all comparison treatments (n=11) and Endigo (n=4) (Figure 2).

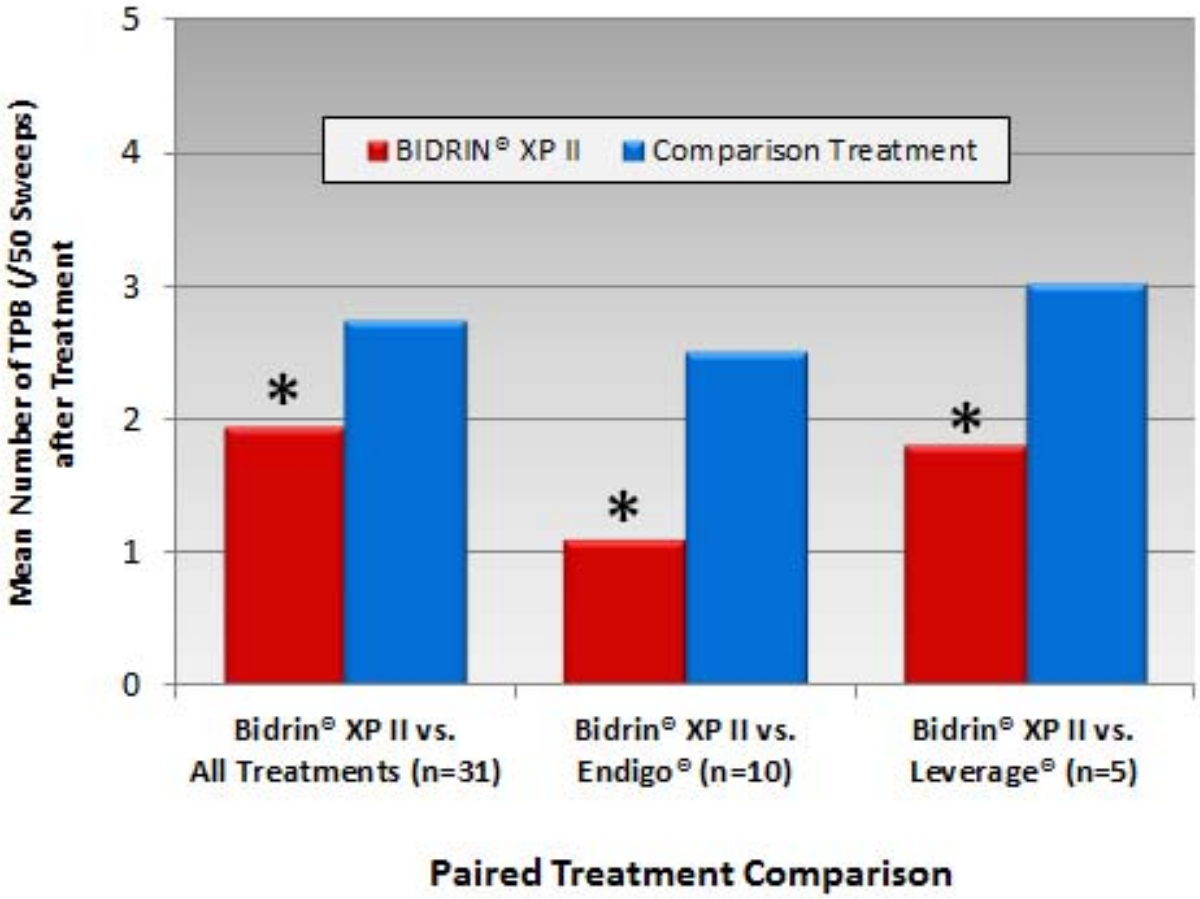

Figure 1. Mean numbers of tarnished plant bugs (TPB) after treatment with insecticides evaluated in Bidrin® XP II™ demonstration trial program in 2011. Count is average of numbers of TPB per 50 sweeps. N = sample size; based on paired t-test analysis, * indicates treatments are significantly different at $P<0.05$.

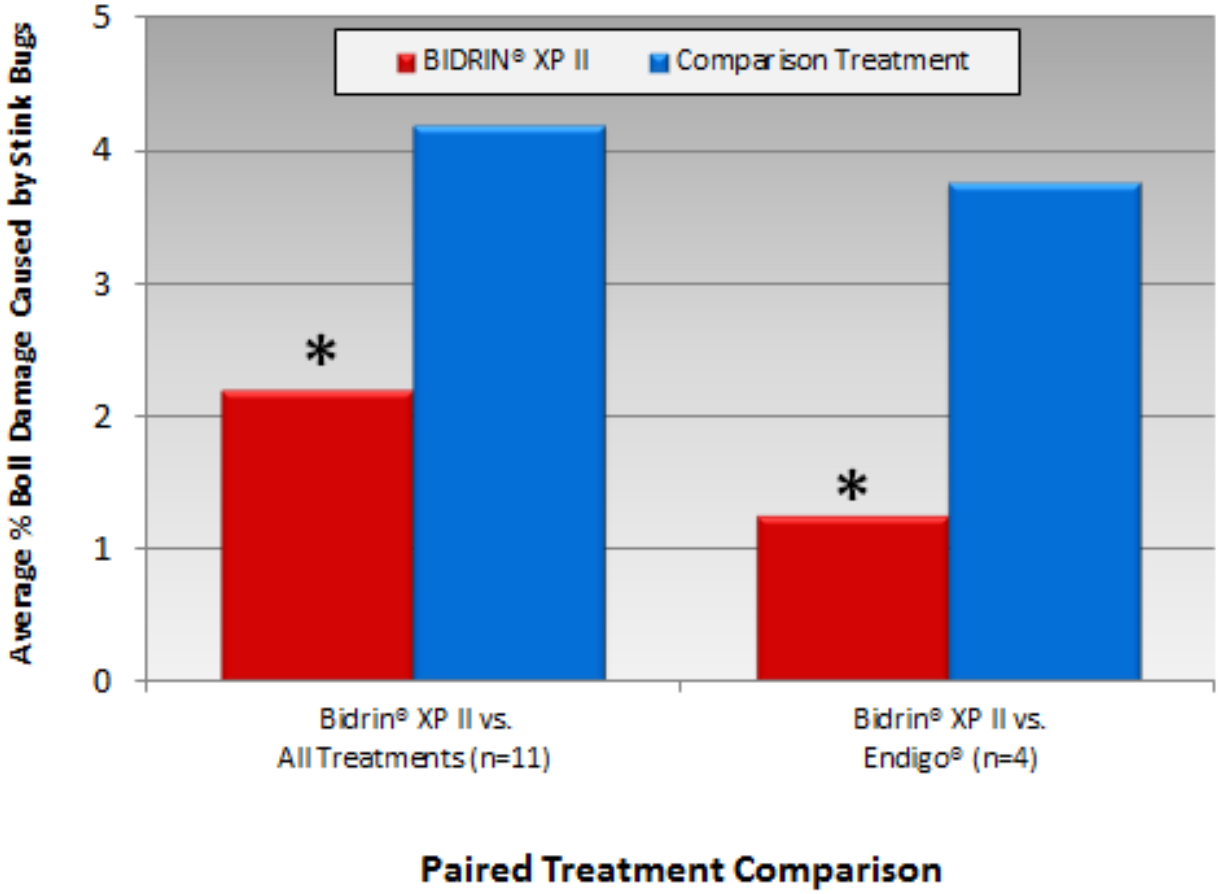

Figure 2. Mean cotton bolls (%) damaged by stink bugs following treatment with insecticides evaluated in Bidrin® XP II™ demonstration trial program in 2011. N = sample size; based on paired t-test analysis, * indicates treatments are significantly different at P<0.05.

Key Findings from 2012 Trials:

- Bidrin XP II averaged fewer TPB per 50 sweeps compared with acephate + pyrethroid, Endigo, Leverage, or abamectin + pyrethroid (Table 3).
- An alternative approach is to classify each paired comparison as a win or loss with a win meaning Bidrin XP II averaged fewer TPB than the comparison treatment. Depending upon the comparison, Bidrin XP II yielded a success rate of 86% to 100% (Table 3), which suggests good to excellent consistency for Bidrin XP II.
- In 2012, cooperators reported pre-treatment and post-treatment counts of TPB, and percent control of TPB was calculated (Figure 3). In three comparisons with sufficient sample size for a t-test, Bidrin XP II provided significantly greater control of TPB than the comparison treatment (all treatments, acephate + pyrethroid, and Endigo). This pattern held true for comparisons of Bidrin XP II with Leverage and acephate + abamectin.
- At twelve locations that observed spider mites, populations tended to decline with Bidrin XP II relative to comparison treatments (Table 4).

Table 3. Mean numbers of tarnished plant bugs (TPB) before (pre-count) and after (post-count) treatment with insecticides evaluated in Bidrin® XP II™ demonstration trial program in 2012. Count is average of numbers of TPB per 50 sweeps.

Comparison Treatment	Trials	Bidrin® XP II Success Rate[a]	Average TPB Counts (/50 sweeps)			
			Bidrin® XP II		Comparison Treatment	
			Pre-Count	Post-Count	Pre-Count	Post-Count
Acephate + Pyrethroid	9	89%	11.5	1.3	12.3	4.0
Endigo®	7	86%	8.4	2.4	8.8	6.3
Leverage®	2	100%	5.5	1.0	5.5	3.0
Abamectin + Pyrethroid	2	100%	7.6	2.8	7.6	3.8
Pooled (Total)	20	90%	9.4	1.8	9.9	3.8

[a] Success rate = percentage of paired comparisons where Bidrin XP II averaged fewer TPB than comparison treatment.

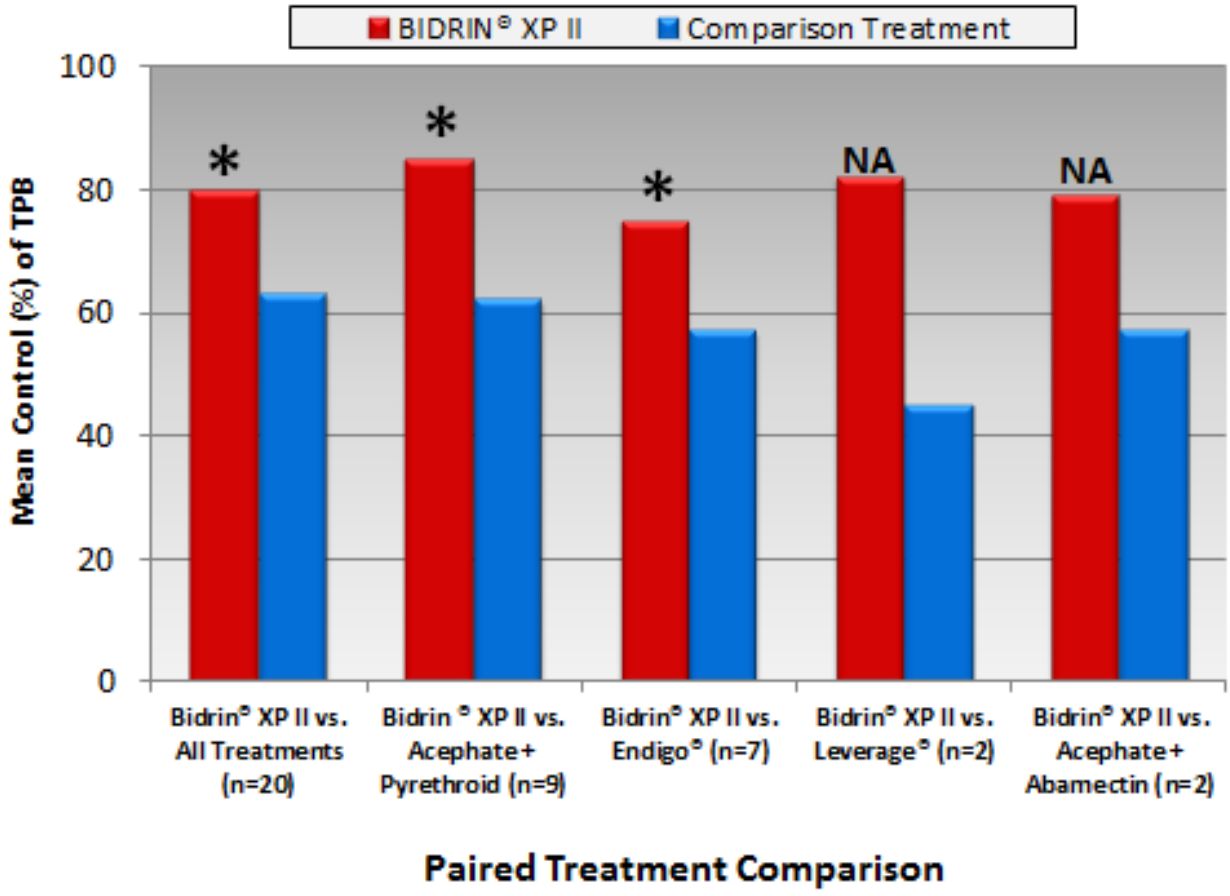

Figure 3. Mean control (%) of tarnished plant bugs (TPB) with insecticides evaluated in Bidrin® XP II™ demonstration trial program in 2012. Control calculated as percent difference before (pre-count) and after (post-count) treatment. N = sample size; NA = t-test not applicable due to limited sample size; based on paired t-test analysis, * indicates treatments are significantly different at $P<0.05$.

Table 4. Change in spider mite population from before to after treatment with insecticides evaluated in Bidrin® XP II™ demonstration trial program in 2012. Numbers based primarily on qualitative assessment of spider mite density.

Treatment	Trials	Change in Spider Mite Population after Treatment		
		Dropped	Unchanged	Increased
Bidrin® XP II™	12	8	4	0
Comparison Treatment	12	2	7	3

Conclusions

Evaluation of Bidrin XP II by crop protection professionals is an important step in defining and developing product expertise for production agriculture. Across two years of testing in a commercial evaluation program with crop consultants, Bidrin XP II consistently outperformed premixtures (Endigo and Leverage) and combinations (acephate + pyrethroid and abamectin + pyrethroid). Numbers of surviving tarnished plant bugs (TPB) and incidence of stink bug damage to cotton bolls was significantly lower with Bidrin XP II than comparison treatments. Results from 2011 and 2012 field trials confirm other research that Bidrin XP II is a useful tool for managing infestations of TPB and other pests in cotton.

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