ARKANSAS CORN AND GRAIN SORGHUM BOARD
Summary of 2009 Results

Title: Improvement of Insect Management Programs for Arkansas Field Corn

Investigators: Paul McLeod

Cooperators:C. Kennedy (CBES); selected corn producers and County Extension Agents

Crop: Corn Status: new

Objective 1. To determine the effects of new BT field corn lines on corn borers, corn earworm and fall armyworm. Because of the late notification (April 6) of the proposal acceptance, only one BT vs parent test was planted at the Cotton Branch Station (CBS) at Marianna. The planting date for the study was 29 April. The impact of corn borers was compared on four Pioneer lines with and without the BT genetics (Table 1). Each BT line significantly reduced corn borer damage (% of plants with damage, amount of feeding, and shank damage) when compared to its non-BT parent. Damage from corn earworm was common in both the non-BT and BT lines although somewhat reduced in two of the BT lines (31P42 and 31D59). Two of the BT lines (31D59 and 1615HR) yielded significantly more than their conventional parents. Although not part of the proposal, additional tests at Marianna demonstrated the effectiveness of new Viptera field corn that possesses BT directed toward corn earworm management. The new trait was highly effective against corn earworm at Marianna in 2009 and may significantly impact yield and aflatoxin levels in future years.

Table 1. Evaluation of field corn cultivars for resistance to insects, Marianna, Arkansas, 2009

Cultivar	% of plants with corn borer damage	% of plants with more than 2 internodes damaged	% of internodes damaged

% shank
damage

ear damage
rating *

yield
bu/A

1. Pioneer 31P40	82.5 a	70.0 a	40.0 a	86.5 a	3.1 a	147.9 bc
2. Pioneer 31P42 Bt	5.0 b	0.0 b	0.5 c	0.2 c	1.2 b	160.1 b
3. Pioneer 31D57	87.5 a	60.0 a	36.0 ab	76.5 b	3.0 a	145.9 bc
4. Pioneer 31D59 Bt	2.5 b	0.0 b	0.7 c	0.7 c	1.6 b	180.3 a
5. Pioneer 1615R	82.5 a	60.0 a	34.0 b	76.5 b	3.3 a	133.4 c
6. Pioneer 1615HR Bt	2.5 b	0.0 b	0.2 c	0.7 c	2.8 a	179.3 a

* Damage ratings are 0 (none) to 5 (extensive). Column means within a planting followed by the same letter are not significantly different (P=0.05, LSD).

Objective 2. To improve insect management systems for conventional field corn in Arkansas. Several studies were completed to address objective 2 as follows.

FC091 - Foliar insecticides were applied in early July against corn borers at the Marianna (Table 2). All of the insecticides significantly reduced the % of plants with corn borer damage, length of tunneling and % shank damage. Coragen and Intrepid significantly increased seed weight per plant.

Table 2. Evaluation of foliar insecticides for corn borer management in field corn at Marianna, 2009.

Treatment
% of plants
with corn borer
damage
tunnel length per plant (cm)

	% shank damage			total seed per plant	total seed weight per plant (g)		kernel weight (g)	
1. Control	57.5a	9.2a	20.0a	493a	225a	0.46a		
2. Hero 1.24 (early silk)	15.0b	2.9cd	5.0b	506a	228ab	0.45a		
3. Hero 1.24 + Quadris (early silk)	20.0b	3.4bcd	5.0b	512a	231ab	0.45a		
4. Hero 1.24 (post-silk)	20.0b	3.6bcd	2.5b	516a	229ab	0.44a		
5. Hero 1.24 + Quadris (post-silk)	25.0b	2.2d	5.0b	499a	230ab	0.46a		
6. Coragen SC	17.5b	1.8d	0.0b	506a	238bc	0.47a		
7. Intrepid 2 SC	25.0b	5.3b	5.0b	525a	243c	0.46a		
8. Capture 2 EC	22.5b	4.8bc	5.0b	502a	225a	0.45a		

Column means within a planting followed by the same letter are not significantly different (P=0.05, LSD).

FC092 and FC093 - Foliar insecticides were applied against fall armyworms in whorl stage corn at Marianna. FAW infestation was high with 48.8 % of the non-treated plants infested (Table 3). Each of the tested insecticides significantly reduced the % of infested plants. However, no significant differences in yield were detected.

Table 3. Impact of foliar insecticides against fall armyworm (FAW) on whorl stage field corn, Marianna, AR 2009.

Treatments	Rate lb AI /A	% plant infestation
1. Hero 1.24 + 0.25% CS-7	5.12 oz or 0.05	14.2 c
2. Coragen SC 1.67 + 0.25% MSO	.045	5.8 d
3. Coragen SC 1.67 + 0.25% MSO	0.066	3.2 d
4. Intrepid 2 SC + 0.25% CS-7	0.125	2.8 d
5. Brigade 2 EC + 0.25% CS-7	0.05	14.2 c
6. Radiant SC (1 lb ai) + 0.25% CS-7	0.047	22.0 b
7. Check	---	48.8 a

Column means within a planting followed by the same letter are not significantly different (P=0.05, LSD).

FC094 - Foliar application of Intrepid against corn borers was initiated at a producer's field near Holly Grove. The insecticide was applied by aircraft in early July. Corn yield and corn borer impact were determined in late Augus (Table 4). Intrepid significantly reduced % of infested plants, tunnel length and % shank damage. However, yield was not significantly increased.

Table 4. Evaluation of foliar insecticides for corn borer management in field corn, Holly Grove 2009.

Treatment and rate	% of plants with corn borer damage	tunnel length per plant (cm)	% shank damage	total seed per plant	total seed weight per plant (g)	kernel weight (g)

				yield			
				bu/A			
1. Intrepid 2 SC							
8 fl oz pr/A	23.3 a	2.0 a	0.0 a	611.1 a	259.6 a	0.424 a	195.4 a
2. Untreated							
	53.3 b	5.5 b	6.7 b	582.5 a	249.7 a	0.432 a	186.3 a

Column means within a planting followed by the same letter are not significantly different (P=0.05, LSD).

FC097 - Survey fields were established in non-BT field corn at Piggot, Marianna, Holly Grove, Lake Village, Morrilton, Ft. Smith and Fayetteville. Insect abundance and impact were monitored. Southwestern corn borer populations were moderate to high at Piggot and Marianna (Table 5). None were detected in other locations in Arkansas. European corn borer population levels were high at Morrilton and moderate at Holly Grove and Marianna. No European corn borers were detected at other sample sites. Corn earworm continues to be present throughout the state and negatively impacts field corn production by reducing the number and quality of kernels per ear and likely increases the potential for aflatoxin. Newer field corn genetics will likely reduce corn earworm impact in future years. Chinch bugs were detected in low numbers near Morrilton and at Gin City.

Table 5. Occurrence and impact of corn borer on conventional field corn in Arkansas, 2009

Location	% of plants with corn borer damage	tunnel length per plant (cm)	% shank damage	total seed per plant	total seed weight per plant (g)	kernel weight (g)
Holly Grove	60 a	5.4 a	10 a	546 ab	245 a	0.450 b
Marianna	25 b	3.8 a	0 a	557 ab	259 a	0.467 a
Morrilton	75 a	2.0 a	0 a	507 b	165 b	0.326 c
Piggott	80 a	14.6 b	5 a	607 a	187 b	0.307 d

Column means within a planting followed by the same letter are not significantly different (P=0.05, LSD).

FC095 and FC096 - A study on the impact of corn borer on field corn kernel size has been implemented at Marianna. A similar study was conducted at Fayetteville using cordless drills to simulate corn borer feeding. Data from both studies indicate that corn borer impact on kernel weight from irrigated plants is likely less than once thought. Plant lodging that results from corn borer feeding represents a major threat to Arkansas field corn production. An additional year of testing is needed prior to formulating solid conclusions.

Objective 3 - To establish information needed for updates to the insect chapter in the "Corn Production Handbook" published in 2003 by the University of Arkansas and the Arkansas Corn and Grain Sorghum Board. Each of the above mentioned studies have provided information needed to update the insect chapter in the "Corn Production Handbook". The insect chapter will be ready for the next printing.