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Kansas State University
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EFFICACY OF VIP & CRY1AB EVENT CORN HYBRIDS FOR THE CONTROL OF SOUTHWESTERN CORN BORER AND CORN EARWORM

by

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SUMMARY

This trial was conducted to evaluate the efficacy of corn hybrids containing Cry1Ab, for controlling the southwestern corn borer (SWCB), *Diatraea grandiosella* Dyar, stacked with a VIP event for controlling the corn earworm (CEW), *Helicoverpa zea* (Bobbie). The experimental stacked hybrid with both Bt11 and MIR162V gave outstanding efficacy against both the corn earworm and the southwestern corn borer.

PROCEDURES

Experimental corn seed (supplied by Syngenta) was machine-planted June 3 at the Southwest Research-Extension Center Garden City, Kansas. The plots were 4 rows wide and 20 ft long. The experimental seed was planted in a single row (row 2), and the other rows were planted to a commercial Bt corn seed. There were 10-ft-wide alleys at each end of the plots. The design was a randomized block design with four replicates. Four to 12 rows of Bt and non-Bt corn were planted around the experimental plots as a border and windbreak. One isoline was treated for second-generation SWCB and CEW with Warrior T at 3.84 oz/acre, applied with a 2-gallon hand sprayer on August 5. The spray was directed at the plants, while the nozzle was moved up and down to treat the whole plant. The plots were infested by free flying feral moths. There was no first-generation data.

Two sets of SWCB and CEW observations were made. The first observations were made in 5 plants per plot on August 16 and 17 to catch the CEW in the ears. At this time, the SWCB had not started tunneling in the stalks. The second observations were made on up to 15 plants (when available) on September 12 through 14 to record the total CEW damage in the ear and SWCB tunneling in the stalk. The ears from both sets of dissected plants were examined for corn earworm damage. Ear tip damage was measured according to the Winstrom scale (cm of feeding penetration plus 1 for silk feeding). We also counted (or estimated) the number of harvestable kernels removed by CEW feeding on both sets of ears. We estimated the number of CEW traces (tunnels) and the cm of tunneling in the kernels. Some SWCB damage in the ear base was present, but it was minor and is not reported separately. Tunneling in the rest of the plant was also recorded. The data were analyzed by ANOVA, and means were separated by LSD.

RESULTS AND DISCUSSION

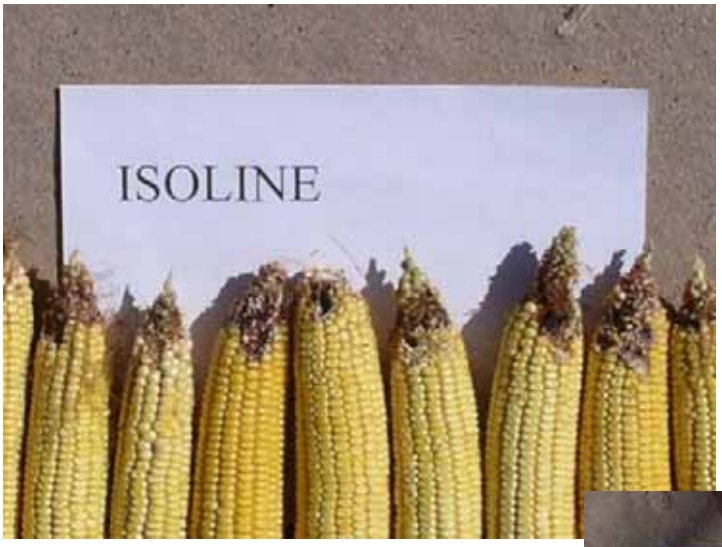
Because the plants were not artificially infested with SWCB larvae, there was no first-generation damage to evaluate. There was considerable variability in the maturity of plants within plots and across the plots. The percentage of plants that had reached brown silk on August 16 was analyzed, and there were no significant differences across the treatments (P=0.3049), but there were differences across replication (P=0.0542)

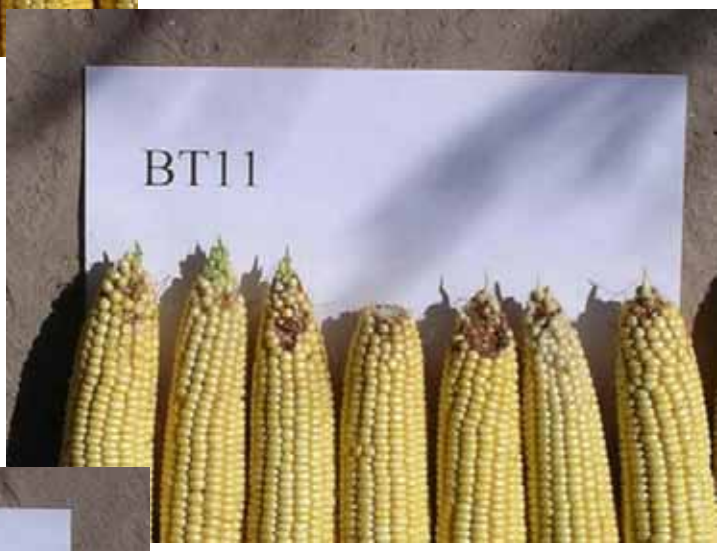
Corn earworm damage was moderate, reaching 3.0 to 4.3 on the Winstrom scale (Table 1). In the August observations, which were made before any of the CEW had left the ears, the number of CEW larvae, the CEW instar, length of CEW feeding tunnels, and Windstrum ratings were significantly less in the two treatments with the MIR162V events (#2 & 3) (Table 1). The Bt 11 event and the Warrior treatments did not significantly reduce the CEW variables. In the September observations, which were made after the CEW damage was complete, the number of CEW is not recorded because they had left the ears. The length of CEW feeding tunnels, number of CEW tunnels, number of kernels destroyed, and Windstrum ratings were significantly less in the two treatments with the MIR162V events (#2 & 3) (Table 1). The Bt 11 hybrid and the Warrior treatments reduced all of the CEW variables, but the reduction was statistically significant for some of the variables.

The second-generation SWCB population averaged only 0.45 and 0.5 larvae per plant in the

untreated non-Bt hybrid (#4) (Table 2). During the August observations, most of the SWCB were found in the ear around the shank, but in September all SWCB were found in the stalk; most of these were down in the base of the plant, and plant girdling had started. All the treatments significantly reduced SWCB variables, except the husk-feeding observations, which record the first feeding attempts of the SWCB (Table 2). There was an average of 0.77 tunnels and 4.2 cm of tunneling per untreated non-Bt plant (#4) (Table 2).

The efficacy of the experimental hybrids was outstanding against both the CEW and the SWCB. The efficacy of the MIR162V (VIP3a) event stacked with a Cry1Ab event was outstanding against both the corn earworm and the southwestern corn borer.





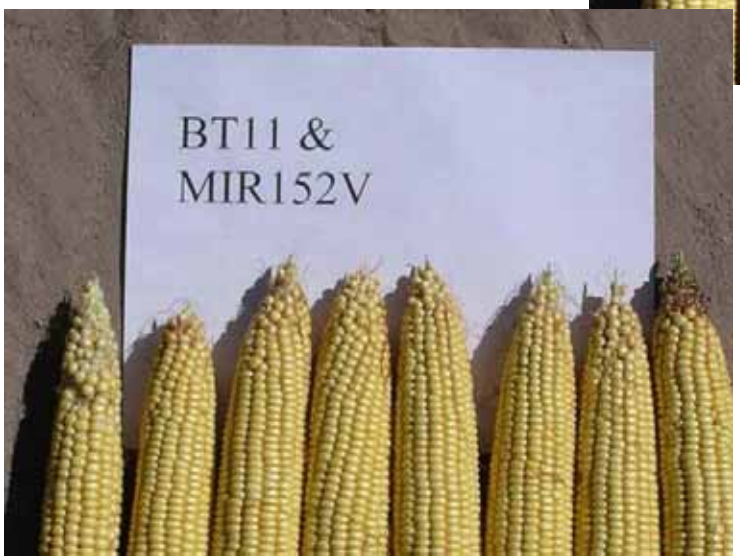


Table 1. Observations on corn earworm feeding taken on the primary corn ears in the different treatments. Corn ear feeding damage recorded August 16 and 17 and September 12 through 14, 2005, Southwest Research-Extension Center, Garden City, Finney Co., Kansas.

Treat. No.	Hybrid Code Event/treatment	August 16 & 17				September 12 through 14			
		Number per plant	Instar	Feeding (cm/ear)	Windstrum rating	Feeding (cm/ear)	Feeding tunnels	Kernels destroyed	Windstrum rating
1.	MG051311 (Bt11)	3.0 ab	2.1 ab	1.5 bc	1.8 b	3.8 b	1.9 ab	27.4 ab	3.1 b
2.	MG033058 (MIR162V)	0.3 c	1.3 c	0.3 c	0.4 c	0.7 c	0.5 c	6.6 c	0.7 c
3.	MG051540 (Bt11 & MIR162V)	0.4 c	1.7 bc	0.0 c	0.1 c	0.4 c	0.4 c	3.3 c	0.5 c
4.	MG032765 Isoline	4.6 a	3.5 ab	3.8 a	3.0 a	5.7 a	2.4 a	41.9 a	4.3 a
5.	MG032765 Isoline & Warrior	1.9 b	3.7 a	2.8 ab	2.5 ab	4.2 ab	1.8 b	25.9 b	3.3 ab
	P-value	0.0001	0.0664	0.0024	0.0001	>0.0001	>0.0001	0.0005	>0.0001
	LSD-value	1.315	1.926	1.7886	0.932	1.5000	0.636	14.587	1.154

Means followed by the same letter are not significantly different ($P \leq 0.05$, LSD).

Table 2. Observations on second-generation southwestern corn borer feeding on corn plants of different treatments. Plants dissected August 16 and 17 and September 12 through 14, 2005, Southwest Research-Extension Center, Garden City, Finney Co., Kansas.

Treat. No.	Hybrid Code Event/treatment	August 16 & 17 Number per plant	August 16 & 17 Husk feeding	September 12 through 14 number per plant	September 12 through 14 Husk feeding	September 12 through 14 Stalk tunneling	September 12 through 14 Shank tunneling	September 12 through 14 Tunnels per plant
			(Pos/15 plt.)		(Pos/5 plt)	(cm/plant)	(cm/plant)	
1.	MG051311 (Bt11)	0.0 b	0.16	0.0 b	0.06 b	0.0 b	0.0	0.00 b
2.	MG033058 (MIR162V)	0.0 b	0.14	0.0 b	0.03 b	0.2 b	0.0	0.03 b
3.	MG051540 (Bt11 & MIR162V)	0.0 b	0.14	0.0 b	0.09 b	0.0 b	0.0	0.00 b
4.	MG032765 Isoline	0.45 a	0.29	0.5 a	0.31 a	4.2 a	0.2	0.77 a
5.	MG032765 Isoline & Warrior	0.0 b	0.33	0.0 b	0.11 b	0.0 b	0.0	0.00 b
	P-value	0.0013	0.2577	0.0004	0.0012	0.0039	0.1262	0.0016
	LSD-value	0.207	—	0.1949	0.113	2.154	—	0.355

Means followed by the same letter are not significantly different ($P \leq 0.05$, LSD).

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