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RESPONSE OF BT CORN TO SIMULATED HAIL DAMAGE

Merle Witt and Lawrent Buschman*

Hybrid corn is grown annually on approximately 3.1 million acres in Kansas and is an important part of agricultural production under both dryland and irrigated conditions. This corn acreage is subjected to hail damage of various degrees each year. Numerous studies have examined the effect of hail damage on the grain production of conventional corn hybrids. However, data have not been published regarding the effect of hailstorm defoliation on the new genetically modified corns resistant to European corn borer. Thus, we undertook to evaluate the influence of simulated hail defoliation on conventional corn hybrids versus Bt-corn hybrids, which have the *Bacillus thuringiensis* (Bt) gene added.

Procedures

Paired corn hybrids with or without a Bt event were grown with flood irrigation at 30,000 plants/a in 30-inch rows at Garden City in 1997 and 1998. Individual plots were four rows wide X 25 feet long. To simulate a hailstorm, 80% of the leaf area was removed manually at the 15-leaf growth stage. The paired hybrids included: Cargill 7997 and 8021 Bt, Golden Harvest 2530 and 2530 Bt, and Novartis 7590 and7590 Bt. The Cargill and Golden Harvest transgenic hybrids utilized the Mon 810 event. The Novartis transgenic hybrid utilized the Bt 11 event. All three hybrids have the trade name Yieldgard Bt.

Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, Kansas 66506

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Results

The simulated hail damage caused average reductions in grain yield of 81 bu/a in 1997 and 63 bu/a in 1998. Yield losses were not significantly different for conventional and Bt hybrids. However, corn borer stalk tunneling was lacking in the Bt hybrids, whereas their conventional hybrid counterparts had 42% of stalks infested in 1997 and 55% of stalks in 1998. Because of the elimination of insect tunneling damage, the Bt hybrids averaged 11% higher yield in 1997 and 8% higher yield in 1998. Resulting grain yields are shown in Table 1.

Conclusions

Essentially all dry matter in the corn plant is produced by photosynthesis in the leaves. Therefore, the potential grain yield is determined by the amount of leaf area present to produce dry matter. A hailstorm that reduces the leaf area will result in reduced growth rate and grain production. Genetically modified hybrids with a Bt gene addition had no European corn borer damage, but the Bt gene did not have a significant influence on grain yield loss following simulated hail defoliation. Grain yield was reduced by 37% when 80% of the leaf area was removed at the 15-leaf growth stage.

Table 1. Harvest results of conventional and Bt corn following simulated hail damage at the 15-leaf stage, Southwest Research-Extension Center, Garden City, KS

	Grain Yield (bu/a)				
	1997		1998		%
Hybrid	Control	Defol	Control	Defol	Yield Loss
Conventional	219	134	164	103	38.5
Genetically Modified (Bt)	230	152	180	115	36.0
LSD (5%)	n.s.	11	14	12	n.s.

Defol = defoliated

Yield corrected to 15.5% moisture; n.s. = not significant.

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* Associate Professor, KSU Southwest Research-Extension Center and Professor, Department of Entomology (located at SWREC).

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Note: Trade names are used to identify products. No endorsement is intended, nor is any criticism implied of similar products not mentioned.