

NEW JERSEY GRAIN AND FORAGE JOURNAL

*A COMPILATION OF RESEARCH AND
EXTENSION PROJECTS IN CORN, SOYBEAN, SMALL
GRAIN AND FORAGE*

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PREFACE

This is the sixth edition of the New Jersey Grain and Forage Journal, an annual journal highlighting research and extension projects in field crops. Traditionally the publication has presented work conducted in New Jersey. This year articles from Delaware and Pennsylvania are included as a result of collaborative efforts by field and forage crop agents, specialists and researchers from the Mid-Atlantic region.

Grain and forage production represents the largest agricultural acreage in the Mid-Atlantic States, adding significantly to and supporting related industries. Not only does this support the local and regional economy, but also provides the benefits of open space to the residents of the region.

We would like to acknowledge and thank the New Jersey Soybean Board and Grain and Forage Producers' Association for their financial support. The Soybean Board allocates soybean checkoff funds for research and promotional activities that benefit the soybean industry. The Grain and Forage Producers' Association promotes research, marketing, legislation and education related to the grain and forage industry.

We hope that these results will be helpful to you as you plant and produce crops in the 2000 growing season and beyond. Your suggestions for research and educational projects are always welcome, as it is our desire to develop programs that serve you most important needs.

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Performance of Bt Corn Hybrids in Pennsylvania and New Jersey

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Research Question

Bt corn hybrids contain a gene that provides nearly complete control of the European Corn Borer (ECB) and are available from many seed companies. These hybrids are typically more expensive than normal hybrids. The extra cost is often \$25/bag of seed, which amounts to \$7 to 10/A. Corn producers are interested in knowing how often the extra cost associated with the Bt corn hybrids will be a profitable investment.

Literature Review

Key factors that influence the profitability of Bt corn are the yield and moisture of the Bt hybrid compared to the best available non-Bt-enhanced hybrid. Lodging is also an important consideration. A recent study (Farnham and Pilcher, 1998) at Iowa State University showed a 3 bu/A benefit of Bt corn compared to their normal counterparts. Previous limited studies at Penn State have shown yield advantages to Bt corn in some, but not all, cases. The benefit of Bt corn appears to be a function of corn borer pressure and the potential of the base genetics of the Bt hybrid. This study was initiated to evaluate the potential of Bt corn under field conditions in 1998.

Study Description

A total of six replicated strip trials were conducted in Warren County, NJ and Adams County, PA. At each location, the experimental design was a randomized complete block with two treatments (hybrids) and two replications. Each plot consisted of a Bt and non Bt hybrid planted in a four or six row strip that was approximately 1000 feet long. Seed was provided by seed companies to participating cooperators. In the Warren and Adams County

trials, each hybrid was replicated at least twice in the same field.

In Lebanon County, PA, 15 hybrids were planted at two different locations and each location served as a replicate. In each trial, the cooperators managed the plots using standard management procedures. Each plot was rated for corn borer damage before harvest by determining the number of corn borer tunnels per stalk. Harvest procedures for all trials were similar. Before harvest, plant populations were determined for each strip. Grain yield and moisture was determined by harvesting the entire strip and weighing the corn with a weigh wagon or truck scales, and then determining moisture with a grain moisture meter.

Applied Questions

How severe was European corn borer injury in these trials?

Corn borer pressure in these trials would be considered light to moderate. Corn borer tunnels/plant ranged from 0.4 to 2.1 tunnels/plant, and averaged 1.1 tunnels/plant. Bessin (1996) estimated that at \$2.50 corn and \$20/bag premium for Bt corn, the estimated loss at 0.5 tunnels/plant would be enough to pay for the premium. He used a loss estimate of 5%/borer/plant. Based on this analysis, a slight yield response (5%) and economic benefit from the Bt hybrids would have expected.

Was lodging reduced with the Bt hybrids?

Lodging was generally reduced with Bt hybrids in these trials.

How did the yield of the Bt hybrids compare to non-Bt hybrids?

Grain yield, moisture, and corn borer infestation data of the six two replicate trials are listed in Table 1. In all of the Adams County trials, there were no significant yield advantages to the Bt hybrids. In the Warren County trial, the yield from the Bt hybrid tended to be less than the normal hybrid. This was significant at the $p=0.2$ level of probability. This means that statistically, there was an 80% probability that this difference was not just due to random variability.

Data from the Lebanon County trial is listed in Table 2. There were no significant differences among hybrids in that trial either. Yields of the Bt hybrids, 33A14, 33Y09, 6800Bt

and Max 496, did not show any trend in this test, suggesting that Bt hybrids as a group did not perform any better than normal hybrids.

Was the grain moisture of the Bt hybrids higher than normal hybrids in the trials?

In general, Bt hybrids were similar to non-Bt hybrids in grain moisture. In some previous trials slightly higher grain moistures with the Bt hybrids were observed.

Recommendations

These results demonstrate that Bt hybrids need to be evaluated on the basis of yield performance across environments. In most cases the Bt hybrids appeared to compete well with non-Bt hybrids under low corn borer pressure, indicating yield drag associated with the Bt gene seems to be low. The results from the Warren County plot suggest that a yield drag may be possible, however. Our results also demonstrated good control of ECB and lodging with the Bt hybrids. In these studies, corn borer pressure was likely below average, and in general, based on yield and moisture, the use of the Bt hybrids was not economical. Over the long term, the yield response to Bt hybrids should be greater than observed in these trials. We will need to continue to evaluate these Bt hybrids over years and at later planting dates to be able to fully evaluate the potential of the Bt hybrids and economics of this technology.

References

Bessin, R. 1996. Bt corn. Entomology Factsheet 118. Department of Entomology, University of Kentucky, Lexington, Kentucky.

Farnham, D.E. and C. Pilcher. 1998. Integrated Crop Management Newsletter. 12-7-98. Iowa State University, Ames, Iowa.

Table 1. Corn grain yield, moisture, lodging and corn borer damage of Bt and non-Bt hybrids in trials conducted in Adams County PA and Warren County NJ.

County/Site	Brand	Hybrid	Yield	Moisture	Population	Lodging	ECB damage
			Bu/A	%	plants/A	%	tunnels/plant
Adams/Adams Dairy	Dekalb	618	93	25.1	24000	0	1.2
	Dekalb	618Bt	86	24.9	23500	0	0
	Sig.*		NS	NS	NS	NS	*
Adams/Brown	Novartis	4640	105	24.6	24500	0	1.2
	Novartis	4640Bt	106	25.6	25500	0	0
	Sig.		NS	NS	NS	NS	*
Adams/Oyler	Dekalb	580RR	148	17.2	26500	1.8	0.8
	Dekalb	591RRBt	148	18.8	29000	1.7	0
	Sig.		NS	NS	NS	NS	*
Adams/Hawkins	Pioneer	3260	150	18.4	24500	2	0.6
	Novartis	7369Bt	151	19.2	24500	0	0
	Sig.		NS	NS	NS	NS	*
Adams/Horst	Dekalb	595	125	23.2	24000	0	0.4
	Dekalb	595Bt	125	23.2	24000	0	0
	Sig.		NS	NS	NS	NS	NS
Adams/Souders	Dekalb	580	156	23.2	23000	13.0	2.1
	Dekalb	580Bt	152	23.6	23000	8.7	0
	Sig.		NS	NS	NS	*	*
Warren/Bilyk	Novartis	4394	156	20.0	26000	5.8	1.5
	Novartis	Max 21	122	19.8	26500	1.9	0.5
	Sig.		NS	NS	NS	*	*

*significant at the 0.10 level

Table 2. Corn grain yield, moisture, and lodging of Bt and non-Bt hybrids in trials conducted in Lebanon County, PA.

Brand	Hybrid	Yield	Moisture	Lodging
		bu/acre	%	%
Beachley Hardy	4680	168	19.2	0
Land O' Lakes	674	160	19.6	2.5
Agripro	9560	160	20.0	2.5
Pioneer	33Y09**	162	20.5	0
Doebler's	642XP	156	20.5	2.5
Novartis	Max496**	144	20.6	0
Chemgro	7036	164	20.8	2.5
Novartis	6800Bt**	156	20.9	1.0
Garst	8464	156	21.2	3.5
Pioneer	33A14**	170	21.3	0
NC+	4578	163	21.3	2
Land O' Lakes	661	160	21.4	1
Hyttest	4612	162	21.9	2.5
NC+	5697	176	22.3	0
Garst	8342	161	22.4	0

**Bt hybrid

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