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Bt corn hybrid evaluation: year 2

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Abstract
This past growing season was good for evaluating the impact of a variety of environmental factors on corn yield, such as nitrogen losses, hail damage, green snap, etc. It was not, however, a particularly good growing season for evaluating the damaging effects of European corn borer. Insect pressures were fairly light across the state. The light insect pressures coupled with the effects of one or more environmental factors made Bt hybrid evaluations challenging in 1998 (i.e., it was difficult to identify exactly what caused yield variability). Presented herein are the results from replicated field trials conducted by Iowa State University in 16 Iowa counties.

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Bt corn hybrids were provided by DEKALB GENETICS, Golden Harvest Seeds, Mycogen, Novartis Seeds, and Pioneer Hi-Bred, International. Each company also provided a non-Bt hybrid that was genetically similar to their Bt hybrid as a comparison. Placement of each pair of hybrids for comparison was based on company recommendations for those hybrids. Therefore, not every hybrid comparison was made in every county.

County plots were coordinated by ISU Extension field crop specialists, usually in cooperation with a local farmer. All hybrids were replicated 3 or 4 times in a randomized complete block design. Agronomic practices (e.g., planting date, planting rate, row spacing, fertility, harvest date, etc.) were determined by the cooperating farmer. Plots were subjected to natural infestations of European corn borer. Grain yields were mechanically collected and calculated either with a yield monitor or a weigh wagon. Corn yields were adjusted to 15.5 percent moisture.

Yield data for 1998 are shown in Table 1, below.. The average yield across the state for Bt hybrids was 162.6 bushels per acre (bu/acre), whereas the average yield for non-Bt hybrids was 159.7 bu/acre, representing a 2.9-bu/acre yield advantage for Bt hybrids in general. There are a few cautions that should be considered when interpreting these results. Although this is the second year for this type of hybrid evaluation by Iowa State University, some of the hybrids were newly introduced in 1998. Likewise, some of the hybrids may have been evaluated at only one location. It is difficult to draw any firm conclusions based on single-season, single-location data. Although progress is being made on the evaluation of this technology, this is only the second year that a large number of Bt hybrids has been available for commercial production.

It is important to remember that agronomic and environmental factors may mollify or augment the yield losses caused by European corn borer. Thus, corn borers are not the only factors that cause yield to fluctuate. This past growing season provided ample evidence of the variety of factors that may have contributed to the enhancement or deflation of corn yields, including corn borer in some areas. One take-home lesson that was evident in 1998 was the competitiveness of some Bt hybrids. The "yield drag" myth may have been dispelled in some cases. In 51 out of 84 comparisons (61 percent) the Bt hybrids outperformed their non-Bt counterparts. The data clearly show that even without corn borer pressure, Bt hybrids are capable of yielding as good if not better than their non-Bt counterparts.

We continue to promote Bt technology as an important pest management tool. Its value, however, may be questioned in years such as 1998 when corn borer pressures are low. Producers may need to view it as an insurance policy. In low-insect-pressure years, the elite hybrids yield well; in high-insect-pressure years, the protection is there.

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Table 1. Relative European corn borer injury and yields (bu/acre) from Bt and non-Bt corn hybrids in 16 Iowa counties.*

			Cal	Ced	Cla	DSM	Dub	Gru	How	Ida	Joh	Luc	Mil	Osc	Ply	Sac	Sto	Uni	Avg.
Maximum inches tunneling**			0.5	0.8	3.2	1.2	0.4	0.2	0.2	1.3	0.4	0.1	0.4	1.2	1.3	0.8	0.6	0.7	
Company	**Hybrid**	**Bt gene*****																	
Mycogen	2593	--							167.0										167.0
Mycogen	X28580	C							166.4										166.4
Mycogen	2722	--					193.7									176.0			184.9
Mycogen	X28700	C					183.5									171.8			177.7
Mycogen	7250	--										110.9						193.9	152.4
Mycogen	X28800	C										104.6						195.0	149.8
Novartis	MAX 88	C			156.9		172.7		165.6					175.9					167.8

Novartis	N64-Z4	C	141.2	200.3				128.8		169.6	192.1				193.1	175.9	164.9		170.7
Novartis	N4640	--	170.3	194.0	147.3		167.0	133.8	155.1	153.4	176.5			171.5	173.8	147.2	170.7		163.4
Novartis	N4640BT	B	165.8	193.0	148.7		169.7	134.7	160.7	164.5	179.1			169.0	175.0	148.7	153.6		163.5
Novartis	N7070	--				183.1						101.6	146.2					186.8	154.4
Novartis	N7070BT	B				186.5						90.7	148.4					192.5	154.5
Novartis	N7639Bt	B				192.3						87.6	131.2					189.3	150.1
DeKalb	DK493	--			156.3				163.7					169.7		152.7			160.6
DeKalb	DK493BtX	D			161.0				157.5					166.5		154.0			159.8
DeKalb	DK621	--	161.0	200.1		167.4	190.5	151.4		174.8	195.6	101.3	141.5		177.2		129.3	183.6	164.5
DeKalb	DK545BtY	A			167.1				165.8					185.5		160.8			169.8
DeKalb	CR8645BtY	A	182.6	196.3		176.6	187.0	143.4		172.2	191.8	107.8	139.5		172.2		152.0	173.7	166.3
Golden Harvest	H2377	--			161.1		181.0		177.8					161.5					170.4
Golden Harvest	EX8673	A			162.1		174.0		176.8					161.8					168.7
Golden Harvest	H2382	--							170.1										170.1
Golden Harvest	EX8700Bt	A							162.6										162.6
Golden Harvest	H2390	--	161.5							159.5						144.6			155.2
Golden Harvest	EX8665	A	167.9							165.6						155.1			162.9
Golden Harvest	H2478	--						146.7									131.3		139.0
Golden Harvest	EX8624	A						150.9									139.5		145.2
Golden Harvest	H2547	--		200.2							191.5								195.9
Golden Harvest	EX8478	A		188.6							188.0								188.3
Golden Harvest	H2581	--				187.0						96.7							141.9
Golden Harvest	EX8421	A				186.7						105.4							146.1
Pioneer	3751	--			151.1				170.5					159.6					160.4
Pioneer	36F30	A			157.0				176.2					168.9					167.4
Pioneer	3489	--	177.7	199.2			184.5	112.9		174.9	184.9	106.5	137.9		190.4	159.2	180.4		164.4
Pioneer	34R06	A	191.2	201.6			196.6	161.3		184.8	190.8	109.6	142.9		194.4	155.9	178.3		173.4
Pioneer	3563	--	177.8				172.8	153.8		168.4					181.0	143.3			166.2
Pioneer	35N05	A	173.0			181.7	173.8	162.0		172.7					176.6	145.7			169.4
Pioneer	3335	--		198.8							212.1	109.9	123.8					189.2	166.8
Pioneer	33A14	A		209.5		192.1					210.4	106.1	142.8					196.0	176.2
LSD 0.05			14.0	7.3	6.7	6.4	13.0		11.1	6.9	8.5	17.3	5.7	9.9	7.1		14.1	7.3	

*Calhoun, Cedar, Clay, Des Moines, Dubuque. Grundy, Howard, Ida, Johnson, Lucas, Mills, Osceola, Plymouth, Sac, Story, Union.

**Maximum inches tunneling (average) in one non-Bt hybrid.

***A = YieldGard (MON810), B = YieldGard (Bt11), C = KnockOut (176), D = BT-XTRA (DBT418)

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