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Abstract

The 2001 growing season marks the sixth year that Bt corn varieties were grown and evaluated at the Northeast Research and Demonstration Farm. *Bacillus thuringiensis*, commonly known as Bt, is a naturally occurring soil bacterium toxic to European Corn Borers (ECB) that has been genetically modified and inserted into corn hybrids. Different Bt genes and different promoters, called events, vary in their expression and subsequent level of ECB protection.

Disciplines

Agricultural Science | Agriculture

2001 Bt/NonBt Corn Variety Evaluation Study

Ken Pecinovsky, farm superintendent

Introduction

The 2001 growing season marks the sixth year that Bt corn varieties were grown and evaluated at the Northeast Research and Demonstration Farm. *Bacillus thuringiensis*, commonly known as Bt, is a naturally occurring soil bacterium toxic to European Corn Borers (ECB) that has been genetically modified and inserted into corn hybrids. Different Bt genes and different promoters, called events, vary in their expression and subsequent level of ECB protection.

Decisions by several countries and major grain buyers to not purchase genetically modified (GMO) corn hybrids or certain Bt events has drawn the mass attention of farmers and grain purchasers, especially after the release of the Starlink Bt event in the 2000 growing season.

European corn borer incidence is highly variable by year and location. In the past, crop scouting was used to determine if economic thresholds of ECB existed to justify use of insecticide applications. Bt corn and insecticide applications are not always warranted each year because of low corn borer populations, due to environmental conditions, several fungal diseases, natural enemies/predators, and parasites. Bt hybrids offer a management option for control of ECB, in which the increased cost (tech fee) of the seed corn will have to be compared to the cost and effectiveness of insecticide use after crop scouting to verify if economical damaging ECB populations are present.

Materials and Methods

The soil consisted of a Floyd, Kenyon, and Readlyn loam, with a pH of 6.7 and 3.5%

organic matter. Soil tests in 1999 reported 37.5 ppm P₂O₅ and 144.5 ppm K₂O. The experimental design was a randomized complete block with three replications, and plots were 15 by 50 feet. The 2000 crop was soybeans. Fertilization included 140 lb N/acre as anhydrous ammonia and 50 lb P²O⁵/acre and 60 lb K²O/acre deep-banded the previous fall. Tillage included a spring field cultivation. Corn varieties were planted two inches deep on May 16, 2001, at 32,454 seeds/acre in 30 inch rows. Frontier 6.0 SL was applied pre-emergent on May 19 at 32 oz/acre (1.5 lb ai/a) rate. Marksman 3.2FL was applied post-emergent on June 9 at 2.5 pt/acre (1.0 lb ai/a) rate. Stand counts were taken August 28. On September 27, six corn plants were collected from the center two rows of each corn plot and dissected for corn borer counts and inches of tunneling. Plots were machine harvested for yield on October 21.

Results and Discussion

Harvest moisture, yield@15% moisture, total borers/plant, borer tunneling (inches)/plant, and final population for the 2001 variety plot are shown in Table 1. Yearly ECB infestation levels are shown in Table 2. ECB populations were fairly low in the first generation (due to the delayed planting), but higher for the second generation. A 9.4 bushel/acre Bt corn advantage was shown when hybrids that were the same isoline were compared with and without the Bt gene.

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Table 1. Evaluation of Bt/nonBt hybrids on growth parameters and ECB insect damage, Nashua, IA.

<u>Brand-Hybrid</u>	<u>Bt/non</u>	<u>%H₂O</u>	<u>Bu/a@ 15%</u>	<u>ECB/plant</u>	<u>Tunneling/plant (in.)</u>	<u>Population</u>
GH2390	Non	20.8	182.9	1.50	1.96	30290
GH8250	Non	21.8	178.6	1.67	2.50	27467
GH2398	Non	20.6	161.7	2.17	2.18	30452
DK4815	Non	19.8	173.9	1.61	1.92	29968
DK537	Non	20.3	182.7	2.22	3.28	29605
P36B08	Non	22.0	180.0	2.17	3.54	29766
P36R10	Non	19.6	175.5	1.39	2.54	31218
P3489	Non	26.1	176.6	0.78	0.88	28475
P34B23	Non	23.0	189.9	1.95	1.53	30573
NK45T5	Non	18.8	174.4	1.89	2.83	31944
NK4640	Non	19.0	170.3	2.17	2.31	30331
NK59Q9	Non	23.0	188.2	1.22	1.39	32347
ASG508	Non	20.7	170.4	1.39	1.89	29564
GH2390	Bt	20.6	196.6	0	0	30048
GH8350	Bt	21.8	191.5	0	0	30936
GH8067	Bt	21.6	175.3	0	0	31339
P36B09	Bt	22.4	181.2	0	0	32267
P36R11	Bt	20.4	175.4	0	0	30532
P34R07	Bt	26.2	195.9	0	0	28838
P34B24	Bt	24.0	179.7	0	0	31904
DK525	Bt	20.3	208.7	0	0	28475
DK533-2	Bt	21.5	206.2	0	0	31662
NK45A6	Bt	18.8	182.1	0	0	30089
NK4640	Bt	19.3	168.9	0	0	32065
NK58-D1	Bt	23.1	196.2	0	0	32589
ASG508	Bt	21.3	193.8	0	0	32294
AVG.- LSD(Variety)		1.08	16.19	0.62	1.02	1356.1 (P=0.05)
AVG. (NonBt)		21.2a	177.3a	1.70a	2.21a	31069a
AVG. (Bt)		21.6b	188.6b	0.00b	0.00b	30191b
Bt/NonBt LSD		0.3	4.5	0.17	0.28	376.1 (P=0.05)

• = Not significant.

Table 2. Yearly ECB pressures and ECB insect damage, Nashua, IA.

<u>Year</u>	<u>Var.</u>	<u>Bu/ac</u>	<u>ECB/plant*</u>	<u>Tunneling (in.)</u>	<u>Variety</u>	<u>Bu/ac</u>	<u>ECB/plant</u>	<u>Tunneling (in.)</u>
2001	Bt	189	0	0	Non-Bt	177	1.70	2.21
2000	Bt	161	0	0	Non-Bt	153	1.53	1.71
1999	Bt	166	0	0	Non-Bt	152	2.09	3.11
1998	Bt	162	0.05	0.07	Non-Bt	157	0.46	0.51
1997	Bt	163	0.24	0.22	Non-Bt	160	1.53	1.52
1996	Bt	170	0.23	0.22	Non-Bt	167	1.57	1.20
Avg	Bt	169	0.09	0.09	Non-Bt	161	1.48	1.71

*=Several Bt events used in previous years, not expressed in entire plant for season-long control.