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Bt/nonBt Corn Variety Evaluation Study

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Abstract
The 2005 growing season marks the tenth year that Bt corn varieties were commercially 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 bores (ECB) that has been genetically modified and inserted into the corn hybrids. European corn borer incidence is highly variable by year and location. Bt seed 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 of the seed corn must be compared with the cost and effectiveness of insecticide.

Disciplines
Agricultural Science | Agriculture

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Ken Pecinovsky, farm superintendent

Introduction

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Materials and Methods

The 2004 and 2005 plot areas consisted of a Readlyn loam and Kenyon loam, respectively. Fall 2003 soil test results for the 2004 study area had a pH of 6.9, 3.5% organic matter, 27.5 ppm P_20_5 (Bray 1), and 132.0 ppm K_20. Fall 2004 soil-test results for the 2005 study area had a pH of 7.0, 3.8% organic matter, 21.5 P_20_5 (Bray 1), and 136.0 ppm K_20. A fertilizer application of 120 lb K_20/acre was spread on both areas after soil testing. The experimental design was a randomized complete block with three replications, and plots were 15 ft × 100 ft (2004) and 15 ft × 156 ft (2005). The previous crops were soybeans. Fertilization, prior to planting, included 140 lb N/acre as anhydrous ammonia. Tillage included a spring field cultivation. Corn varieties were planted 2 in. deep on May 5, 2004, and May 2, 2005, at 33,674 seeds/acre in 30-in. rows. Harness 7EC was applied preemergence at planting at 2.75 pint/acre (2.4 lb ai/acre). Marksman 3.2FL was applied postemergence on June 4, 2004, and May 30, 2005, at 2.5 pint/acre (1.0 lb ai/acre). Three corn plants were collected on October 25, 2004, and September 28, 2005, from the center two rows of each corn plot and dissected for corn borer counts and inches of tunneling. Stand counts were taken prior to harvest and plots were machine-harvested for yield on October 24,2004, and October 14, 2005.

Results and Discussion

Harvest moisture, yield at 15% moisture, total borers/plant, and borer tunneling (in.)/plant for the 2004 and 2005 variety plots are shown in Table 1. Yearly ECB infestation levels are shown in Table 2. Significant lodging did not occur in either year. ECB populations were low in 2004 with no grain moisture or yield differences. ECB populations/tunneling in 2005 was the highest on record for the 10 years of studies with Bt hybrids yielding more than nonBT. A 6.2 bushel/acre Bt corn advantage was shown when compared with the hybrids of the same isoline from 1996 through 2005.

Acknowledgments

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Table 1. Evaluation of Bt/nonBt hybrids on growth parameters and ECB insect damage, Nashua (2004–2005).

2004						2005					
Brand-Hybrid	ECB/ plant	Tunneling (in.)	%H_20	Bu/ac	Bt Adv.	Brand-Hybrid	ECB/ plant	Tunneling (in.)	%H_20	Bu/ac	Bt Adv.
Crows 2145	0.55	0.64	22.6	213.2		Crows 1702	1.78	3.69	16.3	183.4	
Crows 2148Bt	0	0	23.3	215.1	(+1.9)	Crows 1703Bt	0	0	16.5	198.9	(+15.5)
Dekalb 51-43	0.33	0.17	20.5	226.9		Crows 2133	1.67	2.78	16.9	196.5	
Dekalb 50-18Bt	0	0	20.6	230.0	(+3.1)	Crows 2114Bt	0	0	16.7	206.9	(+10.4)
Dekalb 537	0.11	0.03	21.2	208.7		Dekalb 51-43	2.00	5.78	16.8	203.2	
Dekalb 53-32Bt	0	0	21.7	210.0	(+1.3)	Dekalb 50-18Bt	0	0	17.4	216.9	(+13.7)
Dekalb 57-01	0.78	0.50	21.7	234.5		Dekalb 57-01	2.78	5.78	18.2	188.9	
Dekalb 58-78Bt	0	0	22.3	231.3	(-3.2)	Dekalb 58-78Bt	0	0	18.9	217.6	(+28.7)
Dekalb 60-15	0.22	0.17	25.4	230.8		Dekalb 60-15	0.67	1.17	21.0	227.5	
Dekalb 60-16Bt	0	0	26.3	231.7	(+0.9)	Dekalb 60-16Bt	0	0	21.4	249.2	(+21.7)
G. Harvest 7900	0.22	0.25	21.9	217.9		G. Harvest 7900	2.22	4.83	18.8	201.3	
G. Harv. 7990Bt	0	0	22.5	212.7	(-5.2)	G. Harv. 7990Bt	0	0	19.3	205.7	(+4.4)
G. Harvest 8123	0.44	0.50	22.1	206.6		G. Harvest 8123	3.11	8.67	18.0	179.5	
G. Harv. 8249Bt	0	0	22.4	213.0	(+6.4)	G. Harv. 8249Bt	0	0	18.6	195.7	(+16.2)
G. Harvest 8312	0.44	0.78	23.2	231.6		G. Harvest 8312	2.67	8.71	18.5	204.1	
G. Harv 8410Bt	0	0	23.7	222.7	(-8.9)	G. Harv 8410Bt	0	0	18.7	215.0	(+10.9)
LG Seeds 2533	0.11	0.14	22.4	248.8		LG Seeds 2533	1.44	4.89	19.4	219.7	
LG Seeds 2533Bt	0	0	24.4	246.6	(-2.2)	LG Seeds 2533Bt	0	0	20.6	230.0	(+10.4)
NK Brand 45-T5	1.22	0.78	20.8	225.8		LG Seeds 2540	2.11	4.28	19.9	220.6	
NK Brd 45-A6Bt	0	0	20.1	227.0	(+1.2)	LG Seeds 2540Bt	0	0	21.0	232.9	(+12.3)
NK Brand 60-N2	0.33	0.28	24.5	232.9		NK Brand 45-T5	3.22	7.92	17.6	197.3	
NK Brd 60-B6Bt	0	0	24.7	226.8	(-6.1)	NK Brd 45-A6Bt	0	0	17.4	219.8	(+22.5)
Pioneer 36B08	0.33	0.17	22.0	227.5		NK Brand 51-M8	2.56	6.31	17.5	190.5	
Pioneer 36B09Bt	0	0	22.5	226.3	(-1.2)	NK Brd 51-C1Bt	0	0	17.4	204.3	(+13.8)
Pioneer 34N43	0	0	24.8	231.9		NK Brand 60-N2	2.78	4.61	20.0	213.3	
Pioneer 34N44Bt	0	0	25.0	228.4	(-3.5)	NK Brd 60-B6Bt	0	0	19.7	226.6	(+13.3)
						Pioneer 36B08	2.44	4.31	19.7	199.8	
						Pioneer 36B09Bt	0	0	20.0	213.4	(+13.6)
						Pioneer 34N43	2.0	4.64	19.8	204.2	
						Pioneer 34N44Bt	0	0	19.9	229.0	(+24.8)
Avg- LSD (Var)	**0.48**	**0.52**	**1.1**	**11.0**			**1.01**	**3.23**	**0.8**	**8.7**	
Avg (nonBt)	**0.39a**	**0.34a**	**22.6 NS**	**225.9 NS**			**2.23a**	**5.22a**	**18.5NS**	**202.0b**	
Avg (Bt)	**0b**	**0b**	**23.0 NS**	**224.7 NS**			**0b**	**0b**	**18.9NS**	**217.5a**	
Bt/Non Bt-LSD	**0.15**	**0.14**	**NS**	**NS**			**0.29**	**0.91**	**NS**	**6.1**	**(P=0.05)**

Means with the same letter do not differ (P>.05).
NS = no significant difference.
LSD = least significant difference.

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

			ECB				ECB		Bt Advantage	
Year	Var.*	Bu/ac	/plant	Tunneling (in.)	Variety	Bu/ac	/plant	Tunneling (in.)	(bu/ac)	Isolines
2005	Bt	217.5	0	0	Non-Bt	202.0	2.23	5.22	(+15.5)	15
2004	Bt	224.7	0	0	Non-Bt	225.9	0.39	0.34	(-1.2)	13
2003	Bt	151.3	0	0	Non-Bt	148.2	1.13	1.68	(+3.1)	14
2002	Bt	204.4	0	0	Non-Bt	198.8	2.01	2.14	(+5.6)	13
2001	Bt	186.1	0	0	Non-Bt	176.6	1.75	2.31	(+9.5)	11
2000	Bt	160.4	0	0	Non-Bt	153.2	1.53	1.71	(+7.2)	11
1999	Bt	166.3	0	0	Non-Bt	154.1	1.87	2.75	(+12.2)	8
1998	Bt	164.8	0.03	0.04	Non-Bt	158.3	0.44	0.50	(+6.5)	13
1997	Bt	162.8	0.24	0.22	Non-Bt	160.0	1.53	1.52	(+2.8)	12
1996	Bt	167.1	0.03	0.01	Non-Bt	166.7	1.56	1.21	(+0.4)	2
Avg	Bt	180.5	0.03	0.03	Non-Bt	174.4	1.44	1.94	(+6.2)	

*Several Bt events used in previous years are not expressed in entire plants for season-long control.