

COMPARISON OF BT CORN TO NON BT USING STRIP TILLAGE AT FOUR PLANTING DATES

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ABSTRACT

This research was conducted in 1997 on a Dothan sandy loam (fine, loamy siliceous, thermic Plinthic Kandiudults) located at the North Florida Research and Education Center (NFREC), Quincy, Florida. The objectives of the study were to determine if Bt corn offers an advantage over temperate and tropical corn in late planting, to compare silage and grain yields of corn over planting dates and to monitor insect pressure of corn at each planting date. Tropical corn gave satisfactory grain and silage yield, but grain yield dropped significantly after 15 May. Temperate corn was devastated by insects in June and July planting as compared to Bt and tropical corn. Yields of Bt corn silage and grain were lower at later planting probably due to diseases rather than insects, but this hybrid showed potential for late planting as compared to temperate corn. Tropical corn had more insect damage than Bt corn did but less disease, which allowed the tropical to grow to maturity.

INTRODUCTION

The Southeast imports more than 50% of grain used by livestock from the Midwest. Farmers need corn varieties that could be planted until 15 June to take advantage of weather, to allow double cropping after wheat, winter grazing and winter vegetables and to have resistance to insects and diseases. Corn is planted in Florida from 15 February to 15 April, at which time it is discontinued due to fall armyworms, corn earworm and diseases (rust, leaf blight). Having a wide planting window would allow better use of silage and grain storage, better utilization of planting and harvest equipment, spreading of labor to slower periods, better utilization of land and irrigation by multi-cropping and longer use of winter forages. Tropical corn has some insect tolerance, generally good shuck coverage and good disease resistance. Hybrids that are full season (125 days) usually yield better and have better disease resistance and better shuck coverage as is found in tropical corn. Bt corn would be useful for insect control for late plantings.

Corn is recognized as the "queen" of silage crops because it is energy-rich for cattle and has high tonnage and high proportions of digestible nutrients and structural car-

bohydrates needed to maintain desired rumen function in high producing dairy animals (Johnson, 1991). It can be consistently harvested and stored with only minimal loss of nutrients and dry matter. Corn is an outstanding, dependable crop when grown under irrigation when planted early in the deep South and is very adaptable to harvesting by mechanical systems.

Wright et al. (1991) showed that temperate corn planted in early spring yielded more than tropical hybrids in both grain and silage. As planting dates were delayed, more reliable silage and grain yield were obtained from tropical hybrids because of better tolerance to insects and disease (Wright et al., 1991). Corn developed in the tropics is naturally more resistant to insect and disease (Martin, 1991) than corn developed in temperate regions.

Fall armyworm [*Spodoptera frugiperda* (J. E. Smith)] (Sprenkel, 1991) and corn earworm [*Helicoverpa zea*] (Anderson and Linker, 1991) are among the most common insects in corn and have the potential to adversely affect yields (especially late-planted crops). High non-economical rates of insecticides are needed to control fall armyworms because the larvae feed in the whorl or in the ear. Research has shown that it is possible to avoid fall armyworm damage by early planting (Teare et al., 1991).

The objectives of the study were 1) to determine if Bt corn offers an advantage over temperate and tropical corn in late planting and 2) to compare silage and grain yields of corn over planting dates and to monitor insect pressure of corn at each planting date.

MATERIALS AND METHODS

The experiment was conducted in 1997 on a Dothan sandy loam (fine, loamy siliceous, thermic Plinthic Kandiudults) at the North Florida Research and Education Center, Quincy, Florida. Three varieties of Pioneer corn were used to plant in the strip tillage: 3098 (tropical corn), 31B13 (Bt corn) and 3223 (temperate corn). Corn was planted 21 April, 15 May, 16 June and 7 July. Prior to planting, rows were ripped with a Ro-till implement, and the entire study was broadcast sprayed with Roundup Ultra at 1 qt/acre + Induce at 2 qt/100 gal of water. Fertilizer was broadcast applied at 500 lb/acre of 5-10-15 before planting. All three varieties were planted with a cone planter at 24,000 plants/acre with the application of Thimet 15 G. Corn was broadcast sprayed with atrazine at 1 qt/acre when it was 5 in. tall and side-dressed with 450 lb/acre of 34-0-

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0 when corn was 12 in. tall. Corn was harvested for silage with a Hesston silage chopper, and the yields were adjusted to 35% DM. Corn for grain was hand harvested, weighed and adjusted to 15.5% moisture.

Data were analyzed using by analysis of a variance procedure (SAS, 1989), and means were separated using Fisher's Least Significant Difference Test at the 5% probability level.

RESULTS

Total fall armyworm larvae in the whorl was lower for Pioneer 31B13 (Bt corn) on all dates measured than for Pioneer 3223 (temperate corn) and Pioneer 3098 (tropical corn) (Table 1). The highest average number of fall armyworms was recorded for 16 June and 7 July, and Pioneer 3223 had the highest population of the hybrids. The number of fall armyworms did not differ among corn hybrids planted 15 May. Whorl injury was highest for Pioneer 3223 as compared to Pioneer 3098 and Pioneer 31B13 for all planting dates, with the highest injury on corn planted 16 June and 7 July (Table 3).

Total population of larvae in corn ears is shown in Table 2. There was not a significant difference for total larvae in the ear for hybrids planted 21 April. The larvae population was lower for Bt corn than for tropical corn planted 15 May. For the 16 June planting date, the Bt corn had more larvae in the ears than the other two hybrids. For the 7 July planting date, the Bt corn had fewer larvae than the temperate hybrid.

Silage yields of corn are shown in Table 4. The yields of Pioneer 3098 were not significantly different at the 5% probability level for all four planting dates. Pioneer 31B13 silage yields were highest planted 15 May as compared to corn planted before or after this date. The yields dropped significantly for Pioneer 3223 if planted after 15 May. There was not a significant difference for the silage yields for the first planting date (21 April). The yields were higher for tropical corn and Bt corn when compared to temperate corn planted 15 May. For corn planted 16 June and 7 July, the yields were higher for Pioneer 3098 than for Pioneer 31B13 or Pioneer 3223.

Grain yields of corn are shown in Table 5. The yields of Pioneer 3098 were significantly higher planted 21 April and 15 May as compared to the 16 June and 7 July planting. Pioneer 31B13 planted 21 April yielded more grain than 15 May, 16 June and 7 July planting dates. Yields of

Pioneer 3223 corn were higher when planted 21 April than when planted 15 May, 16 June and 7 July. There was not a significant difference among hybrids for grain yield when planted 21 April. Higher yields were obtained for tropical corn and Bt corn than for temperate corn when planted 15 May. Grain yields were significantly lower when planted 16 June. The highest yielding hybrid for this planting date was Pioneer 3098, which was greater than Pioneer 31B13 which was greater than Pioneer 3223. If the last planting is compared, higher yields occurred from tropical corn than Bt corn or temperate corn.

SUMMARY

Tropical corn gave satisfactory silage yield until early July, while grain yield dropped significantly after mid-May plantings. Temperate corn was devastated by insects in June and July planting as compared to Bt and tropical corn. Yield of Bt corn silage and grain was lower at later planting dates, largely due to diseases rather than insects, but this hybrid showed potential for late planting as compared to temperate corn. Bt hybrids had less insect damage than tropical hybrids and as later maturity hybrids are developed with good disease tolerance, satisfactory late plantings may be made.

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Table 1. Total larvae of fall armyworm in the whorl at NFREC, Quincy, FL in 1997.

Planting Date	Corn hybrid			Avg.	LSD _(0.05)
	Pioneer 3098 (tropical)	Pioneer 31B13 (Bt)	Pioneer 3223 (temperate)		
	-----number larvae per plant-----				
April 21	0.25	0.03	0.23	0.17	0.158
May 15	0.15	0.06	0.21	0.14	NS *
June 16	2.16	1.73	4.59	2.83	0.812
July 7	1.03	0.90	6.31	2.75	0.955
Avg.	0.90	0.68	2.83	0.95	
LSD _(0.05)	0.386	0.686	0.781		

* NS - not significantly different at 5% probability level

Table 2. Total larvae in the ear at NFREC, Quincy, FL in 1997.

Planting Date	Corn hybrid			Avg.	LSD _(0.05)
	Pioneer 3098 (tropical)	Pioneer 31B13 (Bt)	Pioneer 3223 (temperate)		
	-----number larvae per plant-----				
April 21	1.26	2.06	1.29	1.54	NS *
May 15	0.29	0.14	0.09	0.17	0.108
June 16	1.30	2.69	1.39	1.79	0.670
July 7	0.78	1.88	3.28	1.98	0.390
Avg.	0.91	1.69	1.51	1.37	
LSD _(0.05)	0.315	0.777	0.433		

* NS - not significantly different at 5% probability level

Table 3. Percent whorl injury on corn at NFREC, Quincy, FL in 1997.

Planting Date	Corn hybrid			Avg.	LSD _(0.05)
	Pioneer 3098 (tropical)	Pioneer 31B13 (Bt)	Pioneer 3223 (temperate)		
	-----%-----				
April 21	15.0	0.30	24.4	13.2	15.70
May 15	33.1	6.12	51.2	29.5	23.53
June 16	68.0	12.7	86.4	55.7	8.48
July 7	87.0	58.9	96.2	80.7	13.50
Avg.	50.3	19.5	64.5	44.8	
LSD _(0.05)	16.30	6.58	16.29		

Table 4. Silage yields of three corn hybrids over four planting dates at NFREC, Quincy, FL in 1997.

Planting Date	Corn hybrid			Avg.	LSD _(0.05)
	Pioneer 3098 (tropical)	Pioneer 31B13 (Bt)	Pioneer 3223 (temperate)		
	-----T/acre-----				
April 21	17.2	16.2	15.9	16.4	NS *
May 15	22.0	18.9	15.2	18.7	4.64
June 16	19.8	13.2	6.0	13.0	2.89
July 7	16.7	9.2	4.4	10.1	1.20
Avg.	18.9	14.4	10.4	14.6	
LSD _(0.05)	NS	1.57	2.13		

LSD_(0.05) for planting date 1.53 LSD_(0.05) for corn hybrid 1.32

LSD_(0.05) for planting date x corn hybrid 2.65

* NS - not significantly different at 5% probability level

Table 5. Grain yields of three corn hybrids over four planting dates at NFREC, Quincy, FL in 1997.

Planting Date	Corn hybrid			Avg.	LSD _(0.05)
	Pioneer 3098 (tropical)	Pioneer 31B13 (Bt)	Pioneer 3223 (temperate)		
	-----bu/acre-----				
April 21	133.3	129.9	122.2	128.5	NS *
May 15	127.3	107.8	82.5	105.9	4.64
June 16	83.5	46.1	7.9	45.9	2.89
July 7	87.5	42.7	3.6	44.6	1.20
Avg.	107.9	81.6	54.1	81.2	
LSD _(0.05)	14.9	16.8	15.0		

LSD_(0.05) for planting date 8.00 LSD_(0.05) for corn hybrid 6.93

LSD_(0.05) for planting date x corn hybrid 13.85

* NS - not significantly different at 5% probability level