Silage Comparisons of Tropical and Temperate Corn at Four Planting Dates for Multiple Cropping Systems

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ABSTRACT

Tropical corn *(Zea mays* L.) offers a silage or grain crop other than legume crops (soybean, peanuts) that may be planted after winter grains or vegetables. Rotation and the need for grain and silage in the Southeast make tropical corn an attractive alternative to legumes. A study was initiated in 1990 to determine silage and grain yields of a tropical corn (Pioneer Brand X304C in comparison with a temperate corn (Sunbelt 1876) planted on four dates (12April, 16 May, 15 June, 13 July) grown on a Norfolk sandy loam soil (fine-loamy, siliceous, thermic, Typic Kandiudult). Rainfall during the 1990 season was less than half of normal, resulting in lower silage and grain yields than might be expected. Grain yields were reduced by a larger factor than were silage yields. Grain and silage yields were better from the temperate hybrid planted in April than from the tropical hybrid. Plantings made a month later, out of the normally recommended corn planting season, resulted in a drastically reduced silage yield for the temperate hybrid. Tropical corn silage yield dropped slightly from later plantings but remained much higher than the temperate hybrid. Later plantings of temperate corn continued to show a drop in silage yield while there was no significant drop in silage yield for the tropical hybrid. This data would indicate that tropical corn could be grown successfully for silage in multicropping systems and should be used when corn is desired to be grown outside of the normal corn planting season.

INTRODUCTION

Cropping system studies and farmer experience have shown that tropical corn fits well into current cropping systems and may replace soybeans in the wheat no-till soybeans system for rotation (Wright et al., (1990). Only a few thousand acres of tropical corn were grown in the mid to late 1970s and early 1980s as a late silage crop after an early silage crop of temperate corn in Florida. As research efforts focused on not only silage but grain production in the mid 1980s, many growers began looking at tropical corn as a potential grain crop for rotation with peanuts and soybeans. Acreage increased from a few thousand acres to over 40,000 acres in 1990. Dairies and grain producers all over the South are trying tropical corn to see where it fits into their operation, especially after winter grazing. Additional work is being done on tropical corn for silage (Overman and Gallaher, 1989; Bustillo and Gallaher, 1989) and grain (Wright and Chambliss, 1989).

Management of tropical corn, with a few exceptions, is very similar to management of temperate corn (Teare et al., 1990). Tropical corn insect and disease resistance is much better than that of temperate corn (Wright and Prichard, 1998). Recent research in Florida has shown that it is possible to manage around insects (Wright et al., 1990; Teare et al., 1990) by early or late planting. Future research will focus on use of biological control agents and timely pesticide applications. Limited data have been collected regarding insect damage, and much more work is needed in this area.

Silage yield and quality are very important factors for dairy farmers to know when selecting corn hybrids. Most corn trials measure grain yields, grain quality, lodging, shuck coverage, ear height and maturity. The few silage trials run usually have a limited number of hybrids, and few quality factors, such as digestibility, are determined. Silage studies require more time, equipment and money for labor and sample analysis than grain trials. Gipson et al. (1990), in a corn silage trial in Georgia, showed about a 30% difference in digestibility of grain, 13% digestibility difference in the fodder and 25% difference in silage yields in a trial with 25 different temperate hybrids. These types of differences between hybrids could mean a substantial savings or increase in milk production for dairymen if information on hybrids were available. It was noted by Ippersiel et al. (1989) that little published information was available on the effect that cultural practices have on silage quality. Most of the data available on quality

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relates to grain (Williams et al., 1984, Myer et al., 1990) Wright et al. (1987) showed a 25% difference in grain protein level among temperate hybrids in a hybrid trial. There are limited data on management effects on corn silage yield and quality.

Many new tropical corn hybrids are being evaluated for silage yield and quality as well as grain yield and other agronomic characteristics. Many Southern states are beginning to work with tropical corn and systems of adaption. Gipson et al. (1990) pointed out that the most desirable silage corn should have high fodder digestibility with a grain content of 40% or less to prevent acidosis in the rumen and to maintain high silage intake. Most of our mid-season temperate hybrids have a grain component amounting to almost 50% of the silage while tropicals tend to have less grain in relation to fodder.

The objective of the study was to evaluate tropical corn for silage yield at four summer planting dates compared with temperate corn.

MATERIALS AND METHODS

Pioneer Brand X304C (a tropical hybrid) and Sunbelt 1876 (a hybrid temperate corn) were planted at four planting dates shown in Table 1 on a Norfolk sandy loam soil (fine-loamy, siliceous, thermic, Typic Kandiudult). Fertilization, herbicide rates and dates of application are also shown in Table 1. All plots were grown during 1990 under rainfed conditions. Each plot contained eight rows 25 ft long so that grain and silage yield could both be determined. Both hybrids were planted at 24,000 plants/acre and thinned back to 20,000 plants. Date of 50% tassel emergence was determined for each hybrid and planting date. Plant and ear heights were measured approximately one week prior to cutting corn for silage. Lodging percentage was determined approximately one week prior to grain harvest. Each hybrid at each planting date was evaluated for insect injury, and no insecticide applications were made for foliage-feeding insects.

RESULTS AND DISCUSSION

Tropical corn (Pioneer X304C was compared to a full-season temperate hybrid (Sunbelt 1876) over four planting dates for both silage and grain. The mid-April date is at the last of the recommended planting period for temperate hybrids. The period of May 15 to June 10 has been recommended to growers in north Florida who are planting tropical corn after winter grazing or small grain for grain. Table 2 shows the average rainfall normally received during the April through October period. The 1990 rainfall during this period was less than half of normal. Tropical corn planted in mid to late May would be silking and tasseling by mid-July and would normally receive another eight weeks of abundant rainfall before drying off in mid to late September.

Figure 1 graphically illustrates rainfall in relation to planting, tassel dates and grain harvest. Tassel dates are closer than planting dates and harvest dates except for the last planting date, which was maturing in the short, cool days of fall. Silage and grain yields from the April planting (Table 3) show the benefit of more timely rains that were received in June, July and August. Silage yields of both the temperate and tropical hybrids were best from the April planting.

These data also indicate that when corn is planted in mid-April for either grain or silage, tem-

Table 1. Dates and rates of activities of each planting date.

	Planting Dates			
Activity	April 12	May 16	June 15	July 13
Emergence Date	9/18	5/21	6/20	7/17
Fertilizer	500 lb 3/9/18-9/11	500 lb 3/9/18-5/7	500 lb 3/9/18-6/19	500 lb 3/9/18-7/16
Thinned to 20,000 pl/acre	5/1	5/30	6/26	7/23
Aatrex and Lasso	9/25 (Aatrex & Lasso)	5/30 (Aatrex & Lasso)	6/28 (Aatrex & Lasso)	7/23 (Atrazine & Lasso)
Accent	5/22	6/5	6/25	7/27
50% Tasseling Date	6/14 Sunbelt 1876 6/18 Pioneer X304C	7/12 Sunbelt 1876 7/15 Pioneer X304C	8/13 Sunbelt 1876 8/17 Pioneer X304C	9/5 Sunbelt 1876 9/7 Pioneer X304C
100 lb/acre N applied	5/2	6/9	6/27	7/25
Pl. ht. and Ear ht.	8/2	8/2	9/6	9/26
% Lodged	8/28	9/6	9/25	11/5
Silage harvest	8/8	8/17	9/14	10/12
Grain harvested	8/31	9/17	10/3	11/19

perate hybrids may be preferred. However, by mid-May silage and grain yields were significantly lower from both hybrids. The tropical hybrid produced approximately 5 tons more silage than did the temperate hybrid but had similar grain yield. Grain yields should be much higher than reported for 1990 in a normal rainfall year (Teare et al., 1990).

The June 15 planting date resulted in a severe drop in both silage and grain yield of the temperate hybrid, but no significant drop was noted for the tropical corn silage or grain yield. Insect damage (not reported here) was much more severe on the temperate hybrid than on the tropical hybrid. Silage yields were almost 8 tons/acre better at this planting date for the tropical hybrid as compared to the temperate hybrid. Mid-July plantings were essentially no different from mid-June plantings. However, insect pressure may have been less because insect numbers seem to level off late in the season when temperatures become cooler. Moisture deficiencies often affect grain yields more than fodder yields because the vegetative stage of growth is longer than the grain fill period and short-term drought may reduce tonnage of silage very little.

Table 2. Rainfall In north Florida durlng the growing season of this study.

Month	20-Year Average Precip.	1990 Rainfall
	in.	in.
April	4.9	2.2
May	4.3	2.0
June	5.2	3.5
July	6.9	3.5
Aug	5.8	3.4
Sep	5.0	0.6
Oct	2.5	0.9
Total	34.6	16.1

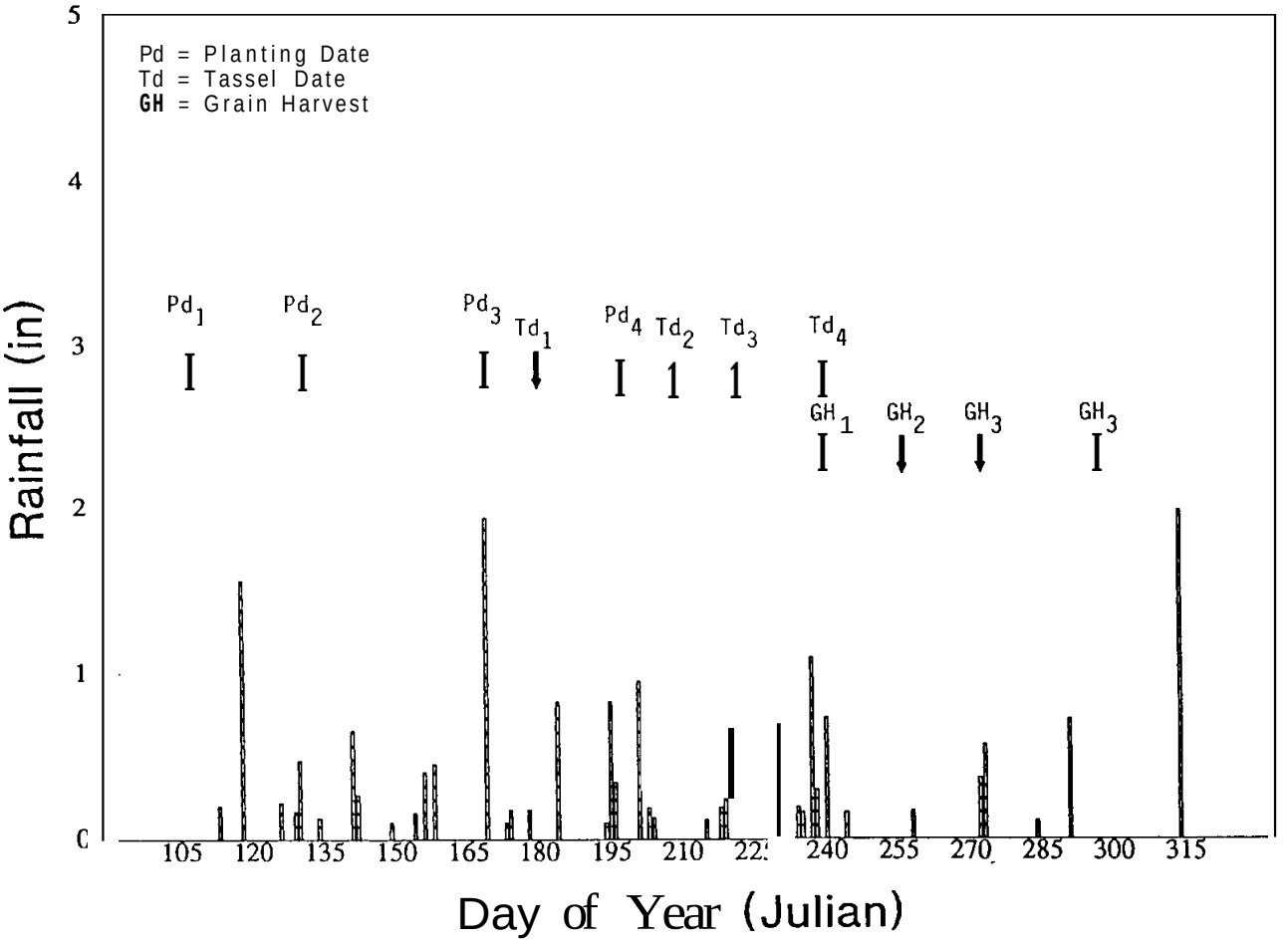

Fig. 1. Rainfall, planting dates, 50% tassel dates and grain harvest dates for the 1990 growing season.

Tabla 3. Comparison of rainfed temperate vs tropical corn silage and grain yields overseveral planting date8 in ● dry year, Quincy, Florida, 1990.

Planting date	Tropical Pioneer 304C			Temperate Sunbelt 1876		
	Wet wt.	Dry wt.	Grain yield	Wet wt.	Dry wt.	Grain yield
	lb/acre	lb/acre	bu/acre	lb/acre	lb/acre	bu/acre
April 12	36017 a'	18222 a	45	38175 a	21534 a	68
May 16	28643 b	12668 b	23	19040 b	9044 b	26
June 15	27221 b	10586 bc	35	12964 c	5090 c	8
July 13	22170 b	8094 c	38	14200 bc	4869 c	19

'Means in a column followed by different letters are statistically different at the 5% level of probability according to Duncan's Multiple Range Test.

CONCLUSION

These results indicate that corn plantings made in the recommended period for temperate corn should be made with temperate hybrids because silage and grain yields will probably be higher than for tropical hybrids. As planting dates are delayed because of multiple crops, the tropical corn hybrids should be planted to obtain a higher and more consistent silage or grain yield. There are other tropical hybrids that have yielded more silage and have almost doubled the grain yield over Pioneer X304C (Wright, unpublished data). As better tropical hybrids are identified, farmers may double crop more corn with varied winter crops. Plantings should be made as early as possible after winter crops are harvested since later plantings have more insect damage. Several years of research have shown that tropical corn can be planted no-till into almost any previous crop stubble successfully. Mid- and la-e summer plantings of temperate corn are normally unsuccessful because of severe insect and disease problems. Tropical corn is not immune to these problems, but it has some resistance and can produce acceptable silage or grain yields when planted during May and early June without insecticide applications.

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