

Forage Research in Texas

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Response of Experimental Bermudagrass Hybrids and Cultivars to Defoliation Frequency

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ABSTRACT

Eight Oklahoma bermudagrass hybrids not previously tested in replicated plots were evaluated beginning in 1981. Harvests were made at 3, 6 and 9 weeks frequency or ages at harvest. At least two hybrids were equal to Coastal in dry matter production and followed approximately the same response pattern as Coastal to frequency of harvest.

INTRODUCTION

More than 80 bermudagrass hybrids developed by the Oklahoma Agricultural Experiment Station have been screened for growth characteristics and forage quality. In the continuing search for hybrids with an acceptable combination of forage quality, winter hardiness, sod density and productivity, the hybrids with the best apparent combinations of these characteristics were tested further in a quantified yield test.

MATERIALS AND METHODS

A test was sprigged in July 1979 involving eight previously untested Oklahoma hybrids, two limpograsses, four standard cultivars (Coastal, Tifton 44, Callie, and Brazos), and 72-77 (a Burton hybrid with superior forage quality). The limpograsses and one Oklahoma hybrid (71-x-11-15) did not become established. Because of weed competition in 1979 and an extended drought period in 1980, the experiment was not harvested until 1981. Main plots were 18 feet wide and 20 feet long surrounded by an 8-foot alley maintained free of vegetation chemically. Each main plot was divided into 3 subplots, each 6 x 20 feet, for harvesting at 3, 6 and 9-week intervals. The main plots were randomized within each of 4 replications. There were 7, 4 and 3 harvests, and 9, 5 and 4 harvests at 3, 6 and 9 weeks of age in 1981 and 1982, respec-

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tively. The plots were fertilized at the rate of 80-00 in early April and 60-0-0 about June 1 and August 1 each in 1981 and 1982, and 100-0-0 each on April 26 and June 23, 1983. No irrigation water was applied during the study.

RESULTS

Forage yield data for 1981 are shown in Table 1. Average yields ranged from less than 5 tons per acre to more than 7 tons per acre. There were at least four individual cultivar-age combinations that exceeded 8 tons per acre. Coastal had the highest yield though not significantly different to Brazos and three Oklahoma hybrids. In general less frequent harvesting results in increased production.

However, in 1981 maximum yield was at the 6-week harvest frequency. Only one cultivar (LCB-11-13) had a higher yield at 9 weeks than at 6 weeks. Brazos showed less of a pattern with age than did most of the cultivars. Rainfall was very high in the spring and early summer of 1981 and harvests could not always be made on schedule. Thus, both the amount of rainfall and some failure in following the specified harvest schedule may have influenced the response to harvest frequency.

Forage yield data for 1982 are shown in Table 2. Average yields ranged from 3.4 tons to over 8 tons per acre. Brazos and Tifton 44 produced significantly less forage than Coastal, and Callie was the lowest yielding entry in the test. There was no difference in yield among the top 5 cultivars. LCB-11-6, the highest yielding cultivar in 1982, was the lowest yielding in 1981. LCB-6-18 was near the top both years and did not differ from Coastal in either year. Entry 72-77 performed very well in 1981 but was near the bottom in 1982. The yield of 72-77 in an earlier test was not outstanding but its quality was exceptional.

Yield increased with each increase in age at harvest in 1982. It is assumed that quality will decrease with advancing age. However, this study is being conducted, in part, to determine if all cultivars respond the same to advancing age.

Yields increased as time between cuttings increased in 1983 (Table 3), each three-week delay in cutting resulting in a 2000-pound increase in total yield for the season. The range in cultivar yields was approximately 5,000 pounds, LCB-11-6 which was the lowest yielding variety in 1981 producing the most dry matter in 1983.

Mean yields for the three years are shown in Table 4. Coastal had the highest average yield and Callie the lowest average yield. Brazos and Tifton 44 averaged about one ton less than

Coastal but did not differ significantly from Coastal. Two Oklahoma hybrids (LCB-6-18 and 71-x-3-6) produced essentially the same as Coastal and several did not differ significantly from Coastal. Further evaluations based on forage quality, quality patterns, sod density and persistence will determine whether they have any value. The three-year average yield response to age at harvest is shown more clearly in Figure 1a than in Table 4. The cultivar x age interaction approached significance ($p = 0.061$). All of the sources increased in yield between 3 and 6 weeks age at harvest but Brazos was the only source that increased between 6 and 9 weeks of age, and Coastal actually decreased to some extent. All of the sources except Brazos and LCB-11-13 increased in yield between 3 and 6 weeks of age in 1981 (Figure 2) and then decreased sharply between 6 and 9 weeks of age. Brazos produced the same at 3 and 6 weeks of age but decreased at 9 weeks of age. In 1983 all sources increased in yield from 3 to 9 weeks of age. Thus, the 3-year average yields for 9 weeks of age generally include a year in which 9-week yields were lower than 6-week yields and a year in which 9 week yields were higher than 6 week yields.

Forage quality (in vitro digestible dry matter) is shown for each harvest in 1981 in Table 5. Three-week old forage was generally quite high in digestibility and there was no major decline in the summer. Actually, two summer harvests were missed because of excessive rainfall between mid-May and mid-July. If those harvests had been made, more of a seasonal pattern may have been evident. Cultivars averaged across harvest dates and harvest ages showed a range of eight digestibility units with LCB-6-10 having the highest value (60.4%) and Coastal the lowest (52.5%).

The interaction of cultivars with age at harvest for IVDMD is shown in Figure 1b and was significant at the .05 level. Three cultivars (hybrids) showed a near linear decrease in digestibility from 3 weeks of age to 9 weeks of age (Coastal, LCB-11-6, 71-x-3-6). LCB-11-13 decreased slowly from 3 to 6 weeks of age and then decreased rapidly to 9 weeks of age. Four of the cultivars showed a quadratic response to age, decreasing rapidly from 3 to 6 weeks of age with little further decline to 9 weeks of age. These included Brazos and Tifton 44. These response patterns do not appear to be related to yield response to age at harvest in 1981 (Table 1). LCB-11-6 remained fairly stable over the range of 3 to 6 weeks of age which would appear to be a desirable trait if this pattern persists. On the other hand LCB-6-10 had as good quality forage as LCB-11-6 at six weeks of age though it had decreased between 3 and 6 weeks of age. LCB-6-10 would appear to be superior over a wide range of ages because of its high quality in the young stage and its relatively acceptable stabilized quality at advanced ages. However, LCB-6-10 was at the low end of yields of the hybrids in this study.

Table 1. Forage yield of bermudagrass hybrids and cultivars cut of different ages, 1981

Cultivar	-----Age (weeks)-----			Average
	3	6	9	
	pounds dry forage per acre			
LCB-6-10	10,660	13,990	7,170	10,607 g ¹
LCB-6-18	13,000	16,165	12,940	14,035 abc
LCB-6-35	9,860	12,640	10,130	10,880 efg
LCB-11-6	7,940	11,290	9,660	9,630 g
LCB-11-13	9,000	10,630	12,280	10,640 fg
71-x-3-6	12,860	16,500	12,315	13,890 abc
72-77	12,030	14,075	12,750	12,950 bcd
Coastal	16,250	16,215	12,485	14,980 a
Callie	10,750	13,910	11,700	12,120 def
Tifton 44	12,430	14,070	10,960	12,490 cde
Brazos	14,690	14,560	13,620	14,290 ab
71-x-9-6	12,550	18,290	12,795	14,545 ab
Average	11,860 b	14,360 a	11,570 b	

¹ Average values in the same line or column followed by a common letter are not significantly different ($P < 0.05$).

Table 2. Forage yield of bermudagrass hybrids and cultivars cut of different ages, 1982

Cultivar	-----Age (weeks)-----			Average
	3	6	9	
	pounds dry forage per acre			
LCB-6-10	7,930	11,510	14,320	11,250 bc ¹
LCB-6-18	11,010	15,660	18,360	15,010 a
LCB-6-35	9,205	13,050	13,760	12,005 b
LCB-11-6	12,430	17,420	18,580	16,140 a
LCB-11-13	11,120	17,320	16,130	14,860 a
71-x-3-6	11,670	14,020	18,770	14,820 a
72-77	6,340	9,640	13,070	9,680 c
Coastal	13,770	16,700	16,560	15,680 a
Callie	5,775	6,930	7,490	6,730 d
Tifton 44	9,475	13,710	14,320	12,500 b
Brazos	8,590	12,120	15,650	12,120 b
71-x-9-6	8,840	13,630	14,870	12,450 b
Average	9,800 c	13,480 b	15,175 a	

¹ Average values in the same line or column followed by a common letter are not significantly different ($P < 0.05$).

Table 3. Forage yield of bermudagrass hybrids and cultivars cut at different ages, 1983

Cultivar	-----Age (weeks)-----			Average
	3	6	9	
pounds dry forage per acre				
LCB-11-6	11046	17164	18380	15530 a ¹
LCB-11-13	13596	14428	15422	14482 a-b
LCB-6-18	12781	15238	15173	14397 a-b
71-x-3-6	10325	15803	16257	14128 a-b
LCB-6-10	8165	14516	18894	13858 a-c
Coastal	12574	12831	14232	13212 a-d
71-x-9-6	12400	10585	15741	12909 b-d
72-77	11476	12412	14301	12730 b-d
LCB-G-35	11658	11058	13767	12161 b-d
Tifton 44	9918	11717	13162	11599 c-d
Brazos	8668	10536	13821	11008 d
Callie	9567	9950	12324	10709 d
Average	11045 a	13020 b	15123 c	

¹ Average values in the same line or column followed by a common letter are not significantly different ($P < 0.05$).

Table 4. Forage yields of bermudagrass hybrids and cultivars cut at different ages, 1981-83

Hybrid or Cultivar	-----Age (weeks)-----			Average
	3	6	9	
	pounds dry forage per acre			
Coastal	14198	15250	14424	14624 a
LCB-6-18	12264	15686	15491	14480 a-b
71-x-3-6	11612	15450	15779	14280 a-b
LCB-11-6	10472	15291	15540	13768 a-b
LCB-11-13	11239	14126	14577	13314 a-b
71-x-9-6	11263	14168	14467	13309 a-b
Brazos	10649	12425	14364	12479 a-b
Tifton 44	10606	13166	12814	12195 a-b
LCB-6-10	8918	13339	13461	11906 b-c
72-77	9949	12044	13374	11789 b-c
LCB-6-35	10239	12249	12552	11680 b-c
Callie	8696	10263	10505	9821 c
Average	10842 b	13788 a	13946 a	

Average yields in a column or line followed by a common letter are not significantly different ($P < 0.05$).

Table 5. The effect of cultivar and age on bermudagrass forage digestibility (IVDDM) College Station, 1981

Cultivar or Hybrid	% IVDDM								Cultivar Average
	4/29	5/19	7/21	8/11	9/7	9/22	10/20	11/5	
3 week frequency									
1 LCB6-10	62.0	68.7		63.0	68.1	66.6	66.1	65.7 a	60.4
2 LCB-6-8	61.4	67.7		64.0	67.5	66.3	62.6	64.8 a	58.6
3 LCB-G-35	65.7	64.7		61.3	61.4	62.8	65.2	63.5 a-b	59.0
4 LCB-11-6	64.0	68.3		64.5	63.6	63.5	64.1	64.7 a	59.1
5 LCB-11-13	64.4	64.4		59.5	64.0	61.9	60.5	62.8 a-b	59.1
6 71-x-3-6	55.7	63.3		65.1	64.8	59.2	56.3	59.6 c-d	52.7
8 72-77	67.0	66.5		63.1	66.5	65.7	62.7	65.2 a	59.2
9 Coastal	57.9	63.9		56.4	57.6	53.8	56.4	57.9 c-d	52.5
10 Collie	60.4	68.1		63.0	67.6	61.4	59.9	63.2 a-b	57.0
11 Tifton 44	61.4	61.4		58.8	60.8	48.8	53.8	57.5 d	53.7
12 Brazos	59.3	64.5		60.1	65.6	57.7	56.2	60.6 b-c	54.8
15 71-x-9-6	62.2	68.4		61.9	64.4	57.6	61.3	62.6 a-b	56.9
6 week frequency									
1 LCB6-10	63.0				60.1		57.2	54.3	58.6 a
2 LCB-6-10	55.8				61.6		53.9	52.9	56.0 b
3 LCB-G-35	61.6				59.1		57.6	56.9	58.8 a
4 LCB-11-6	58.3				62.9		57.1	60.6	59.7 a
5 LCB-11-13	65.4				62.4		54.2	57.7	59.9 a
6 71-x-3-6	54.3				57.3		51.0	52.4	53.8 b-d
8 72-77	55.0				63.1		50.5	54.9	55.9 b
9 Coastal	52.1				52.2		51.7	56.8	53.2 b-d
10 Collie	62.0				57.9		52.6	50.1	55.2 b-c
11 Tifton 44	54.4				49.8		55.4	52.1	52.9 c-d
12 Brazos	51.0				59.5		50.1	47.1	51.9 d
15 71-x-9-6	58.5				56.1		55.6	52.9	55.8 b

Table 5 (Cont'd). The effect of cultivar and age on bermudagrass forage digestibility (IVDDM) College Station, 1981

Cultivar or Hybrid	IVDDM							Cultivar Average
	4/29	5/19	7/21	8/11	9/7	9/22	10/20	
	9 week frequency							
1 LCB6-10			53.1			54.1	63.1	56.8 a
2 LCB-6-8			47.6			56.1	60.9	54.9 a-b
3 LCB-G-35			41.1			56.3	60.8	52.7 a-c
4 LCB-11-6			46.8			51.4	60.7	53.0 a-c
5 LCB-11-13			47.8			57.9	58.3	54.7 a-b
6 71-x-3-6			41.2			49.3	51.4	47.3 d
8 72-77			51.7			57.0	61.1	56.6 a
9 Coastal			40.7			43.9	54.7	46.4 a
10 Collie			48.9			55.7	52.8	52.5 b-c
11 Tifton 44			45.1			50.2	57.1	50.8 c-d
12 Brazos			44.9			54.9	56.0	51.9 c-d
15 71-x-9-6			43.7			54.5	57.7	52.3 b-c

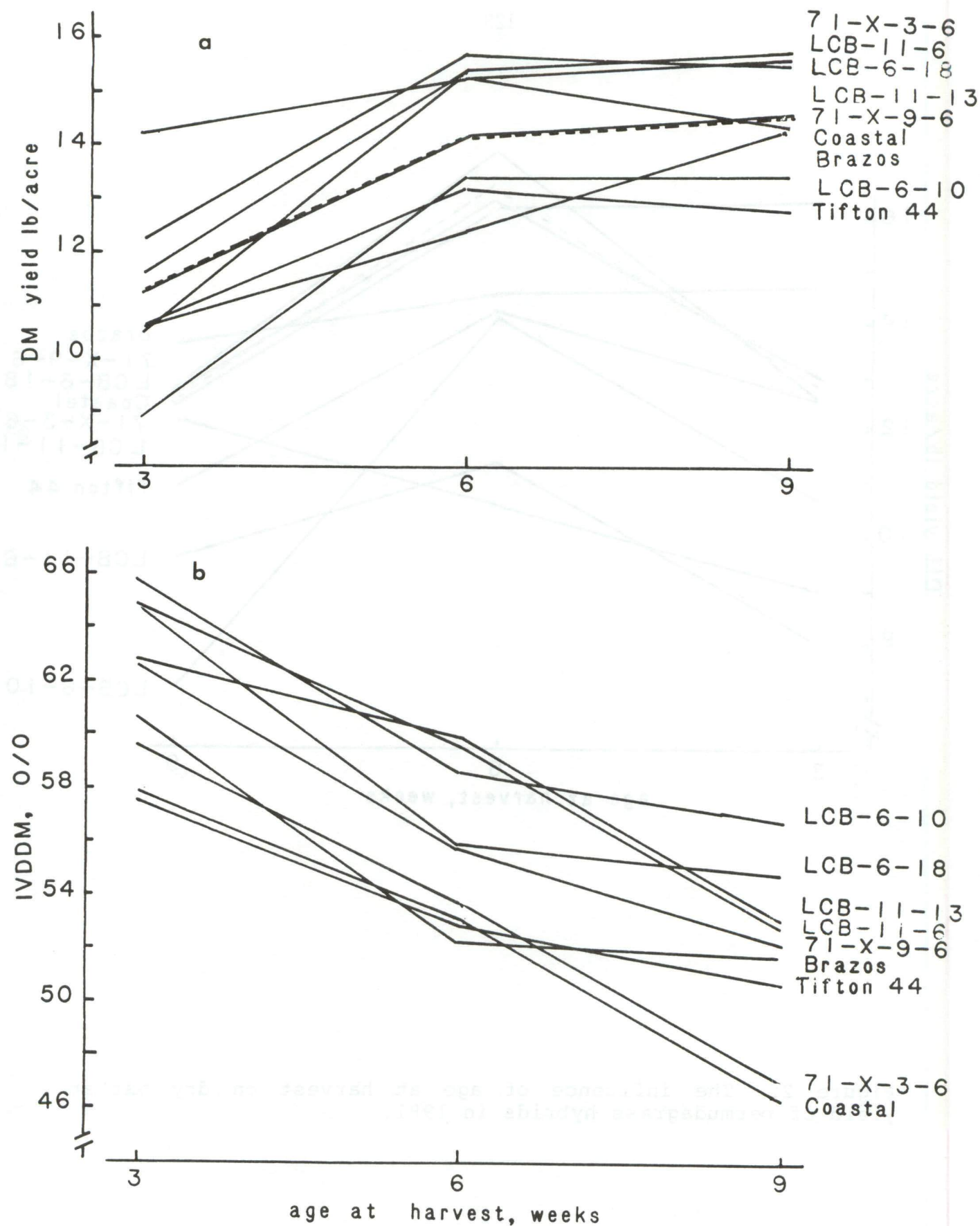


Figure 1. The influence of age at Harvest on three-year average dry matter yield (a) and 1981 forage quality (b) of selected bermudagrass.

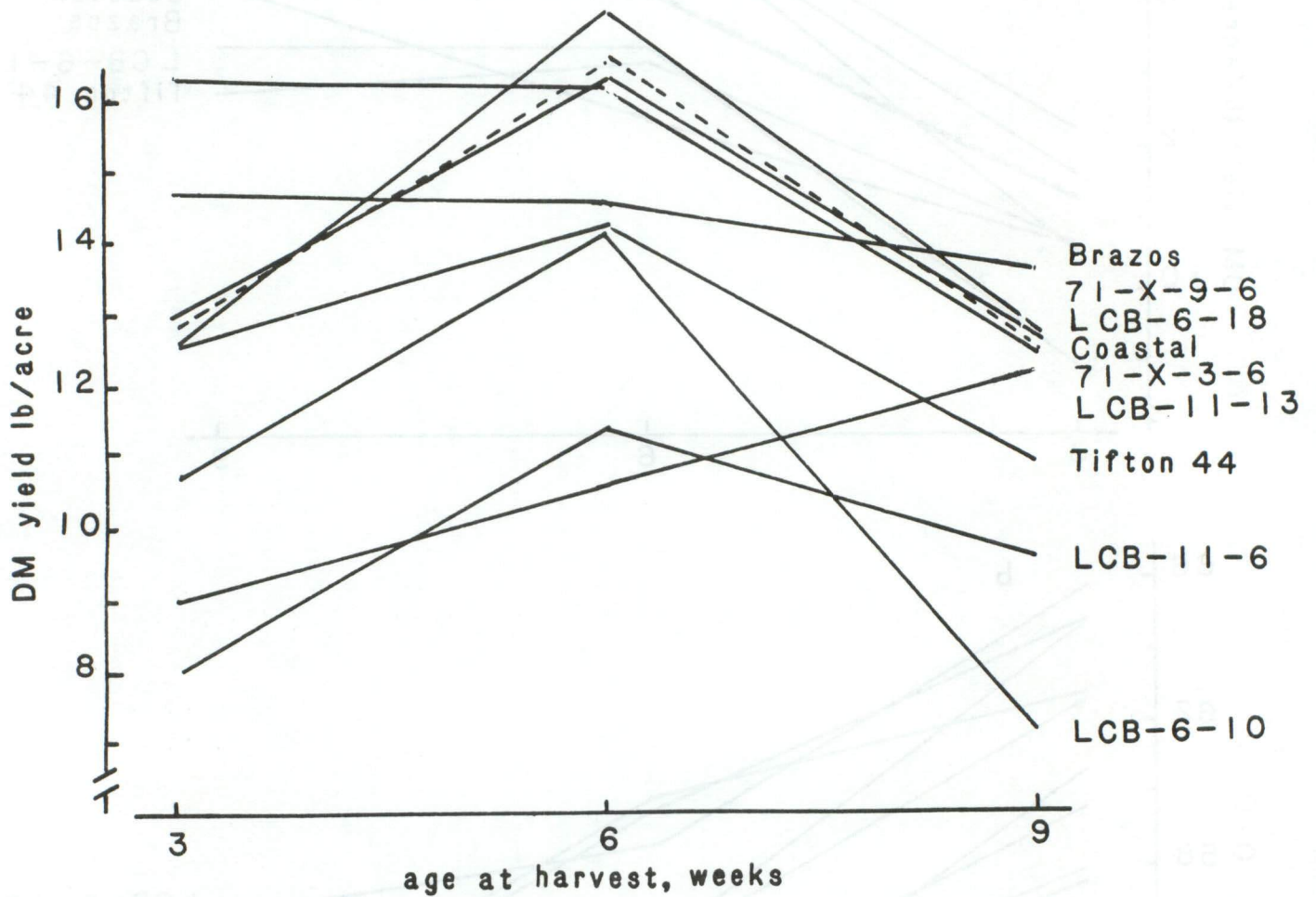


Figure 2. The influence of age at harvest on dry matter yield of bermudagrass hybrids in 1981.