Table 1. Effects of transit and feeding prior to transit

Parameter	Treatment groups[a] 1	2	3
Weight Lost (%)	2.44[b]	3.86[c]	2.94[b]
Weight gain (lb)			
28 days	119.5	122.4	119.2
56 days	210.0	223.1	221.8
Rectal temperature (F)			
Pre-shipment	102.5	102.7	102.5
Post-shipment	102.1[b]	102.9[c]	103.2[c]
Packed cell volume (%)[d]			
Pre-shipment	40.7	41.1	41.9
Post-shipment	43.5	43.3	44.2

[a]Group 1 - assembled, not transported. Group 2 - assembled and transported. Group 3 - assembled, fed and transported.
[bc]Means in the same row with different superscripts are significantly different ($P<.01$).
[d] Amount of red blood cells as percentage of total blood.

calculated using arrival weight and a weight at 28 and 56 days, at which times calves were removed from water for 16 hours. Total weight gains at 28 and 56 days were not affected by any treatment, but calves in Group 3 were slightly heavier than those in Group 2 because they had less weight loss during transit and yet gained an equal amount in the feedlot. As expected, rectal temperatures were not different among the three groups before shipment, but were significantly elevated as the result of shipping 250 miles. Health status was not altered during the 5-hour transportation phase, but the stress of shipping elicited an increase in body temperature. Thus, the normal temperature was 1° F higher in calves that were shipped than in calves subjected to the same period of fasting without being shipped.

Packed cell volume (PCV) shows the amount of red blood cells as a percentage of the total blood. As the body loses water, the percentage of red blood cells or PCV will increase. Average PCV before the transportation phase was 41.2 percent and was not different among the treatment groups. Post-shipment PCV was not significantly affected by treatment but was higher than pre-shipment PCV. These results show that body water losses were the same among treatment groups and were the result of water and feed deprivations. An additional weight loss noted in Group 2 steers must have been either from the body mass or the gut fill. The pre-shipment diet could have reduced total weight losses by preventing the mobilization of body stores. The effect of feeding a pre-shipment diet or of transit on morbidity could not be determined in the study because no animals got sick or died.

Steer Weight Gains on Midland and Hardie Bermudagrass Pastures

G. W. Horn and W. E. McMurphy

Story in Brief

A grazing trial with steers on four bermudagrass varieties (Midland, Hardie, Oklan and SS-16) began in 1977. Winter death loss of Oklan and SS-16 was so severe in 1979 that these two varieties were deemed unsuitable, and tests on them were discon-

tinued. Average daily gain was 1.39 lb for Midland and 1.57 lb for Hardie during a 111-day grazing season starting May 14, 1980.

Stocking rate was adjusted to utilize available forage and totaled 245 and 265 steer days per acre for Midland and Hardie bermudagrass, respectively. This was an average of 2.2 and 2.4 steers per acre for Midland and Hardie, respectively. Total beef production per acre was 351 lb for Midland and 454 lb for Hardie.

These results emphasize the importance of pasture management in maintaining an immature growing forage, combined with steer selection, implanting and parasite control for maximum gain. The vulnerability to drought of this program was also apparent.

Introduction

Bermudagrass has not been promoted as a pasture for stockers. The selection and release of two new bermudagrass varieties, Hardie and Oklan, were based upon laboratory tests for forage quality. The purpose of this study was to compare these grasses with Midland bermudagrass in regard to animal performance. We report herein results of steer grazing trials conducted in 1980, plus a summary of results from 1977, 1978, and 1979.

Experimental Procedure

The trials were conducted at the Agronomy Research Station, Perkins, Oklahoma. Two blocks of pastures, each containing one pasture apiece of the hybrid bermudagrass varieties Midland, Hardie, Oklan and SS-16 (an unreleased experimental strain), were used in a randomized complete block design. The soils were the Dougherty, Konowa and Teller fine sandy loams (Arenic Haplustafs, Ultic Haplustafs and Udic Argiustolls). Soil tests revealed that the pH was 5.7 to 6.5, and soil phosphorus and potassium were very high.

The pastures were sprigged in 1975, and grazing trials began in 1977. Each of the pastures was about three acres and was subdivided with electric fences into three paddocks to facilitate rotational grazing during the grazing trials. The rotational grazing objective was 1-week grazing of the paddocks followed by a 2-week deferment. Thus, throughout most of the bermudagrass growing season, the forage was 2, and never over 3, weeks of age.

In early June of each year, when steers were rotated, each paddock was mowed to remove cool season annuals. The pastures were fertilized with 150 lb of actual nitrogen in three equal applications in early April, late June and early August.

Steers for the 1980 trial were purchased at a livestock auction in March and grazed on small grain with limited forage until the trial began. Average daily gain during this pretrial period was about 0.8 lb. Hereford steers were used in 1980.

All steers (Hereford and Hereford x Angus) for the 1978 and 1979 trials were purchased at a livestock auction in March. The steers were grazed on small-grain pasture with limited forage until the trial began and were in thin condition at the beginning of the trial.

Steers from two sources were used in the 1977 grazing trial. Forty-five were raised on the research station. They had grazed small-grain pasture for 2 months prior to the trial and were in fleshy condition at the beginning of the trial. Fifteen steers were purchased at a livestock auction on May 2; they were in thin condition and were placed directly on bermudagrass. The steers, Hereford and Hereford x Angus, were assigned to treatment groups on the basis of source, breed and weight.

Daily gains were calculated from weight gains of steers that remained in the pastures throughout each grazing trial (tester steers). Average initial weight (mean ± SEM) of all tester steers in 1977 was 518±8.4 lb; in 1978, 520±6.3 lb; in 1979,

486±10.9 lb; and in 1980, 453.5±9.1 lb. Stocking rates on the pastures were adjusted according to the amount of available forage throughout the grazing trials by use of put-and-take steers. For calculation of total steer gain, put-and-take steers were assigned daily gains of tester steers during each period. Steer weights were measured after about a 16-hour overnight shrink without feed or water.

All 1980 steers were implanted with Ralgro at the beginning of each trial. In previous years the steers were implanted with diethylstilbestrol. Injectable Tramisol (levamisole phosphate) was given for internal parasite control on April 10, 1980. Excellent fly control was achieved during each trial by spraying the steers on each weigh date, except July 1 when a pour-on insecticide for grub control was applied, and by keeping dust bags in the pastures. Steers in all pastures had access to trees or constructed shades. A commercial mineral supplement that contained 12 percent calcium and 12 percent phosphorus was fed free-choice during the trials.

The data were examined by analysis of variance. Where F values were significant ($P<.05$), the differences between Midland and Hardie bermudagrasses were marked by the * in Table 2.

Results and Discussion

Rainfall recorded at the station during the first 9 months of each year is compared with the long-term average in Table 1. This 9-month total has varied from 73 to 106 percent of the long-term average. The driest season was in 1978, and the greatest total precipitation was in 1980 although distribution of rainfall in 1980 was very poor. Precipitation was above normal until June 20, 1980, after which the temperatures were extremely hot and precipitation very scarce. By July 21, 1980, the growth rate of the bermudagrass was reduced to the extent that rotation grazing was discontinued, and the study was terminated early on September 2 because regrowth was very slow.

Details of the results for 1977 through 1979 seasons were published by Horn and McMurphy (1979, 1980). The winter of 1978-79 was severe enough that Oklan bermudagrass suffered over 90 percent winterkilling. Oklan bermudagrass was dropped from the test. The SS-16 had about 40 percent winterkilling, and it was dropped from the test by mid-1979. Production from it was so low that it should not be considered for northern Oklahoma. The test is now an evaluation of Midland and Hardie bermudagrass, both varieties being quite winterhardy.

Average daily gains (Table 2) were highest in May and lowest in July. The differences between Hardie and Midland have not been statistically significant. The

Table 1. Seasonal precipitation (inches) for Agronomy Research Station, Perkins

Month	1977	1978	1979	1980	Long-term average
January	0.22	0.92	2.11	2.14	1.53
February	1.16	2.63	0.25	0.86	1.46
March	2.50	1.46	3.80	2.39	2.20
April	2.23	1.85	3.42	4.07	3.16
May	8.46	7.28	6.83	7.57	5.09
June	1.90	4.59	3.01	8.78	4.58
July	3.15	0.90	0.42	0.05	3.45
August	2.88	0.53	1.62	1.56	3.19
September	1.77	0.49	1.94	2.88	3.81
Total	24.27	20.65	23.40	30.30	28.47

Table 2. Average daily gains (ADG) of steers, total steer grazing days per acre, and total gain per acre for intervals in 1980 with 3 years of seasonal averages

Grazing interval	Number of days	ADG, lb		Total steer days/acre		Total gain/acre, lb	
		Midland	Hardie	Midland	Hardie	Midland	Hardie
5-14 to 6-3	20	2.43	2.98	88*	188	36	63
6-3 to 7-2	29	1.67	1.64	94	87	156	143
7-2 to 8-1	30	1.62	1.97	56	56	90	109
8-1 to 9-2	32	0.30	0.25	59	59	17	14
1980 Season	111	1.39	1.57	245	265	351	454
1979 Season	147	1.83	1.99	381	406	658*	861
1978 Season	114	1.82	1.84	242*	259	419	487
1977 Season	153	145	1.73	281	313	416*	552

*Indicates a significant difference (P = 0.05) between Midland and Hardie.

1980 season average daily gains were 1.39 lb for Midland and 1.57 lb for Hardie. These were the lowest seasonal gains in the 4-year study, and a contributing factor was probably the lack of forage in August. July was a very hot month; grass regrowth was occurring early in July, and steer gains were good that month. The average daily gains are a product of environment plus good animal and pasture management practices. The animal management includes selection of good steers, implantation with growth hormones, excellent internal and external parasite control, shade and mineral supplement. Pasture practices of nitrogen fertilization, proper stocking rates and rotation to provide young forage between 2 and 3 weeks of age are also factors favorable to good steer gains.

Stocking rates are expressed as steer days per acre. Dividing steer days per acre by the number of days in that interval gives a quotient of steers/acre for that interval. Thus, Midland bermudagrass for the entire 1980 season had an average stocking rate of 2.2 steers per acre (245/111). Producers do not have the option to adjust stocking rates as freely as in our research. The only way most producers can use this program and keep the available forage young will be with rotation grazing and hay removal at peak growth periods. Therefore, the lowest stocking rate at any grazing interval becomes an important value to a producer. A producer must not run out of forage. For both varieties the lowest stocking rate was in August with 1.8 steers per acre. The Hardie bermudagrass has been consistent every year in providing about twice as much forage (measured in steer days per acre) in May.

Total gain per acre was 454 lb of beef for Hardie and 351 lb of beef for Midland. These results are much lower than the previous year. While the nitrogen fertilization rate each year has been the same (150 lb of actual nitrogen per acre each year), the late summer drought in both 1978 and 1980 made the August application of 50 lb of nitrogen per acre ineffective. The 1979 season results may well reflect residual nitrogen from the previous year.

These results reveal excellent average daily gains in some years. The results emphasize the importance of a complete program for both steer and pasture management to provide and maintain high quality young forage to steers capable of producing. There will be great fluctuations in total forage production from year to year as measured in steer days per acre. However, the minimum stocking rate of about 1.8

steers per acre appears to be consistent with hay removal at peak growth periods. The August average daily gains reveal the vulnerability of the program to excessive heat and drought with no appreciable bermudagrass regrowth available.

Literature Cited

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Relationship of Steer Daily Gains on Bermudagrass to Rate of Forage Digestion

M. Cannon, R. L. Hintz, G.W. Horn and W. E. McMurphy

Story in Brief

Relationships of daily gain of steers grazed on bermudagrass and extent and rate of forage dry matter (DM) digestion were examined. Steer gain data were from grazing trials on Midland, Hardie, Oklan and SS-16 bermudagrass pastures during 1977 and 1978. Rate of digestion and digestibility accounted for a small part of the variation in average daily gain. After variety, month and year were considered, relationships between rate of digestion, digestibility and average daily gain were small and of little value in predicting daily gains of steers on bermudagrass.

Introduction

Identification of indices of forage quality which would be useful in predicting animal performance has been a long-standing research goal. Early studies indicated that forage intake was more closely related to extent of digestion at early time periods (i.e., 6 to 12 hours) of *in vitro* incubation than longer time periods. The objective of this study was to obtain data relative to the relationship between daily gain of steers grazed on bermudagrass and extent and rate of forage dry matter (DM) digestion.

Experimental Procedure

The steer gain data obtained during grazing trials on Midland, Hardie, Oklan and SS-16 (an unreleased experimental strain) bermudagrass pastures during 1977 and 1978 were used. The pastures, consisting of two blocks of the four bermudagrass varieties, are located at the Agronomy Research Station (Perkins, Oklahoma). Details of cattle and pasture management and results of the trials have been previously reported (Horn and McMurphy, 1979).

Hand-clipped forage samples were taken at about monthly intervals from each pasture during the 1977 and 1978 grazing trials. Each sample consisted of clippings from 14 locations within each pasture of about 3 acres. The forage samples were dried, ground, and placed in the rumen of three ruminally cannulated steers for periods of 6, 12, 24, 48, and 72 hours. Forage dry matter digestibility (percent) was calculated from dry matter losses during the ruminal incubations.