Forage and Animal Gains of Coastal Bermuda and Pensacola Bahia[1]

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Highlight

Similarly fertilized "Coastal" bermudagrass and "Pensacola" bahiagrass were clipped from May 18 until October 22, 1964, at monthly intervals, ground, pelleted, composited, and fed to beef steers. Forage production of bermudagrass was more uniform during the growing season than was that of the bahiagrass. Forage harvested earliest and latest in the season had a higher apparent dry matter digestibility, lower cell wall, acid detergent fiber, and acid detergent lignin content than that harvested in the middle of the season. The growth habit of bahiagrass does not suggest that it is a desirable hay plant. Animal performance showed that both forages produced slightly lower gains than did ground snapped corn. Only gains on bahiagrass were significantly lower, however. Plants such as bermudagrass and bahiagrass are probably more satisfactory forage plants when kept young by either mowing or grazing.

In the Southeast two of the most popular forage grasses are "Coastal" bermudagrass (*Cynodon dactylon* (L) Pers.) and "Pensacola" bahiagrass (*Paspalum notatum* var. *saurae* Parodi). They have many agronomic characteristics in common. Both are summer growing, deciduous, sod forming grasses that originated in tropical climates.

The purpose of this research was to compare the forage production and animal gains of the two grasses when grown and harvested under similar conditions, dried, ground, pelleted, and fed to beef steers.

Literature Review

The yield of bermudagrass at different fertilizer rates and on different soil types have been reported (Beaty et al. 1961, Burton et al. 1956). Morris and Celecia (1963) reported that split applications of N produced higher yields than did single spring applications. Burton et al. (1956) have shown that bermudagrass becomes more stemmy as it matures and stems may reach 50% on 8 week old grass. Four week old grass will have about 30% stems. Animal gains on bermudagrass have varied from poor (Baird et al. 1958) to very good (Brooks et al. 1962, Beardsley et al. 1960).

In general, data on bahiagrass are much less complete than on bermudagrass and are more fragmentary. Bahiagrass responds well to fertilization up to 150 pounds of N per acre but above that efficiency of N utilization falls off rapidly. Bahiagrass forage is approximately 80% leaves (Beaty et al. 1963). Growth is reduced by cold weather and drouth (Beaty et al. 1961, Burton et al. 1957). Maximum yields of Pensacola bahiagrass have been obtained from single N applications in the spring and forage production is concentrated in June, July, and August (Beaty et al. 1960, 1965). Data on animal performance on bahiagrass are limited.

Procedure

In 1964, a single four acre block of established bermudagrass and a comparable block of bahiagrass were harvested every four weeks during the growing season. Fifty pounds of N per acre as NH_4NO_3 were applied in April and after each of the first four harvests. Five hundred pounds of 0–14–14 (N-P_2O_5-K_2O) were applied in April.

Forage on both areas was mowed on May 18, June 15, July 16, August 15, September 14, and October 22. Fourteen days of rain following the July harvest ruined that forage, but other harvests were field dried, baled, and stored until pelleted. The forages were ground through a 5/16 inch screen and pelleted through a 1/4 inch die. Two percent molasses was added as a sticker to the bermudagrass at pelleting. The bahiagrass formed a hard pellet and no molasses was added.

Apparent dry matter digestibility was determined by the nylon bag technique, N by micro kjeldahl, cell walls, acid detergent fiber, and acid detergent lignin by the methods of Van Soest (1963).

Test animals were grade beef steers that averaged 601 pounds each. The steers were alloted to treatments by restricted randomization based on preliminary weights. Steers fed ground snapped corn and hay were started on preliminary feeding on November 20. Animals to be fed pelleted bahiagrass or bermudagrass had access to bahiagrass grazing and pelleted bermudagrass during the preliminary feeding period.

On December 3, animals were weighed, lotted and fed the test feeds free choice. Paddocks were open areas 60 by 200 feet and duplicate replications of five steers each were included per treatment. The pelleted forages were composited between harvests and fed with salt and water. The ground corn was supplemented with 11% cottonseed meal (41% protein) and fed with bermudagrass hay free choice.

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Table 1. Pounds of pelleted forage produced per acre by clips of coastal bermudagrass and Pensacola bahiagrass, Americus, Georgia, 1964.

Date of clip	Forage	
	Coastal Bermudagrass	Pensacola Bahiagrass
May 18	1900	0
June 15	538	213
July 16*	3200	2700
August 13	1793	1193
September 14	908	1821
October 22	913	200
Total	9252	6127

* Calculated from bale count and dry matter determinations but not used as feed or pelleted because of 14 days of rain.

No protein, hay, or vitamin A were fed with the pelleted forages.

The steers were weighed after having been given hay and water over night on single days at the beginning and end of the experiment. The feeding period ran from December 3, 1964 until February 1, 1965 a period of 60 days.

Results and Discussion

Yields and Growth Habits

Forage production per acre by clips is shown in Table 1. There can be little doubt that the production of bermudagrass is more uniform than that of bahiagrass. At the first clip, bahiagrass consisted of leaves and the small amount mowed was not long enough to be raked. The period May 18 to June 15 was dry, which is a common occurrence in Georgia. Yield of both forages was reduced in forage production at the June harvest. The bahiagrass yield was reduced much more than the bermudagrass. By June 15, bahiagrass had produced 200 pounds of pellets per acre while the bermudagrass had produced slightly more than 2400 pounds per acre. Part of the difference in yield is no doubt due to the habit of growth. Bermudagrass grows upright and has a central stem to which leaves are attached. In hay harvests, the leaves and stems are handled as a unit and recovery of mowed forage is high. With bermudagrass the leaf-stem unit is large enough that it does not filter down in to the stubble and the intermingling of individual plants facilitates raking. The same growth pattern is repeated by the bermudagrass at each regrowth period during the year.

Bahiagrass forage is produced on growing points that are usually less than one inch from the soil surface. With N fertilization, the sward is dense near the soil surface and decreases in density rapidly towards the tips of the leaves (Stanley et al. 1967). Until late in June, and with a mower set to run at a normal height of approximately 4 inches above the soil surface, only a small portion of the total growth of bahiagrass is clipped. The clipped forage consists almost entirely of single leaves, less than three inches in length, which filter down into the stubble and cannot be raked.

Table 2. Steer performance on a concentrate ratio, pelleted coastal bermudagrass and pelleted bahiagrass ratio.

Item	Concentrates	Coastal Bermudagrass pellets	Bahiagrass pellets
Steers per treatment (No.)	10	10	10
Steer weights (lb)			
Initial	594	616	597
Final	724	737	708
Gain per steer	130	121	111
Average daily gain	2.17[1]	2.01[1]	1.85[1]
Feed consumption (lb)			
Total	1485	1448	1382
Concentrates daily	21.2	—	—
Hay or pellets daily	3.5	24.1	23.0
Total daily	24.7	24.1	23.0
Daily per 100 lbs body weight	3.75	3.56	3.52

[1] LSD at .05 = 0.27 lbs.

While bahiagrass produces considerable grazing early in the season, it is too short to mow for hay until late June or July. July is normally the wettest month of the summer in Georgia and hay drying involves above average risk during that month. During August and September rainfall is frequently low and forage production drops. On the average bahiagrass produces less than 30% of its annual production after August 1. Bermudagrass demonstrated more consistent forage production season-long while bahiagrass production was concentrated largely in June, July, and August.

Bahiagrass produced a dense, firm pellet with almost no fines while bermudagrass had many more fines. The addition of 2% molasses improved pellet quality of the bermudagrass and both forages were consumed similarly by the steers.

Animal Gains

Animal performance data are shown in Table 2. Daily gains of steers fed ground corn and bermudagrass pellets, at 2.17 and 2.01 pounds per day respectively are similar to those reported previously (Brooks et al. 1962). Up to 84 days, steers fed bermudagrass pellets will frequently gain weight similarly to those fed ground snapped corn, but after that time the corn fed steers are likely to gain faster and grade higher as carcasses (Brooks et al. 1962).

Gains of steers eating bahiagrass pellets at 1.85 pounds per day were significantly lower than those of the corn rations. Differences between gains of steers on bermudagrass and bahiagrass were not significant. Since both were consumed similarly and previous work (Beardsley et al. 1960) has shown

Table 3. Dry matter disappearance (DMD), N, cell walls, acid detergent fiber (ADF), and acid detergent lignin (ADL) content (percent) of coastal bermudagrass and Pensacola bahiagrass by four week clips, Americus, Georgia, 1964.

Clip number and date	Coastal bermudagrass					Pensacola bahiagrass				
	DMD	N	Cell walls	ADF	ADL	DMD	N	Cell walls	ADF	ADL
1. May 18	57.5	2.58	61.7	28.9	3.80	—	—	—	—	—
2. June 15	55.7	2.59	61.4	27.6	3.90	55.4	1.79	62.5	31.7	4.39
3. July 16*	—	—	—	—	—	—	—	—	—	—
4. August 13	45.6	2.46	66.9	33.2	4.45	47.8	1.95	66.9	32.7	4.50
5. September 14	51.7	2.46	65.3	30.6	4.44	45.6	1.85	67.0	35.9	5.41
6. October 22	52.1	1.75	62.2	27.9	4.72	57.7	1.97	59.9	28.1	3.26

* Harvest ruined by rain.

that molasses in small quantities does not appreciably influence animal gains, it appears that there may be an appreciable lower forage quality in the bahiagrass.

Factors Affecting Forage Quality

While it is generally assumed that leaves are of higher quality than are stems, and it has been shown that young leaves are superior to old leaves (Burton et al. 1964). When managed as in this experiment, bermudagrass forage, due to removal of the growing point, grew back from new primordial development after each clip. The bahiagrass forage harvested, due to low growing points of bahia shoots, was growth elongation of previously clipped leaf tissue. The harvested forage was probably older than the bermudagrass. The yield data in Table 1 suggest that bahiagrass may grow later into the fall.

In other work, bermudagrass harvested in May produced 39% faster gains than did similarly treated bermudagrass harvested in early September (Beaty et al. 1966). Since much more of the bermudagrass from an area is harvested before July than is bahiagrass it is reasonable to suspect that on a seasonal basis and combined with the difference in location of growth, the 9% superiority of bermudagrass in producing animal gains represents a difference in forage quality that cannot be matched by harvested bahiagrass. It is probable, also, that bahiagrass is a much better plant for grazing than it is for hay. If the reduced gain of steers on the bahiagrass was partly due to the leaves being older when harvested, than it is also reasonable to expect that best animal gains will be obtained on bahiagrass when it is kept younger than that harvested in this investigation.

Apparent Dry Matter Digestibility

A further examination of the apparent dry matter digestibility (DMD) data included in Table 3, provides additional evidence that, as harvested feed, bermudagrass should be the superior forage. Apparent dry matter digestibility values show that at harvests 1, 2, 5 and 6 more than 50% of bermudagrass was digested. With bahiagrass, clips 2 and 6 were above 55% in digestibility. Both forages were comparable in digestibility early in the season with bahiagrass having an advantage at the last clip. However, only 413 pounds of bahiagrass was produced during the time of maximum quality as compared to the 4,259 pounds of bermudagrass, Table 1. When the forages were fed on a composited basis and with comparable animal intake rates, it is surprising that performance of steers fed bahiagrass were as good as those obtained.

During the summer the estimated digestibility of both forages dropped by approximately 10%. That is the time when bahiagrass was producing more than 92% of its total production as compared to approximately 55% for the bermudagrass. These data tend to be in rather close agreement with those previously obtained (Beaty et al. 1966) when forages comparably treated but differing in time of harvest have been compared. The relative poor performance of bahiagrass in this investigation may be partly a result of using investigative procedures that are more favorable to the better known bermudagrass.

Clipping and Forage Age

Reported research suggest that bermudagrass also benefits in forage production from close clipping (Clapp et al., 1965; Holt and Lancaster, 1968). It is probable that some of the bahiagrass forage clipped at the third harvest was present in leaf form but too low to be clipped at the time of the first harvest. Such does not happen with bermudagrass. How much influence the delay in clipping reduced forage quality as measured by animal gains and DMD is not known. The work of Burton et al. (1964) shows that young leaves of pearl millet may be up to 15% more digestible than the old leaves. The 8% decrease in animal gains on bahiagrass obtained in this investigation appears to be well within reasonable limits of the expected.

Chemical Composition and Quality

The cell wall fraction and the acid detergent fiber values obtained on the different cuts in this research tend to be lower than those obtained on unpelleted forage (Beaty et al., 1967). They do, however, follow a trend that is opposite to that of the apparent dry matter digestibility being lowest in the early spring and fall and highest in midsummer.

The data obtained relative to time of growth and digestibility, when combined with collateral information, is excellent evidence that allowing grass to age will decrease digestibility, and lower animal gains. It would appear logical that both digestibility and gains of animals consuming either of these grasses, either as harvested feed or as grazing, would be increased by keeping the forage younger than 30 days old.

The N content of the different grass harvests is shown in Table 3. The bahiagrass averaged 1.89% N which was 0.48% less than the bermudagrass which averaged 2.37% N.

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