Bermudagrass yield and quality through the grazing season

Sam Coleman[a] and Mimi Williams[b]
[a]USDA ARS STARS and [b]USDA NRCS

Introduction

One of the great benefits of cattle production is that the bovine converts fibrous feedstuffs, generally inedible by humans, to high quality, nutritious, and tasty food. Another benefit is that much of the cattle production is on land not suited for more intensive crops. Throughout the U.S.A., pasture, range, and forage crops are utilized on steep landscapes that would be subject to erosion if planted to crops. Moreover, cattle production occurs on both arid and marshy landscapes. Thus, forage supply is a major part of cattle production. Two major constraints to optimum productivity are quantity and quality of feed. If either is limiting, the animal may not be able to produce to its genetic potential. As genetics improve, the demand for nutrients increases. With the increase in nutrient demand often comes are requirement for increased nutrient density, or concentration of nutrients. The major nutrients in terms of quantity required per day are energy and protein. They are also the most costly.

In most parts of the country, SPA analysis has revealed that the largest economic cost for cattle production are for winter feed. In many cases, the winter feed adds extra labor burdens as well. The Coastal Plain region of the Southeast, including Florida, is no exception. The climate is subtropical, having tropical summers and temperate winters. Moisture is deficient except for the summer wet season. The winters are characterized by occasional freezes and drought that prevent tropical (or subtropical) forage species from active growth. Forage quality from the staple forage (bahiagrass) is marginal during the growing season, but during winter both crude protein and energy may be deficient. In central Florida, hay feeding commences around Nov. 15 each year and may continue through mid-May. Temperature is adequate for spring growth, but drought often limits growth, for this is the dry season.

Bahiagrass is the staple forage in Florida because it is persistent under rather loose management. It forms a dense sod (if not severely overgrazed) and rhizomes. Nutritive value of bahiagrass (nutrient concentration and digestibility) can be quite good in the spring and in new growth during the growing season. However, as growth slows down and the plant matures in late summer, quality declines significantly. Other forage species, particularly the improved varieties of bermudagrass, may provide some options for producers to improve summer nutrition and lay by excess for winter feed. The objective for this study was to evaluate several available varieties of bermudagrass for yield and quality during the summer growing season.

Methods

Plots of 10 varieties of improved bermudagrasses were established vegetatively in August, 2002. Sprigs for Tifton 85, Coastal, Tifton 44, Tifton 78, Tifton 68, and Coastcross 2 (radiation induced mutant from Coastcross 1) were supplied by scientists at

the ARS facility in Tifton, GA . Dr. Carrol Chambliss (deceased), agronomist from the University of Florida supplied planting material for Coastcross 1 and an "improved" selection out of Alicia. Traditional Alicia was provided by a Sumter county hay producer, and the Florida strain of Tifton 44 (from here on called Florida 44) from a local farmer near Brooksville, FL. All varieties were established in 6 x 15' plots. Plots were not harvested in 2003 due to late planting and slow establishment. They were clipped a few times to maintain new growth and weeds. Harvesting was initiated on May 21, 2004 and on May 3, 2005 and continued at 28-d intervals. At the beginning of the growing season and after each harvest, plots were fertilized with a complete 16-4-8 to supply 110 lb N per acre.

Results and discussion

Yield, crude protein concentration and yield, digestibility and digestible dry matter yield are shown in Table 1 for the 10 cultivars or experimental lines. Yield of protein and digestible dry matter are calculated by multiplying dry matter yield and protein or digestible dry matter concentration, respectively. This shows the nutrient production per unit land area. Digestibility in this study was determined by in vitro dry matter disappearance, which is different than total digestible nutrient (TDN) calculation, but gives essentially the same result and similar ranking.

Tifton 85 produced the greatest yield of dry matter, protein, and digestible dry matter. This variety was particularly outstanding during the peak of the growing season (July and August, Figure 1). This variety produces excellent hay if harvested at 4 wk or less regrowth. However, it can have large stems that are difficult to dry. Tifton 85 is probably better as a grazing forage and could be used as a supplement (or substitute) for bahiagrass during July and August when bahiagrass quality is reduced. Due to its high productivity during those months (Figure 1), stocking rate could be quite high. Though we have no results, an intriguing question is whether weaning weight could be increased by using a higher quality forage during mid-summer. Also, winter costs might be reduced if cows go into the dry season in better condition.

Tifton 44 produced the least amount of dry matter, protein, and digestible dry matter. This variety is the true Tifton 44, planting material obtained from certified plots in Tifton, GA. It is quite a contrast to what we are calling Florida 44, a popular variety that has been promoted in Central Florida as Tifton 44. Florida 44 was one of the higher producing varieties, especially during the early spring (Figure 1).

The origin of Florida 44 one of interest. The Georgia Crop Improvement Association records indicate that certified Tifton 44 was sold to Walker Farms in Sarasota in circa 1978. Planting material from the Walker Farms stand was used to plant a hay field in Hernando County around 1990. Growth and production of that original hay field in Hernando County impressed a lot of people and it was a source for planting material for other fields starting in 1991 or 1992. These fields were also used as planting material sources as reputation of this bermudagrass spread. Our work clearly shows that Tifton 44 and Florida 44 are distinct lines of bermudagrass based on total yield, seasonal

distribution of the yield, and disease resistance (data not reported). What happened to the certified Tifton 44 between the time it was planted in Sarasota and planting material came to Hernando County is unknown. It is possible that there was other bermudagrass material in the area and the two (or more) crossed. DNA analysis has shown that Florida 44 is genetically different from Tifton 44.

Crude protein content was very good among all varieties (Table 1). Although differences existed, all were higher than would be expected from bahiagrass (~11% at its peak quality). Digestibility was more variable among the varieties (Table 1) with Alicia averaging the lowest (48.7%) and Tifton 68 the highest (56.1%). Tifton 68 is one of the parents of Tifton 85 and has large, succulent stems similar to Tifton 85. The Coastcross 1 and the experimental line, Coastcross 2, also produced highly digestibility dry matter (approx. 54%).

Nutritive value varied significantly over the growing season (Figure 2 and 3). It appears with a 4-wk cutting interval that high growth rate also provides higher nutritive value. This probably occurs because at a faster growth rate, less of the nutrients are converted to fiber. The first cut produced the lowest nutritive value, possibly due to inclusion of mature winter grasses and weeds and a longer than 4-wk regrowth interval after staging in 2004. This was due to slow spring growth due to dry weather.

Preference for variety would depend on expected use. Tifton 85 clearly produces more forage and is as high in quality as any other, except for it's parent Tifton 68. However, if cut for hay, at least one more day is required to dry due to the large stem. Coastal, Alicia and Florida 44 are the varieties of choice for haymaking when targeting the horse hay market. On a nutrient basis generated from a 4-wk harvest interval, the annual digestible DM production from Tifton 85, is worth $851/acre if compared to soybean hulls at $125/ton. Florida 44 is worth $718/acre. One problem with hay marketing in Florida is that it is normally sold, particularly to the horse market, by the bale, not on a weight and nutritive value basis. This means there is little incentive for hay producers to use bermudagrass cultivars with superior nutritional value or to manage stands to maximize the nutritional value of the hay that is produced. Educational programs are needed to help horse producers better understanding of the nutritional value of different hays, so that they will ask for and pay premium prices for higher nutritional hays.

Table 1. Total dry matter, crude protein, and digestible dry matter yield and average % crude protein and digestibility of different bermudagrass cultivars or experimental lines

Variety	Yield, lb/ac	Crude Protein, %	Protein yield, lb/ac	In vitro DM Digestibility, %	Dig. DM Yield, lb/ac
Alicia	16,053	15.5	2455	48.7	8058
Coastal	15,761	14.9	2299	48.9	7777
Coastcross 1	15,593	17.1	2560	54.6	8415
Coastcross 2	14,483	17.4	2481	54.7	8005
Florida 44	16,186	15.5	2463	52.9	8603
Tifton 44	10,758	14.9	1676	52.1	6110
Tifton 68	16,760	16.6	2739	56.1	9516
Tifton 78	14,264	15.8	2217	50.7	7361
Tifton 85	19,442	16.1	3085	52.2	10,200
Improved Alicia	15,864	15.7	2453	53.6	8484
SE[b]	674	0.24	112	0.87	394

cut at 28-d intervals over 2 years.[a]

[a] Harvests from May through October.
[b] Standard error of the mean.

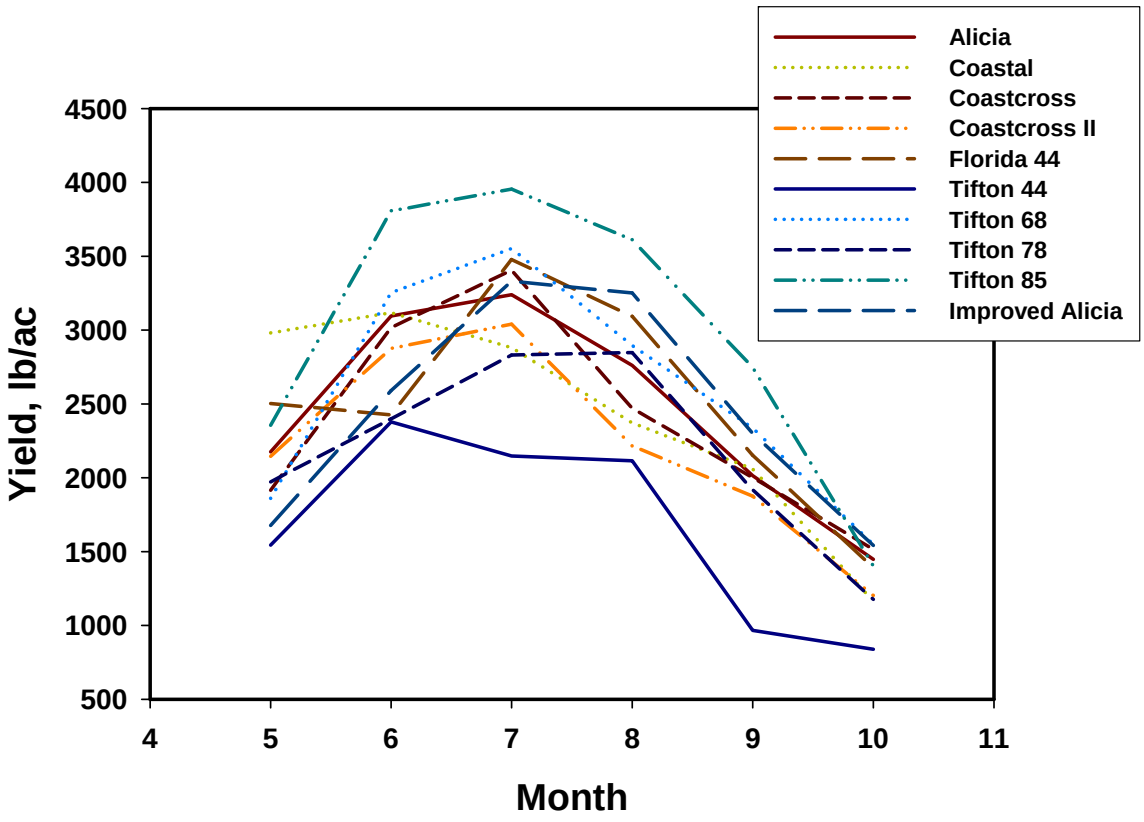

Figure 1. Yield by month of harvest of 10 varieties of Bermudagrass during 2004-05.

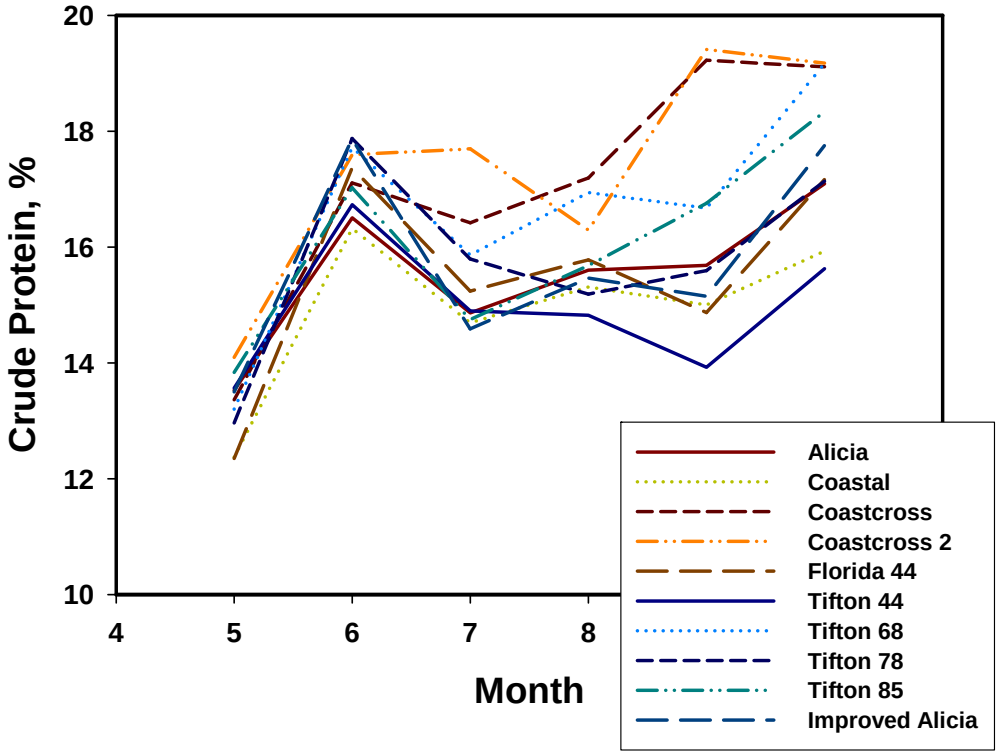

Figure 2. Crude protein concentration by month of harvest of 10 varieties of Bermudagrass during 2004-05

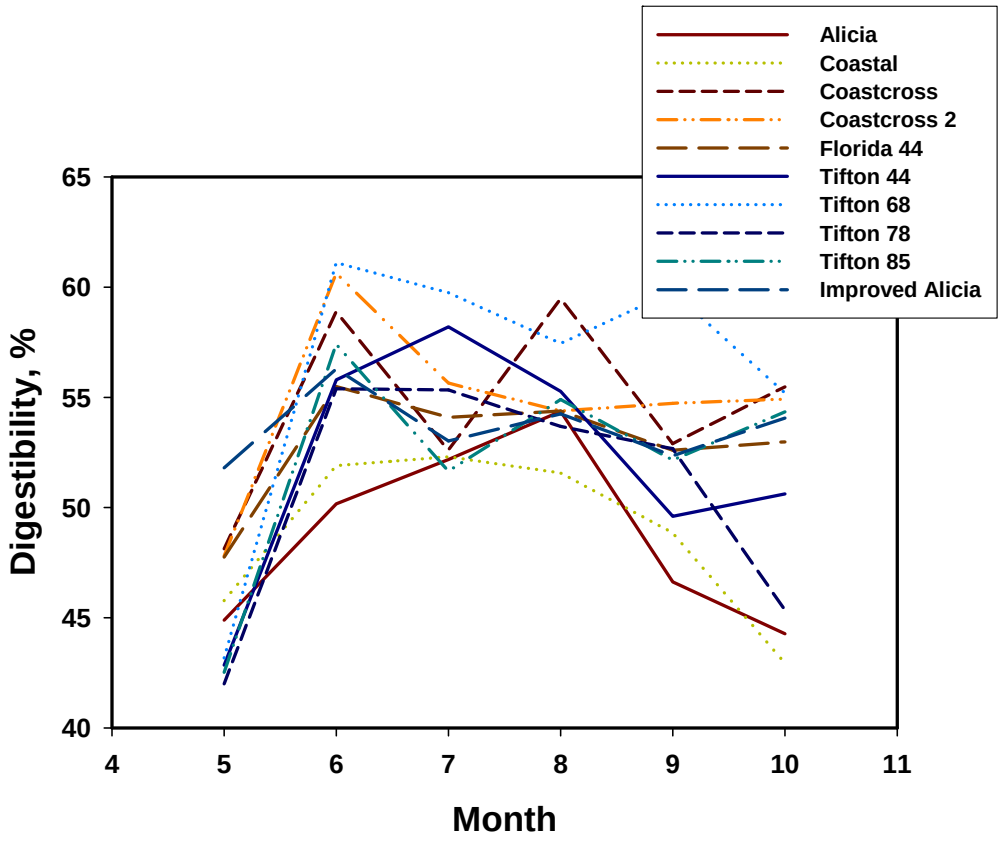

Figure 3. In vitro dry matter disappearance (digestibility) by month of harvest of 10 varieties of Bermudagrass during 2004-05.