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Influence of Clipping Height on the Yield and Quality of Winterhardy Buffelgrass (*Cenchrus Ciliaris* L.) Germplasm

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Summary

In 1976, several pentaploid (2N=4X=45) buffelgrass accessions, each possessing a cytologically distinct "alien" genome of nine chromosomes were collected and introduced into the United States. Subsequent field evaluations suggested that this germplasm had significantly greater winterhardiness than was available in commercial cultivars of buffelgrass. The objective of this study was to compare the forage yield and quality of two selected genotypes having enhanced winterhardiness (409704 and T-704) with that of three commercially available buffelgrass cultivars ('Common', 'Llano', 'Nueces') and a commercially available accession of *Pennisetum oriental* cv. 'Cowboy'.

Introduction

Few evaluations have been conducted to compare the forage production potential of buffelgrass (*Cenchrus ciliaris* L.) germplasm in Texas. This lack of evaluation is due primarily to the limited winterhardiness and adaptation of previous buffelgrass introductions. From the limited evaluations which have been conducted, the rhizomatous cultivars (i.e., Llano and Nueces) have been shown to produce higher yields than Common buffelgrass, but are generally thought to be slightly lower in forage *in vitro* digestibility (IVDMD).

With the identification of buffelgrass genotypes having enhanced winterhardiness, it is important to determine the production potential and forage quality of this germplasm. Therefore, the objective of this study was to compare the yield and forage quality of the two selected winterhardy genotypes to that of Common, Llano, and Nueces buffelgrass.

Procedure

Seedlings (ca. 3-5 tillers) of the selected germplasm (Table 1) were established in the greenhouse before being transplanted to the field in May 1986. Field plots (160 ft.² each) were established in a randomized complete block design having four replications. All plots were fertilized with 150 lbs of nitrogen per acre to facilitate establishment and, thereafter, with 150 lbs per nitrogen during both the 1987 and 1988 growing season.

Estimates of forage production were initiated in July of the establishment year. For each plot, subplots (80 ft.²) were harvested at 30- to 45-day intervals (depending on accumulated forage) to either a 2- or 6-inch height using a flail-type mower. Harvesting was initiated in May and terminated with

a harvest in mid-October in 1987 and 1988. Estimates of forage dry matter production were obtained by drying subsamples at 60°C for 48 hours and correcting the fresh sample weight by the moisture percentage. The subsamples were then ground to pass a 40-mesh screen and frozen prior quality analysis.

TABLE 1. FORAGE YIELD (LB/AC) OF SELECTED BUFFELGRASS GERMPLASM HARVESTED AT 2 INCHES AT COLLEGE STATION, TEXAS (1986-1988)

Entry	1986	1987	1988	Average
T-704	13,910	25,820	15,231	18,230
409704	10,890	21,940	12,696	15,175
Nueces	18,420	29,310	14,095	20,608
Llano	19,850	29,010	18,515	22,458
Common	15,340	18,780	5,585*	13,235
Cowboy	9,474	19,460	12,763	13,899
Mean	14,647	24,053	13,148	17,433

* 70% of plants suffered winterkill.

Estimates of forage quality were made using a modified pepsin-cellulase assay consisting of a 24-hour incubation in acid-pepsin followed by a 24-hour digestion in 1 percent w/v cellulase (Novo Scientific). Estimates of cellulase digestible dry matter (CDMD) were calculated and expressed as uncorrected CDMD values. From previous experiments, these values can be directly corrected to IVDMD estimates using the equation $Y = 31.62 + 0.56x$, where Y equals the estimated IVDMD value and x equals the CDMD value obtained.

Results and Discussion

Over the 3 years in which the study was conducted, buffelgrass harvested at the low cutting height (2.0 inches) produced 30 percent more herbage than when harvested at the 6-inch height. While total herbage production across all entries was greater when more intensive defoliation was utilized (low cut), the large increase in herbage produced at this low cutting height was attributed primarily to the rhizomatous cultivars (Llano and Nueces). These entries yielded 52 percent more forage when harvested at the low cutting height, compared to 18 percent increase in forage production for the other entries in the study.

At the 2-inch cutting height, Llano consistently produced the greatest amount of forage. Over several years, Llano was observed to produce 9, 23, 48, 62, and 70 percent more forage

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than Nueces, T-704, 409704, Cowboy, or Common, respectively (Table 1).

At the 6-inch cutting height, Llano was still observed to produce the greatest amount of herbage (Table 2), however, few significant differences in herbage yield were observed among cultivars. A large interaction was observed between cultivar and cutting height for forage yield which indicates that the use of a single defoliation intensity (cutting height) may not provide the best estimate of cultivar production potential.

TABLE 2. FORAGE YIELD (LB/AC) OF SELECTED BUFFELGRASS GERmplasm HARVESTED AT 6 INCHES AT COLLEGE STATION, TEXAS (1986-1988)

Entry	1986	1987	1988	Average
T-704	8,589	20,000	14,390	14,326
409704	8,256	19,160	17,258	14,891
Nueces	11,480	16,020	11,588	13,039
Llano	12,850	17,380	15,990	15,407
Common	11,170	10,180	8,314*	9,888
Cowboy	8,309	16,830	13,526	12,888
Mean	10,109	16,595	13,511	13,405

* 20% of plants suffered winterkill.

Forage quality was estimated using pepsin-cellulase solubility (CDMD). While data was collected during each year of the study, only CDMD values from the 1986 and 1987 growing seasons are presented (Table 3). In general, little variation in CDMD was noted among the buffelgrass entries, although the *P. orientalis* cultivar 'Cowboy' was observed to

be significantly lower in CDMD (46.6 and 41.6 percent for 1986 and 1987, respectively). These results are supported by previous studies (unpublished) where few differences were observed in forage IVDMD between Llano and Nueces buffelgrass, but where 'Cowboy' was observed to be significantly lower in IVDMD.

TABLE 3. CELLULOSE DRY MATTER DIGESTIBILITY (CDMD) OF SELECTED BUFFELGRASS GERmplasm

	1986	1987	Average
T-704	53.6	45.5	49.6
409704	50.7	45.5	48.1
Nueces	55.0	45.3	50.2
Llano	53.3	43.2	48.3
Common	52.5	45.8	49.2
Cowboy	46.6	41.6	44.1
Mean	52.0	44.5	48.3

Overall, results of this study show that while entries 409704 and T-704 did not have the forage production potential of the cultivars Llano and Nueces at College Station, they produced significantly more forage than Common. Since no significant difference was observed in forage CDMD between the buffelgrass entries, it may be concluded that the winterhardy buffelgrass accessions (409704 and T-704) are similar in forage quality to that of the released buffelgrass cultivars. These results indicate that the winterhardy pentaploid accessions have considerable promise for use as germplasm in the breeding program and should be evaluated more extensively as potential cultivars.