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Use of Non-Destructive Techniques to Estimate Herbage Mass in Bermudagrass (*Cynodon* spp.)

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Summary

Eleven bermudagrass genotypes (*Cynodon* spp.) were evaluated in 1984 and 1985 at Weslaco, Texas (26°N. Lat.) in an attempt to determine potential relationships between the disk meter, plant height, and herbage mass. Results obtained in this study suggest that the relationships between herbage mass and plant height or disk height, was a function of age, cultivar, and season of the year.

Introduction

The use of destructive sampling techniques to estimate herbage mass from pastures is labor intensive, time consuming, and often produces questionable results. Due to limitations on financial resources, inadequate sample numbers are often collected resulting in yield estimates which are not statistically valid. In an effort to increase sample numbers without increasing sampling time, double-sampling techniques are used to estimate forage-on-offer.

Foliage height has been useful in estimating forage yield. Whitney (1974), in an experiment using kikuyugrass (*Pennisetum clandestinum*) and digitgrass (*Digitaria decumbens*), was able to explain 94 percent of the variation in dry matter production for both species using plant height. Similarly, Alexander (1962) indicated that height may be useful in the estimation of forage yield, but that variation between species and seasons required the development of separate regression equations.

Similar conclusions have been made when height has been utilized to estimate "forage-on-offer" in bermudagrass (*Cynodon* spp.) pastures (Kanyama-Phiri and Conrad, personnel communication).

The disk meter has also been utilized to estimate herbage mass. Castle (1976), using the simple disk meter, reported that linear regressions explained 80 to 90 percent of the variation for yield in cutting experiments, but only 39 to 62 percent of the variation for yield in grazing experiments.

The objective of this study was to determine the potential that plant height and the disk meter have in ranking forage cultivars for yield in management studies.

Procedure

Eleven bermudagrass genotypes, consisting of released as well as experimental germplasm were evaluated at Weslaco, Texas (26° N. Lat.) (Hussey et al., 1985). At 6-week intervals, plant height (three estimates per plot) and disk meter height (two estimates per plot) were obtained prior to harvest with a flail type mower. Estimates of plant height represented a mean height of the canopy (not extended height), while the disk meter reading was the height that a 0.5 m disk settled to after being dropped from 1.0 m.

KEYWORDS: Plant height/disk meter/forage yield.

For analysis, mean plant height and mean disk heights from each plot were utilized. Linear regression was utilized to express the relationship between canopy, disk height, and forage yield.

Results and Discussion

For the study, the relationship between height and forage yield was highly dependent on date of cutting, year, and cultivar. When all harvests for the year were analyzed (Table 1) a better relationship was found between height and yield in 1985 (r = .76**) than in 1984 (r = .45**). When only the cultivar Brazos was utilized, a much better relationship was reported between height and yield in 1984 (r = .94**) than in 1985 (r = .75**). While cultivar effects were not statistically significant at the 0.05 level (data not shown), it was possible to obtain very good relationships between height and certain cultivars. In general, for the upright growing types (T-68 and African Stargrass) plant height was explained more than 90 percent of the variation for forage yield.

Disk meter readings were made only in 1985. Again, the data indicated that separate regression equations will be required for every combination of cultivar and season (data not shown). When all genotypes were bulked (Table 2) the relatiohship between herbage mass and disk height explained 58 percent of the variation for yield and 84 percent of the variation for yield in the cultivar Brazos.

The study indicates that plant height may be a better technique for estimating herbage mass from plots than the disk meter. From this limited data set (Table 3) we can see that with the exception of genotype B-12, plant height did a better job of ranking cultivars (compared to destructive sampling) than did the disk meter. However, under plot conditions, stand density is uniform. Since the disk meter combines density and height in its estimate, the disk meter may be expected to provide better estimates of forage yield under grazing than estimates of plant height. This has yet to be tested.

TABLE 1. RELATIONSHIP BETWEEN HERBAGE MASS AND PLANT HEIGHT IN *CYNODON* SPP.

	Year	
All Cultivars	1984	$Y = 141 + 71.1 \times R^2 = .45^{**}$
	1985	$Y = 116.8 + 112.2 \times R^2 = .76^{**}$
BRAZOS	1984	$Y = 547.0 + 118.8 \times R^2 = .94^{**}$
	1985	$Y = 559.0 + 167.5 \times R^2 = .75^{**}$

TABLE 2. RELATIONSHIP BETWEEN HERBAGE MASS AND DISK METER HEIGHT IN *CYNODON* SPP.

	Year	
All Cultivars	1985	$Y = 901.2 + 231.3 \times R^2 = .58^{**}$
BRAZOS	1985	$Y = 2378.3 + 350.1 \times R^2 = .84^{**}$

TABLE 3. RANKING OF ELEVEN CYNODON CULTIVARS BASED ON CUTTING, PLANT HEIGHT, AND SETTLED DISK HEIGHT

Cultivar	Cutting	Height	Disk
I. Star	1	1	2
T-68	2	2	1
B-13	3	4	7
P-7	4	6	9
Coastal	5	5	8
B-2	6	7	5
Brazos	7	10	4
B-12	8	3	9
B-1	9	8	3
T-44	10	11	6
NK-37	11	9	11

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