NSAP 47th Annual Conference (JOS 2022) CONFERENCE PROCEEDINGS
THEME: SECURING ANIMAL AGRICULTURE AMIDST GLOBAL CHALLENGES

DRY MATTER YIELD AND CHEMICAL COMPOSITION OF BERMUDA GRASS(*CYNODON DACTYLON*) AT DIFFERENT POST-PLANTING PERIOD IN BAUCHI STATE

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Abstract
This study was conducted between June, 2020-2021 to September, 2020-2021 rainy season to investigate the dry matter yield and chemical composition of Bermuda grass (*Cynodon dactylon*)at different post-planting period. *C. dactylon* was established on a 3.5ha paddock by transplantation of sprigs from the wild. The dry matter yield (t/ha), leaf dry matter (%), stem dry matter (%) and total dry matter (%) were measured. The results obtained indicated that *C.dactylon* at week 12 had highest yield (7.52 t/ha) which was at par with week 10 (6.63 t/ha) but significantly different (P<0.01) from other weeks. Leaf dry matter followed same pattern as dry matter yield, while stem and whole plant dry matter were higher (P<0.01) in *C. dactylon* at week 12 (55.46 and 57.65% respectively). Higher dry matter yield, leaf dry matter, stem and total dry matter yield were obtained at week 12, but was similar to that in week 10. It is concluded that, Bermuda grass should be harvested at 12 weeks for higher dry matter yield, leaf and stem dry matter with good forage quality.

Keywords: Paddock, Sprigs, Transplantation, Weeks, Yield.

Introduction

The cost of establishment and maintenance of improved pasture has contributed to its confinement to only a few institutional and elitist farms, prompting need to evaluate indigenous pastures that could improve productivity in ruminants. Bermuda grass *(Cynodon dactylon)* is a rhizomatous or stoloniferous perennial grass found in warm temperature, tropic and sub-tropical areas (Santos and Boechat, 1994). It is highly tolerant to drought and heavy grazing which makes it extremely valuable for establishment of the grasses during rainy and dry season. It is a forage and medicinal plant which can be used to control soil erosion (Oudhia *et al.*, 1998). Stage of maturity at harvest is probably the most important factor that influences forage quality. As forage matures, the leaf-stem ratio decreases and the plant becomes increasingly fibrous. Forage leaves contain considerably more protein and less fibre than the stems, so as forage matures and the stem becomes more prevalent and fibrous, quality decreases and the plant become less digestible (Anderson, 2012).

There is no information on any research conducted on *Cynodon dactylon* in Bauchi State, hence the study investigated the dry matter yield and chemical composition of *Cynodon dactylon* at different post-planting periods in Bauchi, Nigeria.

Material and Methods

Study location This study was conducted at Abubakar Tafawa Balewa University Bauchi, Nigeria, located on altitude 640m above sea level and lies between latitudes (110 and 120^{0}N)and longitude (70 and 80^{0}E). Bauchi falls the Northern Guinea Savannah Ecological Zone. The mean annual rainfall for the preceding year was 914.3 mm per annum (Ovimap, 2016).

The experimental soil is loamy sand soil and its characteristics and properties are shown in the table 1 below;

Table 1: Soil characteristics of the experimental site

Properties	Values

Physical properties (%)	
Clay	10.8
Silt	18.3
Sand	71.17
pH	6.36
Chemical properties	
Total N (%)	0.10
Zn (ppm)	2.50
P (ppm)	9.30
Exchangeable captions (meg/100g of soil)	
Ca^{++}	6.65
Mg^{++}	3.18
k^{+}	9.52
Na	26.60

Field study, 2020

Management of Established Pastures

The *Cynodon dactylon* was established at Abubakar Tafawa Balewa University, Bauchi in 2020 and 2021 growing season and the mean of the two season was used as data for analysis. *Cynodon dactylon* was established on a 3.5ha paddock between first week June 2020 to September 2020 during 2020 raining season and same period for 2021 rainy season. The vegetative materials or springs were transplanted at 50cm interval on the prepared land. The planted area was weeded in June, 2020 and 2021 (2 weeks after establishment). A mixture (1:2) of urea (46%N) and NPK (20:10:10) fertilizer was applied at the rate of 100kgN/ha. The fenced paddock was closed to prevent grazing by animals. The second fertilizer dose were applied 4 weeks after the initial fertilizer application. Measurement and sampling of pastures commenced on ending June, 2020 and September, 2020 (4 weeks after establishment) and was done fortnightly. On a sampling day, herbage above 10cm ground level within $1m^2$ quadrate was harvested. The total harvested herbage in each quadrat was weighted fresh before and after sorting out the trial pasture from the weeds a sample of the harvest from each quadrate was weighed and the dry matter determinate in an oven at 60^0C for 48hours. Sub-samples were taken in which the leaves were separated from the stem and the dry matter of the parts determined for each pasture specie. The average total dry matter yield (t/ha) and the part dry matter of *Cynodon dactylon* was calculated as the mean of all week. The dry matter yield production during the period was estimated using the method of Tarawali *et al*. (1995).

Experimental Design and Analysis

The experiment was a Randomized Complete Block Design (RCBD) design, where the weeks are the treatments. The Data generated was analyzed using a One-way analysis of variance and the mean was compared for significance using Standard Error of mean (SEM) following the procedures of SAS (2005).

Results

Table 2shows the effect of sampling period on dry matter yield (t/ha) and component dry matter of *C. dactylon*, sampling period had significant ($p<0.01$) effect on the dry matter yield, leaf dry matter, stem dry matter and total dry matter. The least value obtained were in the first four weeks post-planting while week 12 post-planting had the highest values for each of the parameters measured. The dry matter yield ranged from 3.72 to 7.52 t/ha in week 4 to 12, respectively. The corresponding leaf dry matter was 38.93 to 56.45% in week 4 to 12. Similarly, the stem dry matter from week 4 to 12 ranged from 39.12 to 55.46% while the corresponding total dry matter were 38.32 to 57.65t/ha, respectively. Generally, in all parameters measured, yield components progressively increased ($P<0.01$) from week 4 to week 12 except for dry matter yield and leaf dry matter between week 10 and 12.

Table 3: Effect of period (post-planting) of sampling on dry matter yield (t/ha) and component dry matter (%) of *Cynodon dactylon* in year 2020 and 2021

Period (weeks)	DM Yield (t/ha)	Leaf DM (%)	Stem DM (%)	Total DM (%)
4	3.72^{c}	38.93^{d}	39.12^{e}	38.32^{e}
6	4.14^{c}	41.26^{c}	42.71^{d}	41.39^{d}
8	5.41^{b}	49.58^{b}	44.36^{c}	45.88^{c}
10	6.63^{a}	55.94^{a}	53.56^{b}	53.53^{b}
12	7.52^{a}	56.45^{a}	55.46^{a}	57.65^{a}
Mean	5.58	48.43	47.04	47.38
SEM	±1.02	±2.72	±2.64	±2.19

^{a,b,c} = means on the same row with different super script are significantly (P<0.01) different**,** **DM** = Dry matter**, SEM** = Standard Error of Mean.

Chemical composition of Bermuda grass (*Cynodon dactylon*)

The chemical composition of *Cynodon dactylon* at different weeks is shown in the Table 3. Values showed that Dry Matter and Neutral Detergent Fibre (P<0.01) increased as weeks increased from week 4 to week 12 except at week10, while Acid Detergent Fibre and Ash increased (P<0.01) progressively to week 12. In contrast, Crude protein and Nitrogen Free Extract decreased(P<0.01) consistently as weeks increased except at week 10.

Table 3: Effect of sampling period (weeks) on Chemical composition (%) of *Cynodon dactylon*

	Sampling periods (weeks)						
Parameters	**4**	**6**	**8**	**10**	**12**	**Mean**	**SEM**
Dry matter	85.63	88.92	89.63	88.96	89.70	87.57	2.05
Crude protein	10.19^{a}	9.73^{ab}	8.91^{b}	7.64^{c}	6.52^{d}	8.00	1.24
Acid Detergent Fibre	28.19^{a}	29.92^{b}	31.79^{c}	36.34^{d}	37.60^{e}	30.77^{f}	1.83
Neutral Detergent Fibre	26.11^{a}	39.62^{b}	43.16^{c}	42.73^{c}	49.34^{d}	38.19	2.53
Ether extract	0.24	0.53	0.58	0.45	0.32	0.42	1.64
Ash	2.34^{a}	3.50^{b}	4.26^{cd}	4.62^{d}	4.63^{d}	3.87	1.18
Nitrogen free extract	61.12^{a}	46.62^{b}	43.09^{c}	44.56^{c}	39.19^{d}	49.52	2.68

^{a,b,c} = means on the same row with different super script are significantly (P<0.01) different

Discussion

There was a progressive increase in dry matter yield and dry matter content of the leaf, stem and whole plant with advancement in period from week 4 to week 12 as weeks increased, plant tissue replaces moisture in plants (Sani *et al*. 2020). Horowitz (1972) reported that *Cynodondactylon* had a far less growth rate than other perennial grasses. There was a progressive increase in dry matter yield and in the dry matter content of the leaf, stem and whole plant with advancement in period because the plant matured more with changes in rainfall, temperature and sunlight (Minson, 1990). The dry matter yield for *Cynodon dactylon* obtained in this study was higher than the range of 1.58 to 4.62 t/ha earlier reported for various cultivars of *Cynodon dactylon* (Kanno *et al.*, 2009) but lower than 7.3 to 13.4t/ha reported by (Woodard and Sollenberger, 2011). The higher yield may be attributed to differences in cultivars level of fertilizer application and age of plant establishment (Sani *et al.*, 2020).

Nutrient content decreases in forages as the plant matures and age increases (Anderson, 2012; Sani *et al*., 2020). The decrease in forage quality from early stage of plant growth to late stage is due to increase in stem over leaf in plant leaf-stem ratio. As stem increases relative to leaf, fibre and lignin content of plant replaces crude protein and free carbohydrate in forages and hence reduction in forage quality (Sani *et al*., 2020) as observed in this study.

Conclusion

It is concluded that, Bermuda grass should be harvested at 12 weeks for higher dry matter yield, leaf and stem dry matter with good forage quality.

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