Biomass Yield and Nutritive Quality of *Panicum maximum* in the Natural Pastures during the Dry Season in Abeokuta, Nigeria

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Introduction

Panicum maximum Jacq. is among the prominent grass species in the grazing lands of the South-western part of Nigeria. An understanding of cutting management to find out the best agronomic practices that will improve the yield and nutritive value of these grass species, especially in the dry season formed the focus of this research work. The objective of the research is therefore to evaluate the effects of cutting height and interval on the dry matter yield (DMY), digestibility and chemical composition of *P. maximum* in the natural pasture during the dry season.

Methods

The experiment was conducted on a naturally occurring pasture site dominated by *P. maximum* at the Federal University of Agriculture, Abeokuta, Nigeria, located on latitude 7°58′N and longitude 3°20′E.

An area of 500 m^2 was mapped out from the existing natural pasture to accommodate 24 experimental plots of 4 x 4 m made up of 6 treatments and 4 replicates arranged in a randomised complete block design. The factorial treatments consisted of 2 two cutting heights (*i.e.* 20 and 30 cm above ground level) and three cutting intervals (*i.e.* four, six and eight weeks). The intervals were randomly distributed among the blocks. Data collection from the plots commenced four weeks after the initial cut back for 24 weeks. At each cutting, fresh herbage was harvested from the plots at different heights and intervals and weighed using electronic sensitive scale. A fresh herbage sub-sample of 400 g was taken and separated into leaf (blade and sheath), stem (with inflorescence) and other species. These were weighed separately and oven dried at 60^{o}C until constant weight was obtained for dry matter yield (DMY) determination.

Proximate analyses were carried out according to AOAC (2000) procedure to determine the crude protein (CP), ether extract (EE) and ash contents. Neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) contents were determined according to Van Soest *et al.* (1991). Cellulose was taken as the difference between ADF and ADL while hemicellulose was taken as difference between NDF and ADF.

Calcium (Ca) and sodium (Na) contents were determined using Jenway Digital flame Photometer. Phosphorus (P) contents were determined by the Vando-Molybdate Colorimetric method while magnesium (Mg) content was determined using Atomic Absorption Spectrophotometer (AAS) (Fritz and Schenk, 1979).

In vitro gas production, metabolisable energy and organic matter digestibility were determined (Menke and Steingass 1988) and short-chain fatty acids according to the procedure Getachew *et al.* (2000). *In vitro* dry matter digestibility (IVDMD %) was calculated as follows:

(Initial DM input)–(DM residue–Blank)/(Initial DM input)x100

All data were subjected to two-way analysis of variance (ANOVA) in using statistical package SAS (1999).

Results

The results showed that DMY significantly (P<0.05) increased with increase in cutting height (13,389–15,462 kg/ha), this corroborates the findings of Hisham (2003) working with *P. maximum* that higher cutting height produced higher DMY than lower ones. On the other hand, there was no effect (P>0.05) of cutting interval on DMY of the grass. This might be as a result of little re-growth potential and reduced soil nutrients among others. Bamikole *et al.* (1998) reported that DMY in unfertilised pure grass plot declined at a faster rate under regular cutting as the soil nutrient reserves of the land under cultivation were continually depleted. The leaf proportion of the grass decreased (95.2 to 83.9%) (P<0.05) with increase in cutting interval, while proportion of stem in the sward increased with increase in cutting interval.

The crude protein content of the grass declined (11.1 to 8.4%) significantly (P<0.05) with increase in interval of cutting, but the values were within the level recommended for optimum ruminant performance in the tropics (Minson 1990). As observed, NDF, ADF, ADL, cellulose and hemicelluloses significantly (P<0.05) increased (53.4 to 77.9%, 29.7 to 44.2%, 7.4 to 13.3%, 22.3 to 31.0% and 23.7 to 33.7%, respectively) with increase in cutting interval for the grass.

The leaf proportion which decreased with increase in cutting height and interval and the stem proportion that increased with increasing cutting interval, support the lower CP contents recorded in this trial as cutting was delayed for the grass. The values for NDF and ADF increased with increase in cutting interval and height. The increasing values of NDF and ADF of the grasses with advancing harvesting stage might be associated with an increase in

stem proportion and cell wall lignifications which made them more fibrous and less digestible as forage matured.

In vitro dry matter digestibility (62.7–49.6%) and metabolisable energy (8.9–6.4 MJ/kg) for the grass also declined ($P<0.05$) as cutting interval increased. The decline in digestibility with maturity might be due to deposition of lignin in the cell wall with increasing maturity and the increasing proportion of stem which becomes less digestible when compared with the leaf portion at advanced maturity.

The results showed no effect of cutting height on the nutritive quality parameters of the grass. The *in vitro* gas production for the grass increased as incubation period extended from 0–72 hrs. The P, Ca, Na and Mg contents indicated no definite pattern observed for the treatments imposed.

Conclusion

For desirable dry matter yield and nutritive quality, P. maximum is best harvested every six weeks at 30 cm above the ground level. Finally, to match up with the mineral requirements of ruminants on forage-based diet, during the dry season; there is need for Ca, P, Mg and Na supplementations based on the physiological state and age of such ruminant.

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