Production of Aruana Guinea Grass Submitted to Cutting Severities and Nitrogen Fertilization

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Presenter Information

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Introduction

Aruana Guineagrass (*Panicum maximum* Jacques cv. Aruana) is widely used as pasture for sheep, which are extremely susceptible to infestation by larvae of gastrointestinal parasites in tropical pasture-based systems (Zanini *et al.* 2012) A way to mitigate this problem, and consequently reduce the need for use of anthelmintics, is by managing pastures with post-grazing height low enough to favor the incidence of sunlight at the base of tussocks that will kill and control larval development, without jeopardizing canopy regrowth and persistence. The pre-grazing sward height recommended for Aruana Guineagrass is 30 cm, when the canopy intercepts 95% of the incident light, and a 15 cm post-grazing height (Zanini *et al.* 2012). As cutting severity and nitrogen (N) fertilization cause morphological and physiological adaptations in individual plants - altering the production of forage grasses - the objective of this study was to evaluate the accumulation of morphological components of Aruana Guineagrass subjected to cutting severities and N fertilization.

Methods

Cylinders were collected (15 cm diameter by 20 cm deep) with undisturbed soil + plant samples (Mattos and Monteiro 2003) from an Aruana Guineagrass pasture established in 2001 and used for sheep grazing. The material (soil + plant) collected was stored in ceramic pots and placed in a greenhouse. Treatments corresponded to four nitrogen (N) rates (50, 100, 150 and 200 mg/dm^3) combined with two defoliation severities (10 and 15 cm height), in a complete randomized block design with four replications in a 4 x 2 factorial arrangement. The experiment was conducted from November 2012 to March 2013. After a 20-day adjustment period, the first cut at 10 and 15 cm height and application of N was carried out. Further cuts at 10 or 15 cm were made as the plants reached 30 cm high. After each cut, the collected material was separated into leaves (leaf laminae), stems (stems + leaf sheaths) and dead material, then dried in a forced draught oven at 65^{o}C until reaching constant mass before weighing. The results were used to calculate the accumulation of each component above he cutting heights (10 and 15 cm) at each cut. Those values were added in order to present the results of total production by morphological component during the period evaluated. Data were subjected to analysis of variance using the GLM procedure of the statistical package SAS® (Statistical Analysis System, version 9.3), using a 5% significance level, the F test was used to compare means of cutting heights, and for the N rates the regression analysis (linear and quadratic effects) was used. For analysis of leaf accumulation and leaf:stem ratio data were log-transformed and for stem accumulation data were square root-transformed.

Results

Dry matter accumulation per pot of leaf, stem and dead material of Aruana Guineagrass varied according to cutting heights and N rates (Fig. 1). The accumulation of leaf material per pot was 14% higher at 10 cm cutting height than at 15 cm with 200 mg/dm^3 of N applied, but not significantly different at the lower N rates. The regression analysis showed a linear response to N rate for accumulation of leaf material per pot ($Y = -0.9250 + 0.08695N$; $R^2 = 0.99$) across the cutting heights. The stem accumulation was higher at 10 cm cutting height than at 15 cm for all N rates, which was also observed for dead material accumulation. However, only with 200 mg/dm^3 of N, the leaf:stem ratio did not differ between cutting heights (4.1 and 6.6 ± 5.0 for cuts at 10 and 15 cm height, respectively). In regards to stem accumulation per pot, the regression analysis showed a quadratic effect in the average of cutting heights ($Y = 0.84375 – 0.0127N + 0.00013 N^2$, $R^2 = 0.98$), and the smallest forage accumulation was observed with 50 mg/dm^3 of N. No effect of N rate on dead material accumulation was observed. According to Zanini *et al.* (2012), managing Aruana Guineagrass swards with grazing at 95 % incident light interception (30 cm high) and having it grazed to 15 cm post-grazing height ensures greater rate of dry mass accumulation and better control of stem elongation. However, our results showed that there seems to be an advantage at 10 cm cutting height compared to 15 cm for leaf accumulation per pot, as long as nutritional N requirements are met, with 200 mg/dm^3 of N as in this experiment and in the absence of environmental stresses. Cutting to 10 cm height can favor the control of gastrointestinal larvae development

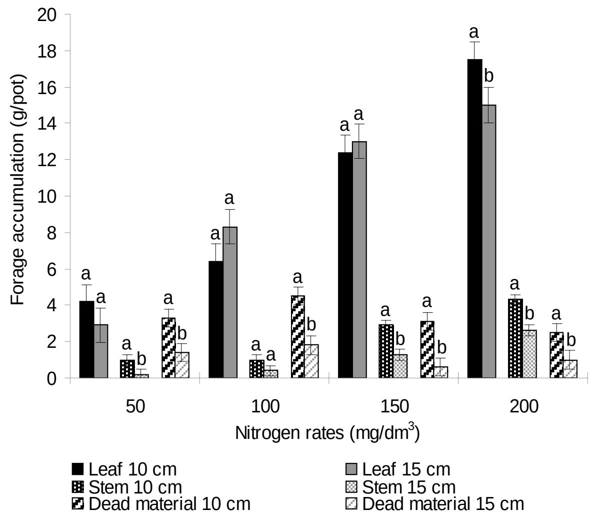

Figure 1. Morphological components accumulation in Aruana Guineagrass subjected to two cutting heights and four nitrogen rates. Lower case letters indicate significant differences (P<0.05) between morphological components means within nitrogen rates. Vertical bars correspond to standard error of the mean.

because it allows higher incidence of solar radiation at the base of tussocks. The use of N fertilizer on pastures aimed mostly at increasing mass production should be managed carefully to ensure environment protection. Furthermore N fertilizer used to increase productivity should always be accompanied by adjustments in the frequency and severity of cuts. For the N application to be effective, it is required to harvest the leaves before they become senescent as it is also required to prevent stem elongation which is common in tropical grasses from the point that the canopy intercepts more than 95% of incident light onwards.

Conclusion

The use of 10 cm cutting height together with a regrowth that allowed the canopy to reach 30 cm height can be used as a target in the management of Aruana Guineagrass, in particular if N provided is adequate.

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