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Accumulation of dry matter and morphological composition of irrigated Mombaça grass with and without nitrogen fertilizer under grazing

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Introduction

Brazil has the largest commercial cattle herd in the world and is the world's leading exporter of fresh and processed meat. Beef production is based on pastures and the production system is influenced by the absence of fertilization and the seasonality of forage production during the year, caused mainly by variation in temperature, rainfall and sunlight hours. Nitrogen (N) is the most important element for the development and growth of grasses, since it accelerates the formation and growth of new leaves, and improves regrowth vigor, resulting in greater production and carrying capacity of pastures (Cecato et al. 2011). The present study aimed to quantify the accumulation of dry matter and percentage of leaf blade of irrigated Mombaça grass (*Panicum maximum* cv. Mombaça) at 4 N fertilizer levels, under intermittent grazing.

Methods

The work was conducted in the northwest of Paraná, Brazil (22°50'16" S, 51°58'22" W; 410 m asl). The soil is classified as Oxisol of sandy texture (Embrapa 2006). A split-plot design with blocks of Mombaça grass (*Panicum maximum* cv. Mombaça) with 4 replications was used. As main plot, 4 levels of N fertilizer were imposed: 0 (control), 200, 400 and 800 kg N/ha/yr; the seasons of the year were the subplots. The nitrogen was applied after grazing in split applications according to the number of grazings per treatment, with 4, 7, 9 and 10 grazing cycles, respectively, for 0, 200, 400 and 800 kg N/ha/yr. The pasture was irrigated with 80 mm per month. A rotational stocking method with crossbred dairy cows was used, with animals entering when the pasture reached 95% light interception and being removed when the pasture's residue was 40 cm high. To determine dry matter (DM) production, 6 samples of 1 m^2 per paddock were cut to ground level before grazing commenced. The harvested forage was dried and herbage accumulation calculated as the difference in available DM before and after grazing. The percentage of leaf blade was determined by separation of the morphological components into leaf, stem and dead material. Results were expressed on a seasonal basis (spring, summer, autumn and winter). The data were analyzed by the statistical analysis system (SAS 2002).

Results and Discussion

Accumulation of DM was highest in summer at all N levels, with the other seasons generally following in order spring, autumn and winter (Table 1). In general, DM accumulation increased linearly as N fertilizer level increased; this was also reported by Freitas et al. (2005), Moreira et al. (2005) and Fagundes et al. (2006).

In all seasons, fertilizing with N increased the average Lf % (percentage of leaf blade). However, overall Lf % was higher in summer, spring and autumn than in winter, independently of N fertilization. The lowest Lf % occurred in non-fertilized plants, independently of the season, and in winter, independently of the dose of N. This result shows the importance of using N at times with appropriate weather conditions to influence the number of leaves and the rate of elongation, and consequently the production of pasture DM (Cecato et al. 2011).

Conclusions

Application of N fertilizer is a useful management tool to increase both available dry matter and the percentage of leaf in the available forage. Manipulation of fertilizer usage to suit particular seasons is a valuable way to obtain optimum responses.

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Table 1. Accumulation of dry matter and percentage leaf blade (± SD) of irrigated Mombaça grass with and without N fertilizer under grazing, for the various seasons of the year.

Season	Nitrogen (kg/ha/yr)				Mean
	0	200	400	800	
			Accumulation of dry matter (t DM/ha)		
Spring	2.89±0.22 Db[1]	6.53±0.29 Cb	10.17±0.18 Bb	17.45±0.59 Ab	9.25±5.60
Summer	4.23±0.26 Da	8.11±0.23 Ca	11.99±0.17 Ba	19.75±0.48 Aa	11.05±5.98
Autumn	2.51±0.48 Cb	4.45±0.32 Bc	6.46±0.30 Ac	6.79±0.80 Ac	5.05±1.62
Winter	1.58±0.35 Db	2.51±0.14 Cd	3.52±0.25 Bd	5.11±0.81 Ad	3.21±1.42
			Percentage of leaf blade (%)		
Spring	65.2±0.55 Ca[1]	76.0±1.79 Aa	73.5±2.40 Ba	72.4±0.88 Bb	71.9±4.41
Summer	60.5±1.97 Ca	71.9±1.10 Ba	75.5±2.96 Aa	76.4±2.33Aa	71.1±6.81
Autumn	63.3±3.26 Ba	74.2±2.46 Aa	73.3±2.69 Aa	73.3±1.26Ab	71.5±5.51
Winter	48.8±4.23 Bb	66.5±1.22 Ab	66.8±2.73 Ab	71.3±1.51Ab	63.3±9.16

[1]Values within parameters followed by the same letters do not differ by Tukey's test (P<0.05); upper-case letters compare N rates within seasons, while lower-case letters compare seasons at the same N rate.

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