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Nutritive Value and Biomass Production of *Brachiaria humidicola* Hybrids with Divergent Biological Nitrification Inhibition Activity

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Abstract

Tropical land areas utilised for feed production are under continuous pressure to provide sufficient feed in terms of biomass and nutrient quality. Also, some *Brachiaria humidicola* (Bh) genotypes have been identified with high Biological Nitrification Inhibition (BNI) activity. The BNI trait may reduce the rate of transformation of ammonia into nitrate in soils and could contribute to mitigation of climate change by avoiding the formation of nitrate and later moderating nitrous oxide emission during denitrification. Twelve intraspecific hybrids of Bh with contrasting BNI activity were classified into 1) high (0.58–0.96 mg NO₃ kg⁻¹soil day⁻¹), 2) intermediate (1.27–1.62 mg NO₃ kg⁻¹soil day⁻¹) and low (1.84–2.49 mg NO₃ kg⁻¹soil day⁻¹) activity. Five Bh genotypes from CIAT’s forage germplasm collection (CIAT 679, CIAT 26146, CIAT 26149, CIAT 26159, CIAT 16888) were employed as controls. Seventeen plots (4 × 4m²) with three replications were used to allocate the experimental units. Each single plot was divided into eight subplots (0.5 × 0.5 m²). Rising-plate-meter (RPM, 30 cm diameter) was used to measure successively the compressed sward height (CSH) of pasture on each subplot at 0, 7, 14, 21, and 28 days after pasture height homogenisation. Eight RPM-heights were taken on each subplot and were averaged. Biomass was collected at two points below the disc (one sample under and one sample above CSH average) of the RPM to ground level after CSH measurement. Biomass was dried for 48 hours at 60°C and ground (1mm) for further analysis. Near infrared spectroscopy (Foss 6500) was used to calculate crude protein (CP), neutral detergent fiber (NDF), NDF digestibility (NDFd), acid detergent fiber (ADF), and in-vitro dry matter digestibility (IVDMD). Ten percent of the samples were randomly assessed by wet chemistry for NIRS validation. The randomised complete block design was employed for data analysis (SPSS-v20). Bh hybrids with intermediate BNI activity had the largest biomass production (3208 kg DM ha⁻¹) and which differed from that of the hybrids with either high or low BNI activity (2916 or 2800 kg DM ha⁻¹, respectively). In contrast, no differences among the BNI groupings were observed for CP, NDF, ADF, NDFd, or IVDMD. Further evaluations across seasons, years, and locations, are recommended to confirm and extend these findings.

Keywords: BNI, *Brachiaria humidicola*, nitrous oxide, tropical grasses