

EFFECT OF CO₂ FERTILIZATION ON BIOMASS PRODUCTION OF A TROPICAL GRASS

EFEITO DA FERTILIZAÇÃO DE CO₂ NA PRODUÇÃO DE BIOMASSA DE UMA GRAMÍNEA TROPICAL

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The rising concentration of carbon-dioxide (CO₂) in the atmosphere, due mainly to fossil fuel combustion and deforestation, is a predictable aspect of climate change and can increase the photosynthesis rate of C₃ and C₄ plants. However, few studies have evaluated these effects on grasses used in Brazilian pastures for livestock grazing. In this study, we evaluated forage production of *Brachiaria brizantha* under contrasting CO₂ atmospheric conditions in a free air carbon-dioxide enrichment (FACE) facility located at the Embrapa Environment research unit, Jaguariúna, São Paulo state (22°43' S, 47°01' W, 570 m above sea level). The facility has twelve octagonal rings (10 m diameter) distributed in a 7 ha area in a completely randomized block design with two treatments and six repetitions. Six rings are kept in untreated conditions ($\approx 390 \mu\text{mol mol}^{-1} \text{CO}_2$; Control) and other six with pure CO₂ flux to achieve a higher target concentration ($\approx 550 \mu\text{mol mol}^{-1} \text{CO}_2$; Elevated CO₂) by means of an arrangement of tubes and wireless network controller based on environmental sensors. In October 2015, *Brachiaria brizantha* cv. Marandu was sown in 5.8 m² plots inside each of 12 octagonal rings combined with P and K fertilization (82 kg ha⁻¹ P₂O₅ and 41 kg ha⁻¹ K₂O), followed by N fertilization (40 kg ha⁻¹ N) 30 days later. Seventy days after sowing, the aboveground biomass was cut, leaving 20 cm of plant residue. From January to July 2016, at regular intervals of 21 days, ten harvests were performed, in which after measuring the canopy height, two forage samples (0.25 m²) from each plot were collected, weighed (fresh mass, FM) and dried (dry mass, DM) in a forced air circulation oven (72 h at 55 °C) to determining the aboveground biomass availability. The statistical analysis was performed using SAS® 9.4. The data were submitted to analysis of variance using the PROC GLM procedure, and the effect of treatment (Control and Elevated CO₂) was tested by least squares. Forage height and fresh and dry aboveground biomass production were not significantly different between treatments ($P > 0.05$). The results indicate that at least under short-term enrichment, *B. brizantha* was not affected by elevated CO₂. This result is in line with other studies that have shown that C₄ plants are less responsive than C₃ plants to CO₂ enrichment, probably because in C₄ plants, the ribulose-1,5-bisphosphate carboxylase-oxygenase (RuBisCO) is located in bundle sheath cells in which CO₂ is concentrated three to six times higher than atmospheric concentration, which is sufficient to saturate RuBisCO and prevent any increase in CO₂ uptake with CO₂ fertilization.

Keywords: *Brachiaria brizantha* cv. Marandu; climate change; elevated CO₂

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