Efficient water use and nitrogen uptake in ryegrass under different nitrogen doses in a rotatínuo grazing concept

Gabrielle G. da Silva*[1], Lóren P. Duarte[3], Leonardo D. Mori[3], Davi B. Bernardo[2], Luciano P. Brauwers[3], Paulo C. de F. carvalho[3]
[1]Universidade Federal do Rio Grande do Sul, Porto Alegre/RS, Brasil; [2]Universidade Federal do Pampa, Dom Pedrito/RS; [3]Universidade Federal do Rio Grande do Sul, Porto Alegre/RS
*Master student - gabriellegenros@gmail.com

Efficient water use (EWU) and nitrogen uptake (N upt) are crucial aspects for promoting sustainable agricultural production. Contemporary challenges such as food security, water resource scarcity, and the need for agricultural intensification require agricultural production to occur without compromising the quality of life for future generations. Therefore, the objective of this study was to investigate the effect of different N doses and irrigation on EWU and N upt in ryegrass (Lolium multiflorum) pasture managed under a rotatínuo grazing concept. The study was conducted in Eldorado do Sul, Brazil, from May to November 2022, at the experimental farm of the Federal University of Rio Grande do Sul. The local climate is classified as humid subtropical (Cfa). The experimental design was a randomized complete block with three replications distributed in 18 plots. To determine EWU, evapotranspiration was estimated using the FAO Penman-Monteith method. Water use efficiency was calculated as crop biomass divided by evapotranspiration. Crop coefficients were adjusted based on soil moisture for each treatment, measured using the HidroFarm device. N upt was determined by collecting three above-ground biomass samples from 0.025 m² quadrants when plants reached a height of 20 centimeters. Samples were dried at 55°C for 72 hours, ground, and analyzed for N content using the Kjeldahl method to ensure accurate assessment of plant nutritional content. Results were analyzed using ANOVA and Tukey's test at 5% significance level in R software. Results showed that water use efficiency was 12.8 ± 1.08 mm kg^{-1} DM ha^{-1} and 13.4 ± 1.16 mm kg^{-1} DM ha^{-1} for 75N and 150N, respectively, while the no N treatment (0N) recorded 6.52 ± 1.79 mm kg^{-1} DM ha^{-1}. N upt was 80.4 ± 7.77 kg ha^{-1} and 95 ± 8.63 kg ha^{-1} for 75N and 150N, respectively. These data suggest that treatments with higher water use efficiency also achieved higher levels of N upt. Additionally, results indicated that higher N doses (75N and 150N) showed greater water use efficiency compared to 0N. There were no statistically significant differences in water use efficiency and N upt among the irrigation treatments.

Keywords: water use efficiency, nitrogen uptake, ryegrass, rotational grazing, nitrogen doses, irrigation

Acknowledgments: Aliança SIPA, YARA Knowledge Grows.