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"Solidarity in a competing world — fair use of resources"

Brachiaria humidicola Grass Reduces Soil Nitrous Oxide Emissions from Bovine Urine Patches under Tropical Conditions

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Abstract

The generally high levels of nitrogen (N) in bovine urine result in the formation of soil nitrous oxide (N_2O) emission hotpots when bovine urine is deposited in grazed pastures. High spatial variability in the distribution of urine patches makes mitigation of N_2O emission challenging. Previous studies have reported that the roots of tropical forages such as *Brachiaria humidicola* (Bh) exude organic molecules that can inhibit the activity of soil microbial nitrifiers (biological nitrification inhibition-BNI), thus reducing ammonia oxidation and, consequently, nitrate and N_2O production. We hypothesised that N_2O emissions from soils under forages with BNI capacity are lower than from soils under forage species without BNI capacity. To test this hypothesis, field plots with two forage cultivars, *Brachiaria* Hybrid Mulato (BHM) and Bh 679 which, correspondingly, have low and high BNI capacity, were selected from a long-term field experiment (10 years) at the International Center for Tropical Agriculture in Colombia. Soil nitrification rates and denitrification potential were evaluated through laboratory assays conducted using soils from the selected field plots. Soil N_2O emissions from simulated urine and water patches were monitored using the static chamber technique over a 30 day period. Concurrently, soil variables such as mineral N and moisture were monitored. Results from the laboratory assays show a suppression of both nitrification and denitrification in soils from plots with Bh 679 than those BHM. Cumulative N_2O fluxes were higher from soils under BHM (155 mg N_2O-N per m^2) compared to those under Bh 679 (60 mg N_2O-N per m^2). N_2O emissions were not related to N input. We conclude that tropical forages with BNI capacity can play a key role in mitigating N_2O emissions from bovine urine deposited on grazing pastures.

Keywords: Biological nitrification inhibition, climatic change mitigation, denitrification, nitrification, nitrous oxide, urine patches

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