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NITROUS OXIDE LOSSES FROM BEEF CATTLE EXCRETA IN AN INTEGRATED CROP- LIVESTOCK SYSTEM

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Introduction The nitrogen originated from bovine excreta and deposited in pasture, can be lost from the production system in various forms, including gaseous emissions. Nitrous oxide is one of the most potent greenhouse gases due to its high global warming potential. The objective of this study was to evaluate the effect of bovine excreta and of their deposition on the soil in the wet or dry season, on gaseous losses of nitrogen in an integrated Crop-Livestock system (iCL).

Material and Methods

Fourty eight plots were established in a randomized complete block of split-plots: 3 treatments (urine, dung and control), 2 pastures, 2 periods of excreta application (dry and wet seasons) repeated in time (two years of applications) in four blocks. The gas samples were taken by the method of manual static chambers. Immediately after the application of the excreta samples were taken during seven consecutive days. Then the frequency of sampling was reduced to twice a week and, finally, fortnightly, totaling 502 days in the dry seasons and 388 in the rainy seasons. Concurrently, soil sampling was carried out to verify the water filled pore space (WFPS), pH, nitrate and ammonium levels. Descriptive statistics was used to demonstrate the daily N_2O flux. Data were subjected to analysis of variance (ANOVA) and means were compared by Tukey's test ($p<0.05$).

Results and Conclusions

The deposition of excreta in the pastures under iCL increased soil N_2O fluxes, compared to those from the control site. In the dry season positive fluxes of N_2O occurred after rainfall event, responding increased WFPS. In the rainy season emissions increased soon after application of excreta. In the dry season the N_2O fluxes were associated with greater availability of ammonium, however, in the rainy season the fluxes were correlated with the availability of nitrate. It was not possible to conclude whether nitrification or denitrification was the dominant process in N_2O production, however it seemed that both played relevant roles, like described by Sordi et al. (2014). Urine deposition resulted in greater losses of nitrogen than dung. The largest FE were observed for urine in the rainy season of the year (0,44%). It was below the default 2% EF recommended by the IPCC. The EF of urine in the dry season was 0,20%. For dung it was 0,13% in the rainy and 0,08% in the dry season. Our results suggest that the EF proposed in the IPCC Guidelines (2006) for cattle excreta are overestimated for the tropical savannah ecosystem of Brazil. Similarly to the findings by Lessa et al. (2014), the disaggregation of EF for excreta type is recommended.

References Cited

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