EFFECT OF CHEMICAL COMPOSITION OF DUNG ON THE EMISSIONS OF N_2O AND CH_4

EFEITO DA COMPOSIÇÃO QUÍMICA DAS FEZES NAS EMISSÕES DE N_2O E CH_4

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Abstract

The objective of this study was to investigate whether the chemical composition of the dung of different species of herbivores (sheep, goats, beef cattle, dairy cattle and horses) can be an indicator of N_2O and CH_4 emissions. The incubation was conducted in a greenhouse. Soil collection was carried out in an area of *Urochloa brizantha cv. Marandu* that has been established for more than 10 years. The experiment was carried out in a completely randomized design with five treatments and five replications. The treatments used were dung from sheep, goats, beef cattle, dairy cattle and horses. The amounts added per treatment were 400 g of soil and 100 g of fresh dung. The soil was maintained at a constant temperature of 18% volumetric moisture throughout the experimental period. The dung samples were dried in forced-air ovens at 55 °C, then ground and analyzed for chemical composition. We evaluated dry matter (DM), volatile solids (VS), total nitrogen (TN), non-protein nitrogen (NPN), neutral detergent fiber (NDF), acid detergent fiber (ADF), insoluble nitrogen content in neutral detergent fiber (NDIN), insoluble nitrogen and total carbon from dung. After the application of the treatments, sampling was carried out daily during the first week. From the 8th day after application (DAA) onward, collections were made three times a week up to 30 DAA, and weekly up to 100 days of evaluation. Sampling was performed after the chambers were closed (T_0), and after 30 minutes (T30). To reduce the dimensionality of the data and provide insights into the effect of the chemical composition of dung on N_2O and CH_4 emissions, principal component analysis (PCA) was performed. For this, the data were evaluated in terms of the assumptions of the test. We utilized a factorial map to describe the effect of the chemical composition of dung on the different animal species with emissions of N_2O. The PCA divided the original dataset to achieve high dimensionality of latent hits, namely PC_1 and PC_2, as a result of orthogonalization. The primary (61.9%) and secondary (19.6%) components together represented 81.5% of the emissions. The first principal component had positive linear correlations with the eigenvalues, namely N_2O ($r = 0.89$, p-value <0.05), TN ($r = 0.92$, p-value <0.05), NDIN ($r = 0.98$, p-value <0.01) and ADIN ($r = 0.88$, p-value <0.05). In contrast, there were negative linear correlations with NDF ($r = -0.93$, p-value <0.05) and C/N ($r = -0.94$, p-value <0.05). For PC_2, there was a positive linear correlation with the variable VS ($r = -0.89$, p-value <0.05), and negative correlation with CH_4 ($r = -0.94$, p-value <0.05). The results corroborate other works that have demonstrated the increase of N_2O emissions as the NT content increases and the C/N ratio decreases. This study also demonstrates the need for more research to evaluate the interactions between moisture and dung microbiota with N_2O emissions.

Keywords

Chemical composition, excreta, greenhouse gas, methane, nitrous oxide.