145-6 Correlating Denitrifying Catabolic Genes with Soil N2O Emissions Under Contrasting Soil Disruption and Organic Amendments.

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*Roberto André Grave[1], **Rodrigo da Silveira Nicoloso**[2], Marcio Luis Busi da Silva[2], Melissa Paola Mezzari[3], Martha Mayumi Higarashi[2], Paulo Cezar Cassol[4] and Morgana Dalla Costa[5], (1)Instituto Federal Catarinense, Concordia-SC, Brazil*
(2)Embrapa Swine and Poultry, Concordia-SC, Brazil
(3)UNOESC, Videira-SC, Brazil
(4)UDESC, Lages-SC, Brazil
(5)FACC, Concordia-SC, Brazil

Agriculture accounts for up to 84% of the anthropogenic N_2O emissions to the atmosphere. Soil tillage and fertilization practices can affect soil abiotic factors (e.g., pH, temperature, water saturation, nitrate and labile organic carbon contents) and consequently the abundance of nitrifying and denitrifying bacteria communities that regulates N_2O efflux from soils. Nonetheless, the impact of organic N sources on bacterial communities and N_2O production in aerated soils under conventional tillage and no-till systems remains unclear. Labile C-rich organic fertilizers [i.e. raw swine slurry (RS)] could stimulate oxygen consumption by the growth of heterotrophic bacteria respiration leading to anoxic environment that are not conducive for complete denitrification. Contrastingly, the application of anaerobically digested (ADS) or composted (CS) swine slurry could offset soil N_2O emission by limiting substrate availability for both nitrifying and denitrifying bacteria. We evaluated short-term N dynamics and N_2O emission from a Rhodic Kandiudox under contrasting soil disruption [undisturbed (US) and disturbed soil (DS)] and N sources (140 kg N ha^{-1} as urea, RS, ADS, CS, and a control treatment without N). Soil abiotic factors were correlated with real-time quantitative PCR (qPCR) data to estimate concentrations of bacteria community harboring specific catabolic nitrifying-ammonium monooxygenase (amoA), and denitrifying nitrate- (narG), nitrite- (nirS and nirG), nitric oxide- (norB) and nitrous oxide reductases (nosZ) genes. Water-filled pore space (WFPS) was consistently higher in the US and increased N_2O emission in comparison to DS when WFPS was higher than 0.6 cm^3 cm^{-3}. N_2O emission from US amended with ADS and CS was 47.5 and 16.6% lower than RS (5.6 kg N_2O-N ha^{-1}), respectively. Correlations between soil abiotic factors and the distribution of nitrifying and denitrifying bacteria specific genes will be discussed in attempt to demonstrate the effects of organic fertilization and their implications on N_2O emission under contrasting soil disruption levels.
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