Comparing N2O Concentrations with Surface Fluxes under Different Farming Practices during Spring Thaw

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A field study in the Red River Valley, Manitoba, Canada, investigated the impact of farming management practices, including fertilizer best management practices (BMPs) and 4R principles, on soil nitrous oxide (N2O) concentrations and flux emissions. Conducted over the spring-thaw period and growing season, the study used four fields on clay soil and measured N2O concentrations and surface fluxes with a micro-meteorological tower. It found significant variability in N2O levels, with the highest concentrations at deeper soil depths. For instance, Field One recorded up to 4 µLN2O/L at 30 cm depth post-harvest in 2021, while the spring thaw of 2022 and 2023 saw even higher levels, particularly in Field Two with 37 µLN2O/L at 30 cm. The study also noted that enhanced efficiency nitrogen fertilizer (EENF) generally led to higher N2O concentrations compared to conventional fertilization, especially at 5 cm and 60 cm depths during the initial growing season. Significant effects of cover crops on N2O concentration were observed at all depths. However, these effects were not significant during the spring thaw. A notable correlation between N2O concentration and precipitation at 15 cm depth was observed, but no correlation was found between N2O concentration and flux emission. This research provides insights into the effects of different farming practices and environmental factors on N2O emissions in agricultural soils, contributing to the understanding of greenhouse gas emissions in agricultural settings.