

A field study of soil N₂O concentrations affected by cover crop in the Red River Valley, Manitoba

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Cover crop (CC) has been suggested as a promising strategy due to its benefits in preventing soil erosion and improving soil health. However, it remains unclear how CC affects soil N₂O concentration and emissions over the spring-thaw period in Manitoba. A plot-based field study with four fields was undertaken on clay soil in the Red River Valley, Manitoba, Canada, to illuminate the fluctuation of the temporal and spatial changes of soil N₂O concentration over the spring-thaw period and growing season as affected by CC. Cover crops (rye) were planted on the two eastern Fields during the fall of 2021. N₂O concentrations at 5, 15, 30, and 60 cm soil depths were measured using the silicone diffusive equilibrium samplers to estimate soil profile N₂O effluxes. The results show that when frozen soil is thawed, soil profile N₂O concentrations at all depths significantly increased in all Fields. We also observed that N₂O concentrations at 30 cm and 60 cm were about 2.7 and 1.3 times higher than those at lower depths. Moreover, soil N₂O concentrations were generally not affected by cover crops. Future data analysis will focus on the relationship of soil N₂O concentrations with surface flux measured using the micro-meteorological tower.