Preferred theme: **Reducing Nitrogen Losses**

Cover crops and soil tillage differently affect N2O emissions.

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Abstract *(250 words, excluding up to 3 references, no figures)*

Cover crops can affect nitrous oxide emissions (N_2O) when incorporated as residues into the soil, however, this may differ depending on tillage strategy and cover crop. The objective of this case study was to quantify N_2O emissions as influenced by these factors. Perennial ryegrass (RG*, Lolium perenne*), plantain (PL, *Plantago lanceolata*), RG-PL, and RG-PL-red clover mix (RG-PL-RC, *Trifolium pratense*) with 82, 103, 55, and 136 kg biomass N/ha were either terminated by shallow rotovation followed by deeper ploughing (ro+plou), or directly by ploughing (plou), respectively. The N_2O flux was continuously measured with automated chambers from March – June 2021 (DOY 72-166). Measurements were not replicated, but plot variance was evaluated. Cumulative N_2O-N emissions were higher for plou (3.7-7.5 kg/ha) than for ro+plou (1.2-3.7 kg/ha), with 2-to-5-fold higher emissions in plou for RG-PL, RG, and PL, and the smallest difference in RG-PL-RC. In ro+plou, lowest and highest cumulative N_2O emissions were in PL and RG-PL, while in plou it was RG-PL-RC and RG-PL, respectively. Average soil NO3-N accumulated from 3.5 to 10.4 and 2.9 to 8.6 mg/kg in ro+plou and plou, respectively (DOY 84-119), indicating mineralization and nitrification of residue-N. Thereafter, NO3-N gradually decreased and N_2O emissions increased, indicating denitrification as the main process of N2O production. The results demonstrate possible interactive effects of cover crop and tillage on N_2O emissions, and that ro+plou consistently reduced N_2O emissions under the studied climatic and soil conditions. This case study contributes further on how cover crop type and tillage strategy affect N2O emissions.