



Investigation of soil microbial factors related to greater than expected residue induced N₂O emissions from canola (*Brassica napus L.*)

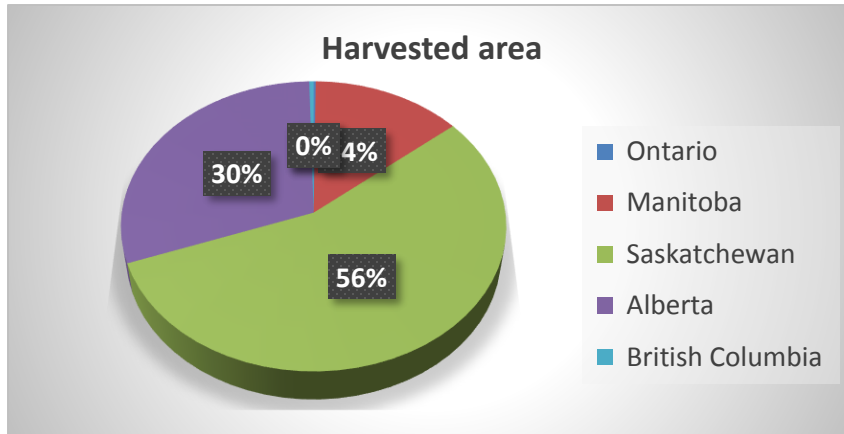
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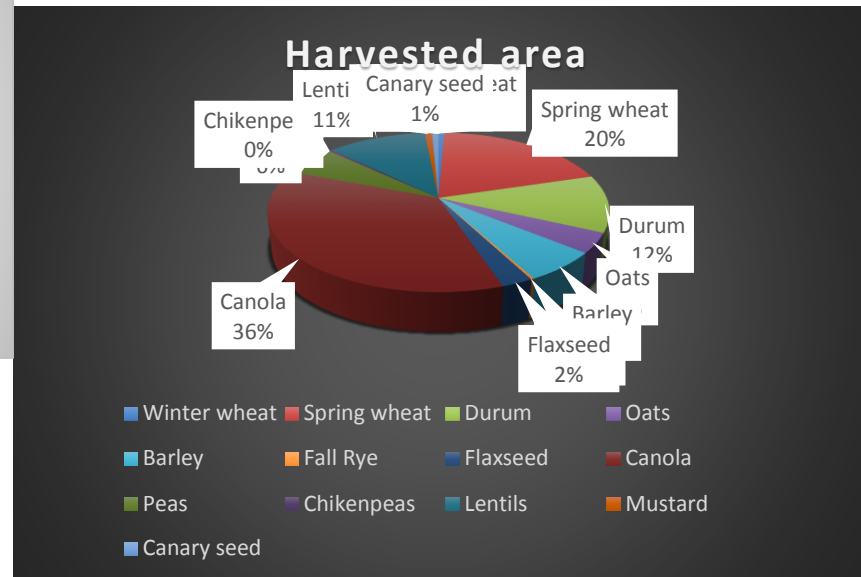
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Introduction

- **Canola cultivation in Canada**
 - 20% of world canola production



12.7M Acres of land

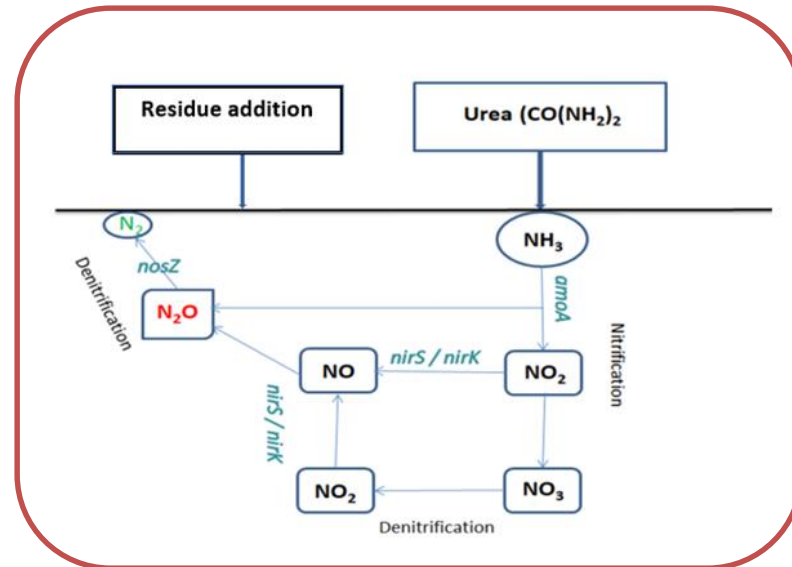


20.1M tonnes of straw residue

7.7M tonnes of root residue

- Previous studies: Begum et al. (2013) Baron and Lemke (2013)

- Nitrous oxide (N_2O)
 - GHG
 - Global warming Potential
 - Persistence
 - Source
 - Process involved
 - Nitrification
 - Denitrification



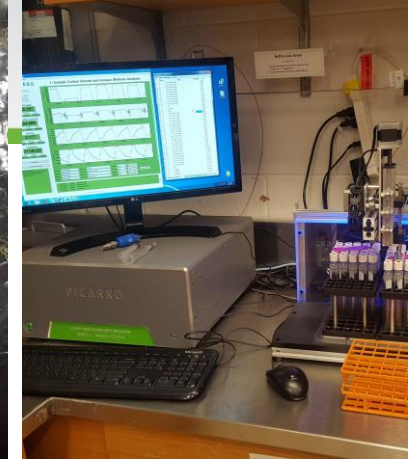
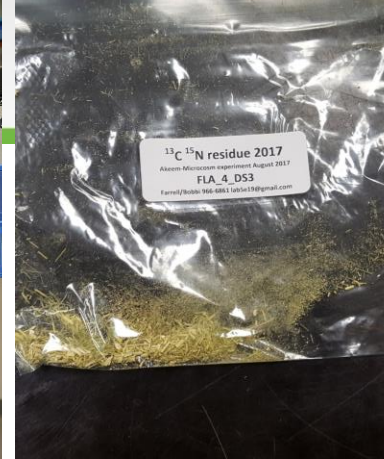
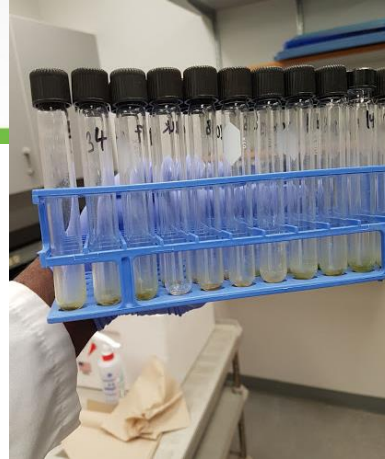
Hypothesis

Differential N_2O and CO_2 emissions after residue addition, quantitatively depends on crop residue quality and microbial activities in the soil

Objectives

- Investigate why canola residue induces greater N₂O emissions, using ¹⁵N and ¹³C enriched residues (canola, flax, pea and wheat)
- Find relationship between emissions and active microbial communities present in the soil

Materials and Methods



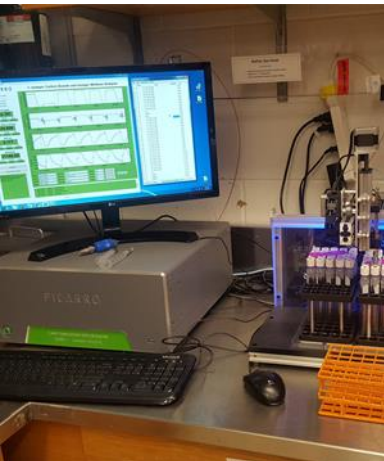
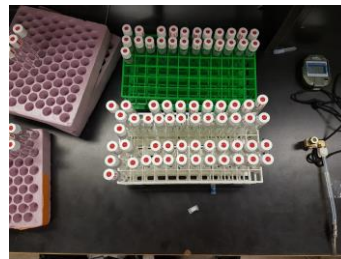
Residue production, incubation and gas sampling

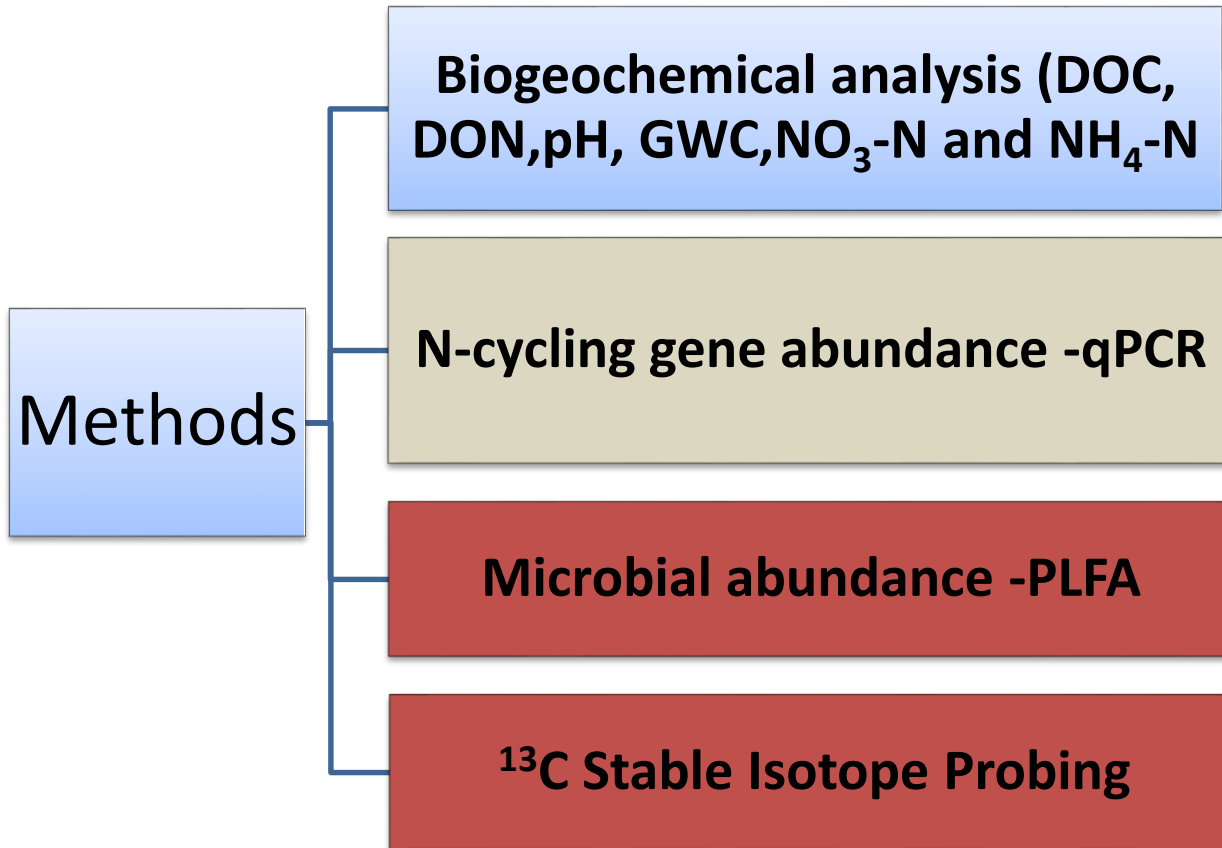


Variable residue addition

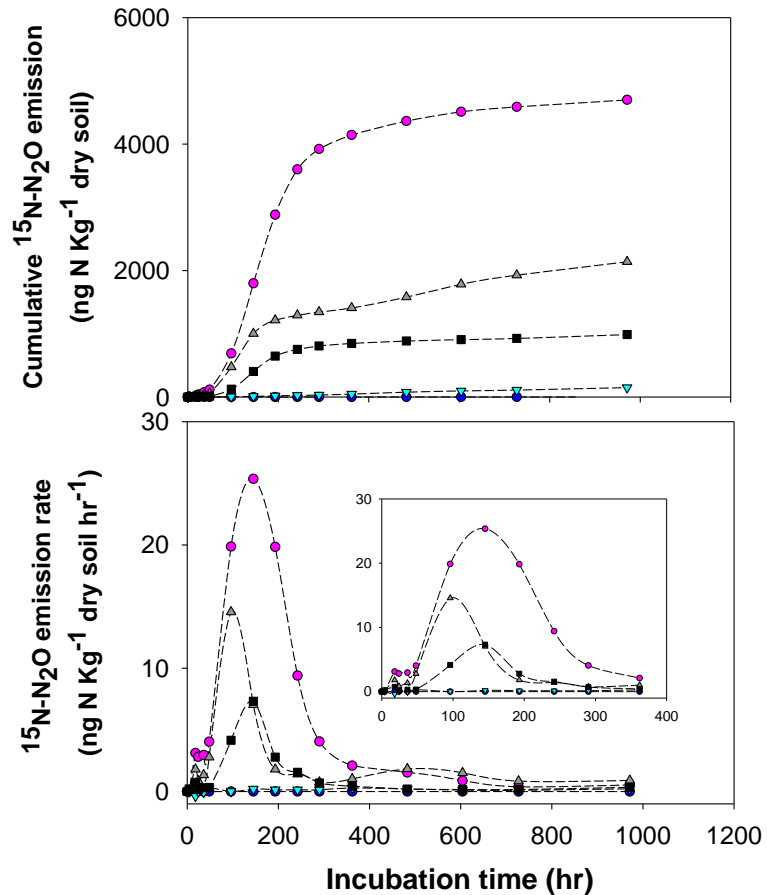
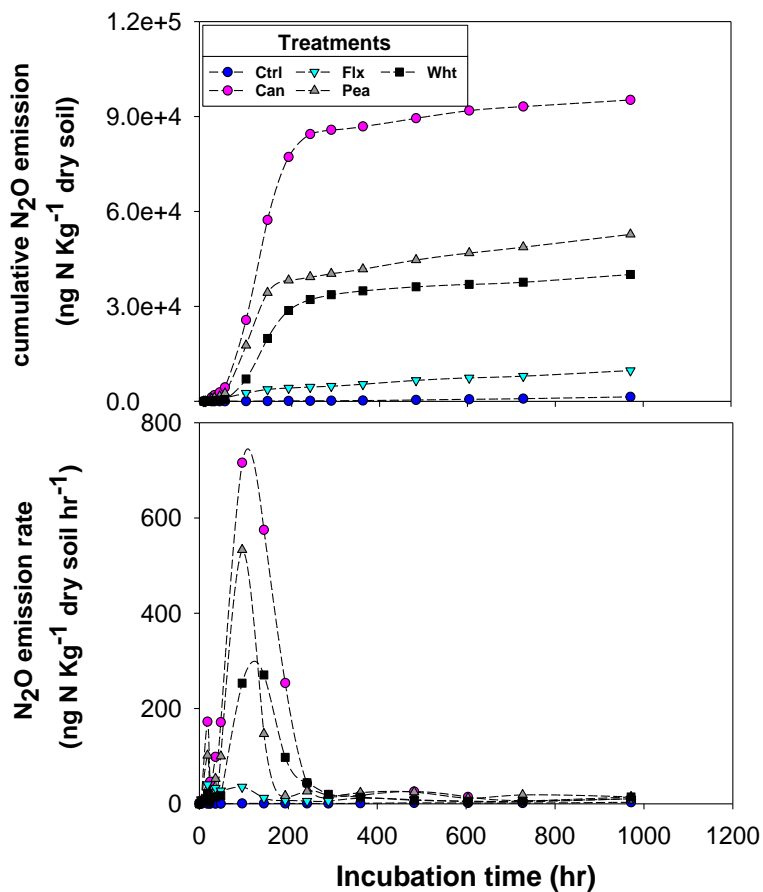


5 Trts * 4rep * 4 DS + 4 Blks

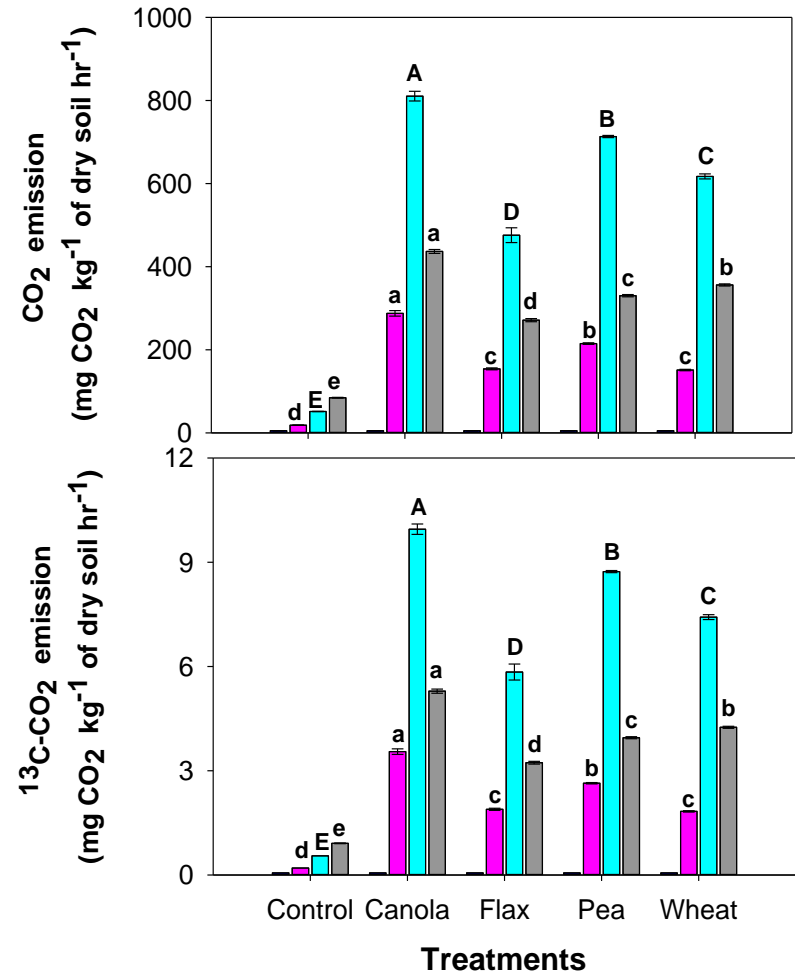
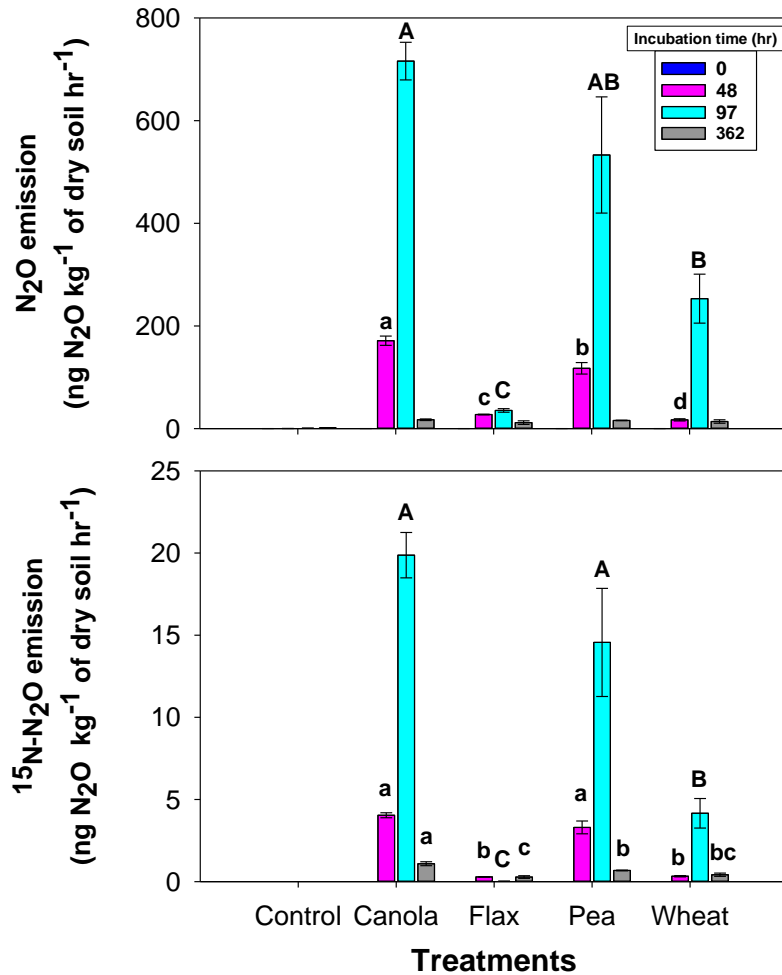


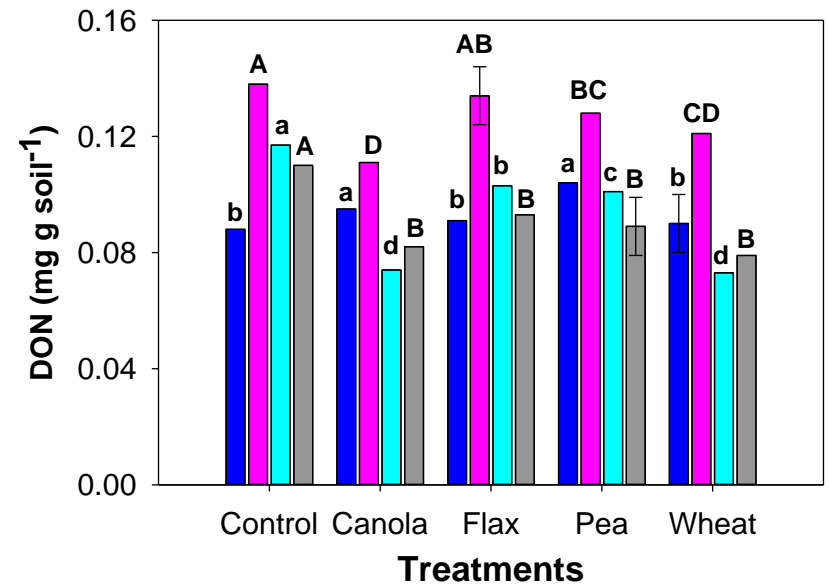
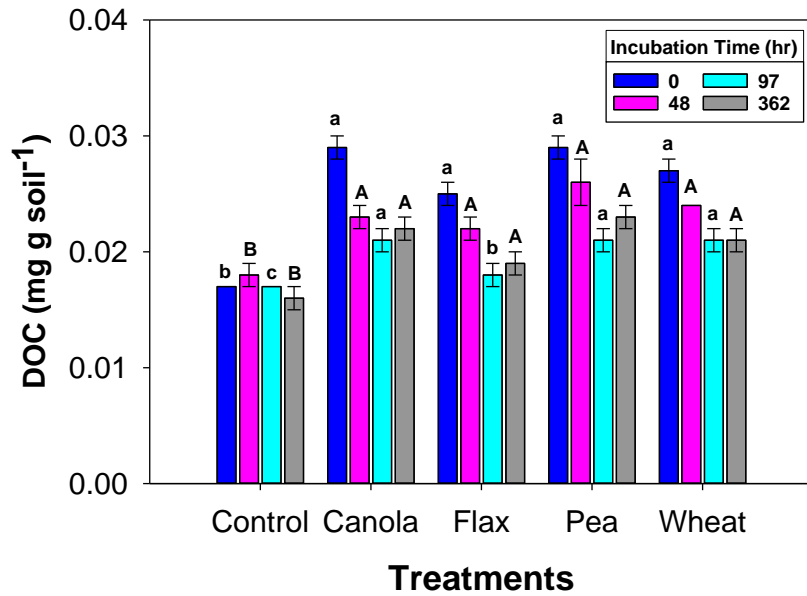


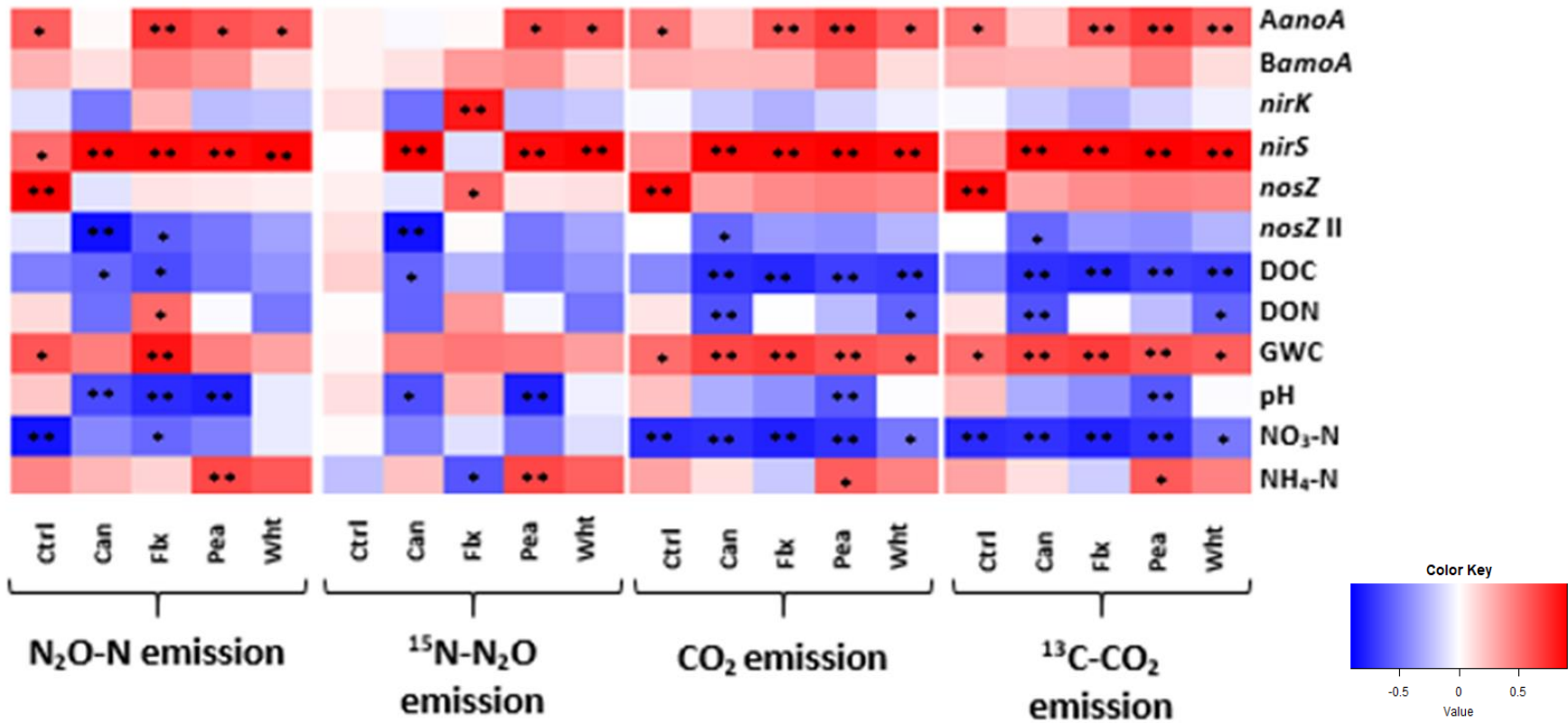
Results and Discussion



Residue	Residue EF (%)
Control	-
Canola	6.76
Flax	0.27
Pea	3.86
Wheat	2.60







Spearman correlations of N_2O , ^{15}N - N_2O , CO_2 and ^{13}C - CO_2 emissions with N cycling functional genes, biogeochemical properties and microbial abundance of incubated soil, as affected by labelled residue application. *The correlation coefficients ranging from negative to positive are indicated by colour intensity changing from blue to red. * $p < 0.05$, ** $P < 0.001$.*

Summary and next steps

- ❑ Canola residue induce higher denitrification because of increase DON availability per unit of DOC, thus higher capacity to generate N_2O
- ❑ *nosZ* genes are the only known N_2O sink in the soil. This gene is not actively sinking N_2O produce on canola compare to other residue treatments.



Analysis of ^{13}C -SIP data to determine microbial community differential energy source

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