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Soil organic matter response to 29 years of maize residues incorporation under contrasting nitrogen fertilisation regimes

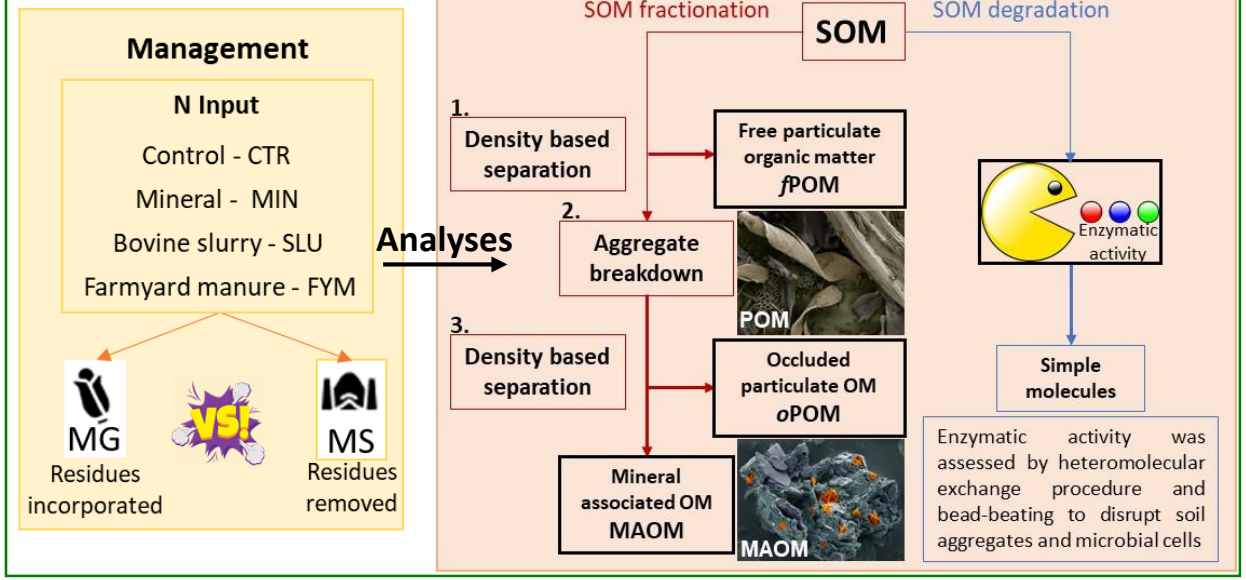
Claudia Damatirca[1], Barbara Moretti[1], Laura Zavattaro[2], Luisella Celi[1], Flavio Fornasier[3], Chiara Bertora[1]

[1]DISAFA, Univ. of Turin, Italy, claudia.damatirca@unito.it; [2]DSV, Univ. of Turin, Italy; [3]CREA – VE, Gorizia, Italy

Introduction

Preserving and, where possible, increasing soil organic matter (SOM) storage will improve soil functions, such as nutrient cycling and carbon sequestration. This study aimed at evaluating the effect of long-term (29 years) maize residues incorporation experiment on quality and quantity of SOM stocks and soil enzymatic activity under four different N fertilisation strategies.

Materials and Methods



Results

There was an effect of fertilisation on TOC content in both bulk soil and SOM fractions in the first layer: MG system showed a significant C accumulation in bulk soil and SOM fractions, except for *f*POM (Fig. 1a).
As in 0-15 cm layer, in the second layer (15-30 cm) fertilisation had a positive effect on the C content in both soil and SOM fractions (Fig. 1b), but residue incorporation influenced positively only soil TOC and MAOM C content .

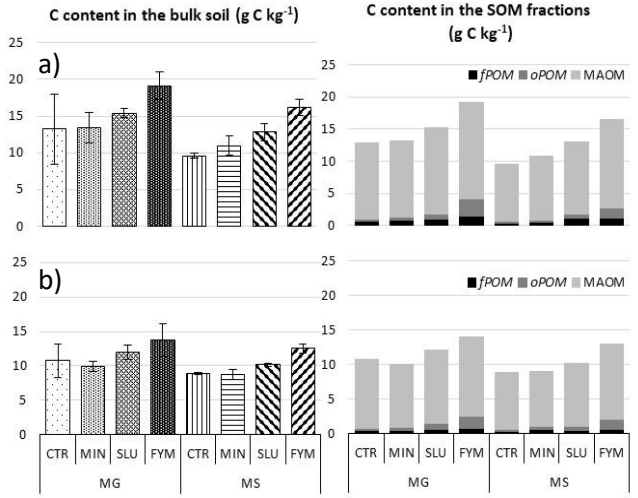


Fig. 1 C content in the bulk soil (left) and in the SOM fractions (right) in the: a) 0-15 cm and b) 15-30 cm layers

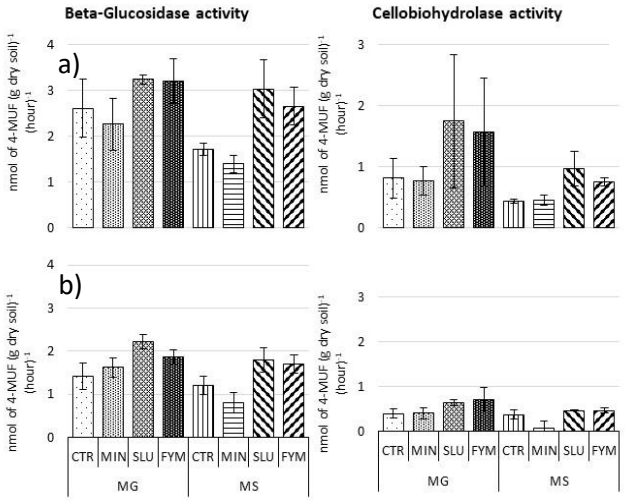


Fig. 2 BetaG (left) and Cell (right) activity in the: a) 0-15 cm and b) 15-30 cm layers

BetaG activity was influenced by both fertilisation and residue addition in both layers. Same trend was observed for Cell activity. Both enzymes were negatively affected by mineral N addition, but in the MG treatment this negative effect was reduced thanks to residue incorporation. FYM and SLU followed a similar trend with intense activity of both enzymes. Conversely, MIN and CTR had similar and low enzymatic activities. The activity in the MG treatment was always higher than in MS (Fig. 2a, b).

Conclusions

The presence of more *o*POM in MG than MS treatment is good indication of crop residue contribution to SOC stabilization. Both BetaG and Cell enzymes are involved in SOM turnover with a high importance in C cycle. Their increased activity and little changes in *f*POM between MG and MS reflect the high turnover rates of C in the soils where crop residues and manure or slurry are regularly applied.