



Parma 16-19 settembre 2019

ABSTRACT BOOK

a cura della Società Geologica Italiana



Congresso
SIMP-SGI-SOGEI 2019

Il tempo del pianeta Terra
e il tempo dell'uomo:
Le geoscienze fra passato e futuro



PRESIDENTI DEL CONGRESSO

Mario Tribaudino (SIMP), Fabrizio Storti (SGI)

COMITATO SCIENTIFICO

Luca Bindi, Angelo Camerlenghi, Piergiulio Cappelletti, Fulvio Celico, Carlo Doglioni, Elisabetta Erba, Francesco Frondini, Guido Giordano, Massimo Mattei, Alessandro Pavese, Stefano Poli, Antonello Provenzale, Elisabetta Rampone, Mauro Soldati, Andrea Zanchi

COMITATO ORGANIZZATORE

Alessandra Montanini (coordinatore)
Domenico Calcaterra, Bernardo Carmina, Lorenza Fascio, Nadia Malaspina, Fabio Massimo Petti, Alessandro Zuccari

COMITATO ORGANIZZATORE LOCALE

Andrea Artoni, Fabrizio Balsamo, Luca Barchi, Danilo Bersani, Cristian Cavozi, Alessandro Chelli, Andrea Comelli, Daniela D'Alessio, Antonietta Di Matteo, Giovanna Gianelli, Paola Iacumin, Giovanni Leonelli, Alessio Lucca, Luciana Mantovani, Paola Monegatti, Davide Peis, Emma Petrella, Davide Persico, Mattia Pizzati, Emma Salvioli Mariani, Arianna Secchiari, Enrico Selmo, Elena Turco, Roberto Valentino, Giuliana Villa

ABSTRACT BOOK EDITORS

Bernardo Carmina, Fabio Massimo Petti, Giulia Innamorati, Lorenza Fascio

*Papers, data, figures, maps and any other material published are covered by the copyright own by the **Società Geologica Italiana**.*

DISCLAIMER: The Società Geologica Italiana, the Editors are not responsible for the ideas, opinions, and contents of the papers published; the authors of each paper are responsible for the ideas opinions and contents published.

La Società Geologica Italiana, i curatori scientifici non sono responsabili delle opinioni espresse e delle affermazioni pubblicate negli articoli: l'autore/i è/sono il/i sol/i responsabile/i.

Effects of natural and NH₄-charged zeolite amendments and their combination with 3,4-dimethylpyrazole phosphate (DMPP) on soil gross ammonification and nitrification rates

Ferretti G.*¹, Galamini G.¹, Deltedesco E.², Gorfer M.³, Faccini B.¹, Zechmeister-Boltenstern S.², Coltorti M.¹ & Keiblinger K.M.²

¹ Department of Physics and Earth Science, University of Ferrara.

² University of Natural Resources and Life Sciences Vienna (BOKU).

³ Austrian Institute of Technology (AIT).

Corresponding email: frgcm@unife.it

Keywords: gross N transformation rates, Nitrogen cycle, natural zeolites.

The use of zeolitites (rocks with > 50 wt% of zeolites) at natural (NZ) and NH₄-enriched state (CZ) as soil amendments is recognized as a valuable management practice to improve agricultural sustainability. Zeolites are known to influence the nitrogen (N) dynamics in soils because of their very high cation exchange capacity.

However, their influence on soil N transformation processes is mostly unknown, especially concerning their effects on gross rates of mineralization and nitrification. Recent studies demonstrated that NZ has limited influence on soil microbial biomass activity in the short-term period, while CZ is responsible for a priming effect on soil microbial biomass, which stimulates net NO₃⁻ production and NH₄⁺ consumption. In this optic, the high NO₃⁻ concentrations induced by CZ suggests that the application together with a nitrification inhibitor (NI) would improve Nitrogen Use Efficiency (NUE) and reduce N losses.

With this work we aimed at unveiling the mechanisms for different N availability after zeolite amendments, by measuring gross N mineralization and nitrification rates in zeolite amended soils both with and without the addition of a NI.

Gross nitrification and mineralization rates were evaluated using the ¹⁵N pool dilution technique in soils amended with NZ and CZ, with and without a commonly used synthetic nitrification inhibitor 3,4-dimethylpyrazole phosphate (DMPP).

The experiments were performed on a slightly alkaline soil with silty-clayey texture, amended with ten wt% of NZ and CZ in comparison to an unamended soil. Fertilizers were added at a ratio of 170 kg N ha⁻¹. At time 0 and after 24 h, we measured NH₄⁺ and NO₃⁻ concentration and N isotopic signature. The total evolved N₂O during the incubation as well as total DNA and functional genes involved in the N cycle (*amoA*, *BamoA*, *nirS*, *nosZ*) through qPCR were also determined.

Results show that the addition of NZ to soil had no effects on NH₄⁺ and NO₃⁻ production and consumption rates in this soil. On the other hand, CZ amended soil showed a significantly higher gross NH₄⁺ production as well as high N₂O emissions. The latter were corroborated with a significantly lower content of *nosZ* and *nirS*. The lower expression of N₂O reductase genes likely resulted in higher N₂O emissions.

Concerning the DMPP, it generally lowered the NH₄⁺ consumption, favoring the preservation of this pool. The efficiency of DMPP was not affected by the presence of zeolites at natural state but showed synergic effects with CZ. Additionally, DMPP application reduced by more than 90% the total amount of evolved N₂O in all the treatments. These results suggest that the addition of DMPP to soils can mitigate N₂O losses to a large degree, while the NUE for CZ amendments can be sharply improved via reduced gross nitrification and can thus reduce N losses to the water bodies.

SPONSOR

PLATINUM



GOLD



SILVER



BRONZE



PATROCINI

