



**Proceedings of the 53rd National conference of
the Italian Society for Agronomy**

**Resource management in the
innovation of the agri-food**

Matera

11-13 September 2024

Edited by

Marco Bindi
Giuseppe Di Miceli
Albino Maggio

Scientific Committee

Marco Bindi
Albino Maggio
Vittoria Giannini
Fileberto Altobelli
Daniele Antichi
Giuseppe Di Miceli
Elisa Marraccini
Alessia Perego
Domenico Ronga

Organizing Committee

Michele Perniola
Mariana Amato
Anna Rita Rivelli
Stella Lovelli
Daniele De Rosa
Giuseppe Mercurio

Società Italiana di Agronomia (SIA) www.siaagr.it
ISBN: 978-88-908499-9-2

The correct citation of article in this book is:

Authors, 2024. Title. Proceedings of the 53rd Conference of the Italian Society of Agronomy (Bindi M., Di Miceli G., Maggio A., Eds.) Matera, Italy, 11th-13th September 2024, pag. 1-295.

Contrasting effects of two zeolites used as soil amendment on water retention characteristics of a sandy-loam soil

by Satriani Antonio | Comegna Alessandro | Castronuovo Donato | Belviso Claudia | Lovelli Stella | National Research Council-Institute of Methodologies for Environmental Analysis | School of Agricultural, Forest, Food and Environmental Sciences, University of Basilicata | Department of Pharmacy, University of Salerno | National Research Council-Institute of Methodologies for Environmental Analysis | School of Agricultural, Forest, Food and Environmental Sciences, University of Basilicata

Abstract ID: 109

Topic: Soil

Presenter Name: Lovelli Stella

Contribution: Post

Zeolites are aluminosilicate minerals that have been gaining interest in agriculture due to their environmentally friendly nature (Baricevic *et al*, 2023). They can serve as a reservoir of water and nutrients for plants, improve soil sorption capacity, reduce soil acidification, and increase nutrient use efficiency (Baričević *et al*, 2023, Castronuovo *et al.*, 2023, Mondal *et al*, 2021; Jarosz *et al*, 2021). However, the use of natural zeolites or those synthesized from oversaturated commercial solutions is more explored commercially than those synthesized from residues (de Carvalho *et al*, 2024), and there is little information regarding the effect of commercial zeolites on the hydrological properties of soils with different textures. In this study, a sandy-loam soil (54% sand, 35% silt and clay 11%) was collected and mixed with varying amounts of synthetic zeolite, derived from coal fly ash (S; Belviso *et al*, 2022) and a commercial one (C; Zeolite ® Italia). Repacked soil samples were combined with two levels of zeolite (2% and 5%) by weight, and the obtained soil samples were characterized by measuring soil water retention curves (SWRCs) of soil-zeolite mixtures. The experimental soil water retention curves obtained from laboratory tests were modelled using the van Genuchten equation (van Genuchten, 1980). In the comparison of two zeolites specific attention was laid on the impact of zeolite in modifying soil's capacity to retain water, and hence on the energy required by plants to acquire a unit mass of soil water, referred to as Integral Energy (E_i ; Minesny and Mc Bratney, 2003). Finally, the ANOVA test, analysis was performed. In our experiments, the ability of two zeolites added to sandy loam soil to retain water and then modify the range of available water was observed in a contrasting way. The Field capacity, Plant Wilting Point, Air Capacity and Integral Energy in the compared treatments on a sandy-loam soil varied among two zeolites studied (S and C) and among the soil percentage mixtures (i.e., 2% and 5%). We observed a shift of the water availability range towards higher soil humidity values in the case of synthetic zeolite (S), and a shift towards lower values of soil moisture in the case of commercial zeolite (C). Moreover, the E_i approach yielded valuable insights into soil water availability for plants. Our observations demonstrate that this parameter has an opposite variation according to the type of zeolite used in the sandy-loam soil studied. In sustainable agriculture and land management, exploring zeolites that can potentially reduce water usage in irrigation is crucial. However, the practice of amending soils with zeolites requires a rigorous approach

due to the complex effects on soil water retention curves that may be affected by the type of the zeolite, soil texture (Belviso *et al*, 2022; Comegna *et al.*, 2023) and zeolite concentrations in soils.