Sviluppo di biostimolanti microbici e applicazione a colture erbacee di pieno campo

Laura Ercoli, Elisa Pellegrino

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Biostimolanti – Terza edizione

Una nuova rivoluzione verde

Bari, 2 Marzo 2022

Sant'Anna
Scuola Universitaria Superiore Pisa

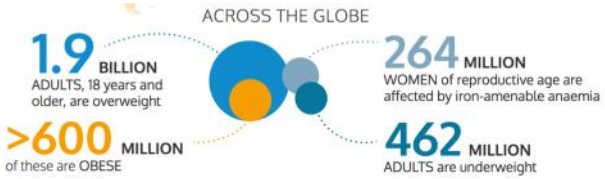
Le sfide che l'agricoltura deve affrontare

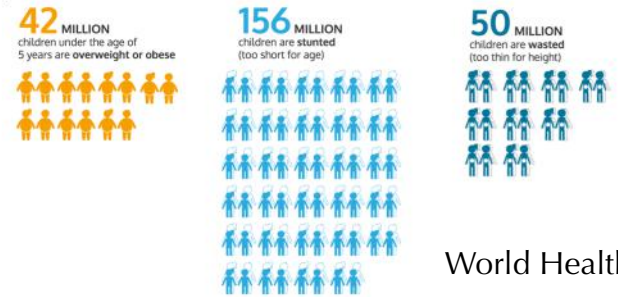
Current World Population

7,927,388,680

https://www.worldometers.info/world-population/
Accessed on February 15, 2022; 5.57 p.m.

Problemi di nutrizione

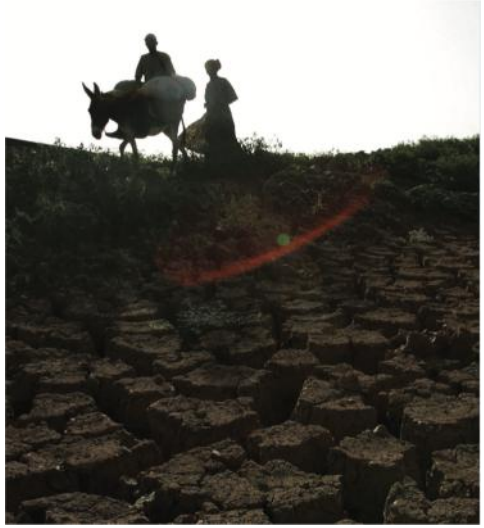




World Health Organization

Le sfide che l'agricoltura deve affrontare

Cambiamento climatico



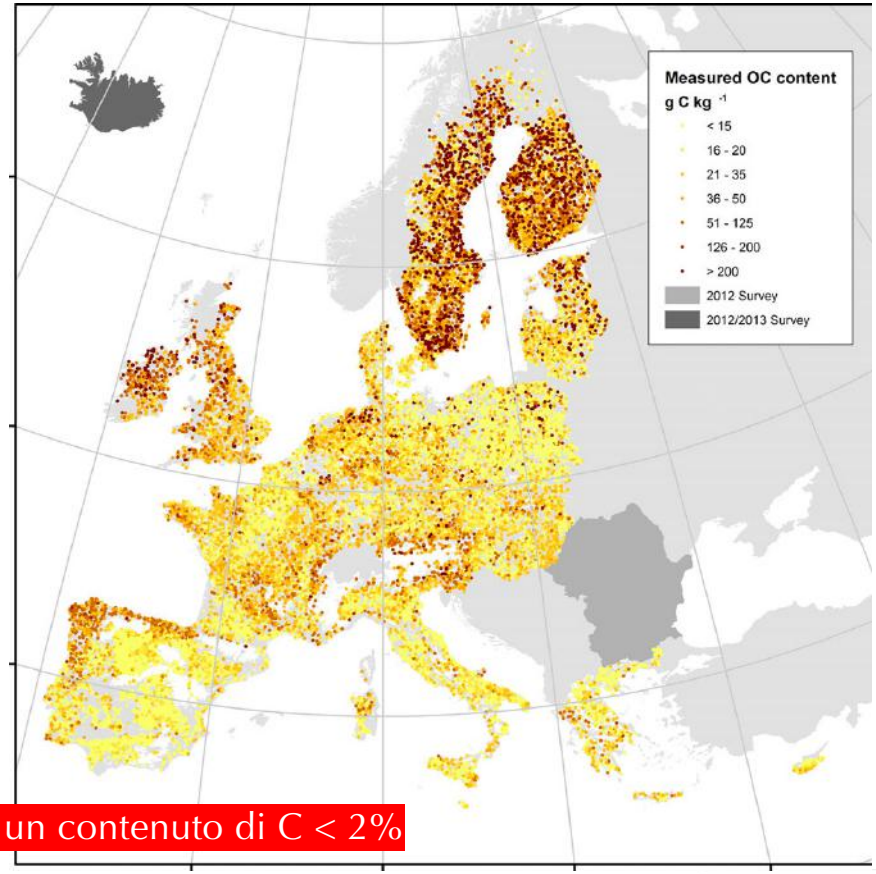
10 Gennaio 2022

CARBON DIOXIDE	GLOBAL TEMPERATURE	ARCTIC SEA ICE EXTENT	ICE SHEETS	SEA LEVEL
↑ 417 parts per million (current)	↑ 1.18 °C since 1880	↓ 13.0 percent per decade since 1979	↓ 428 billion metric tons per year	↑ 3.4 millimeters per year

https://climate.nasa.gov/

Le sfide che l'agricoltura deve affrontare

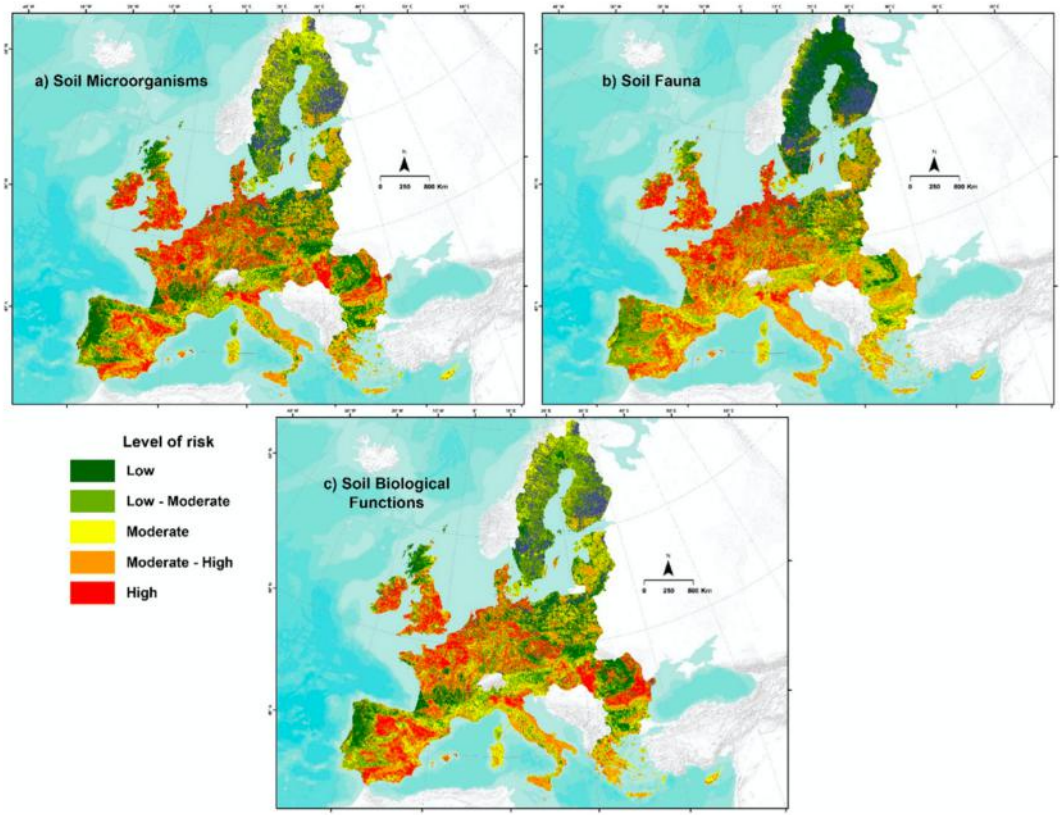
Perdita di qualità del suolo



45% dei suoli ha un contenuto di C < 2%

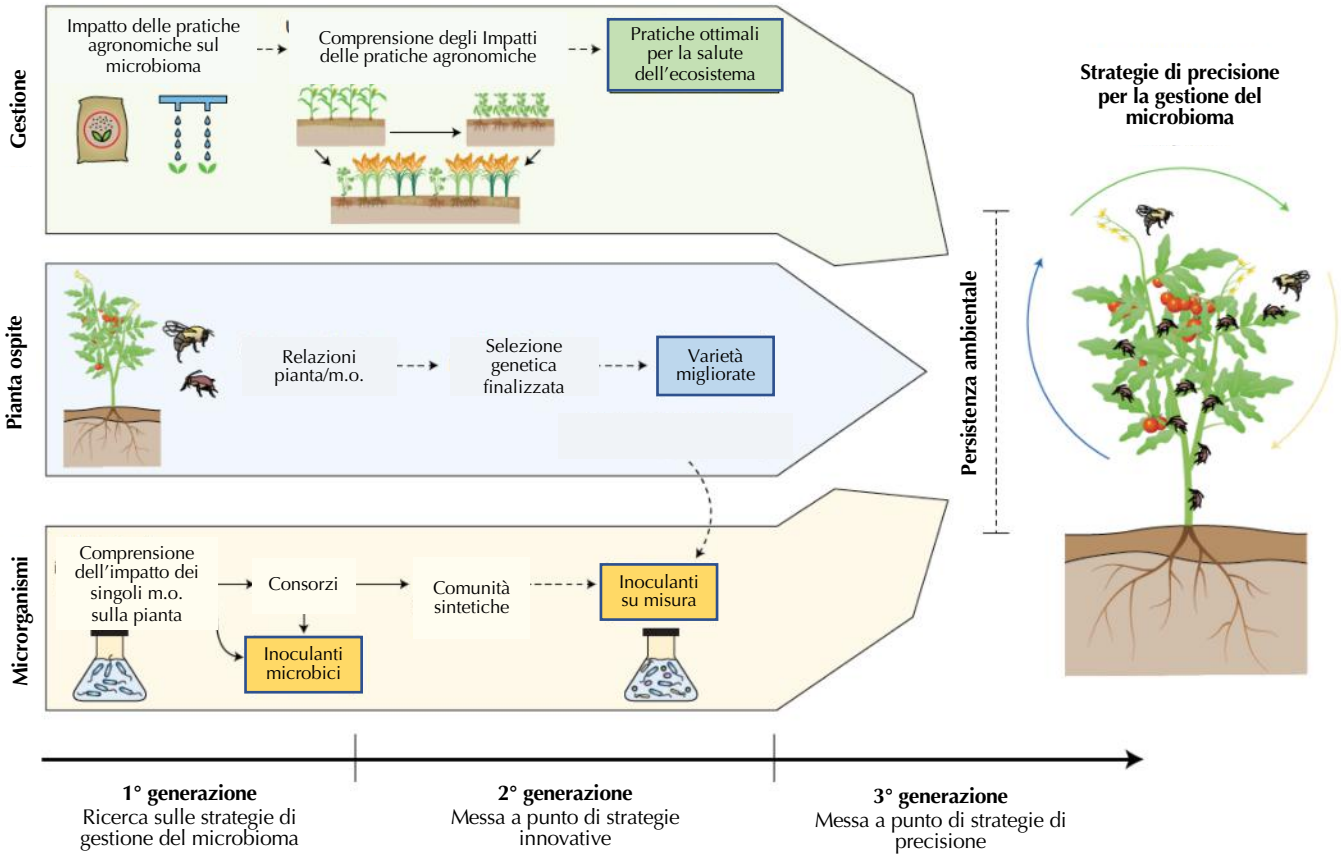
Le sfide che l'agricoltura deve affrontare

Perdita di biodiversità del suolo



Orgiazzi et al., 2022

A che punto è la ricerca sui biostimolanti microbici?



French et al., 2021

Inoculazione in campo di AMF

"mycorrhiza AND triticum" and "mycorrhiza* AND wheat"*

Contents lists available at ScienceDirect

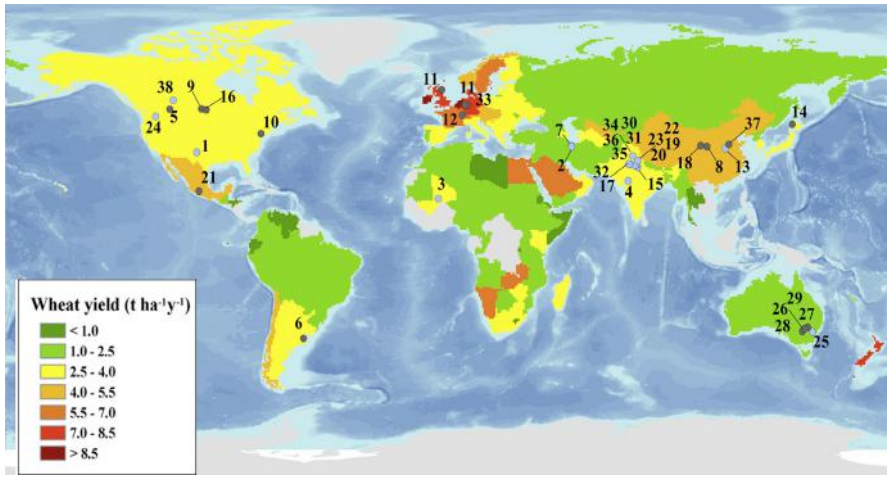
Soil Biology & Biochemistry

journal homepage: www.elsevier.com/locate/soilbio

Responses of wheat to arbuscular mycorrhizal fungi: A meta-analysis of field studies from 1975 to 2013

Elisa Pellegrino [a,*], Maarja Öpik [b], Enrico Bonari [a], Laura Ercoli [a]

[a] Institute of Life Sciences, Scuola Superiore Sant'Anna, Piazza Martiri della Libertà 33, 56127 Pisa, Italy
[b] Department of Botany, Institute of Ecology and Earth Sciences, University of Tartu, 40 Lai St., 51005 Tartu, Estonia



n =333

Pellegrino et al., 2015

Inoculazione in campo di AMF

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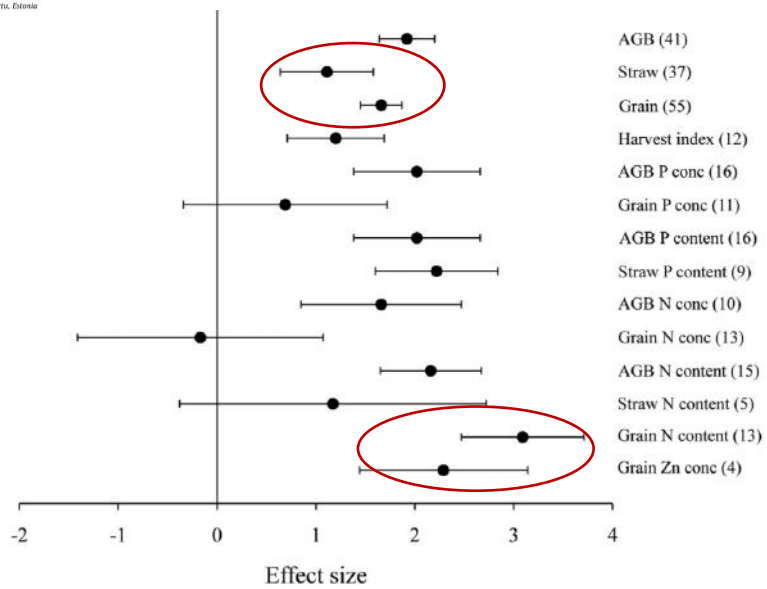
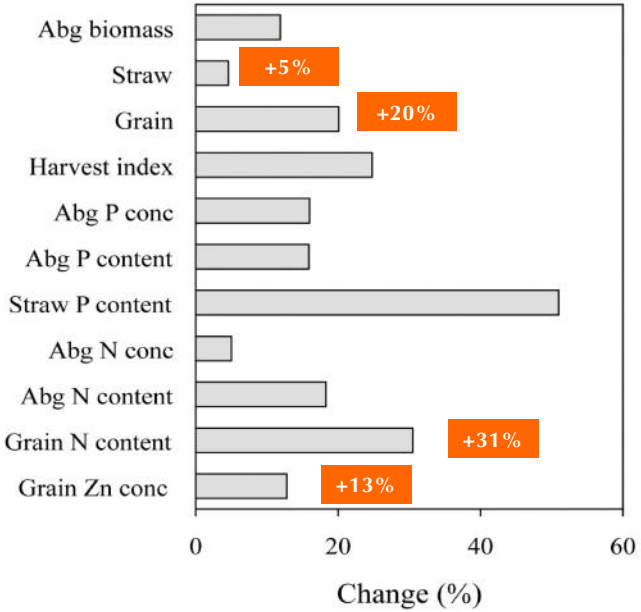




Pellegrino et al., 2015

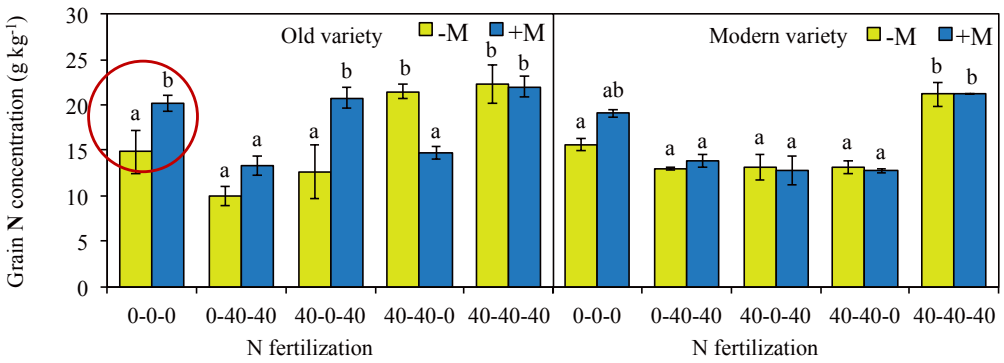
Inoculazione in campo di AMF

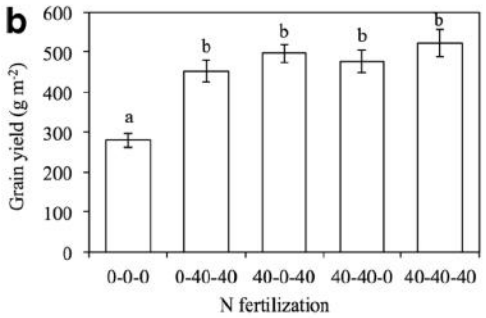
Plant Soil
DOI 10.1007/s11104-017-3319-5

REGULAR ARTICLE

Strong increase of durum wheat iron and zinc content by field-inoculation with arbuscular mycorrhizal fungi at different soil nitrogen availabilities

Laura Ercoli · Arthur Schüßler · Iduna Arduini · Elisa Pellegrino





Ercoli et al., 2017

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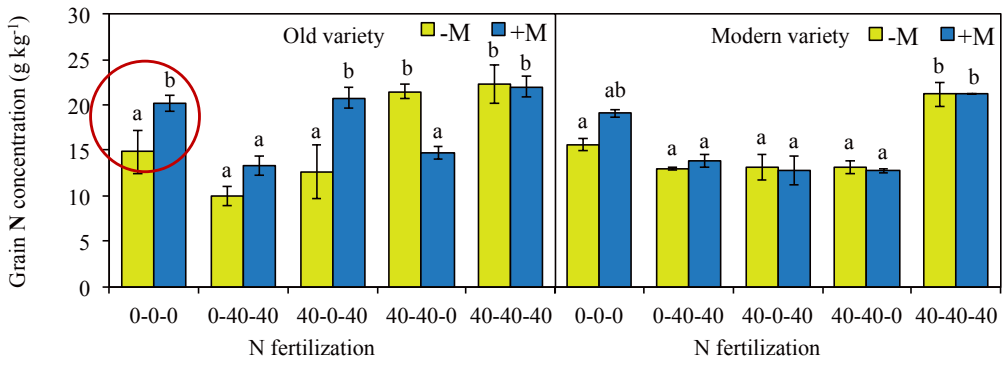

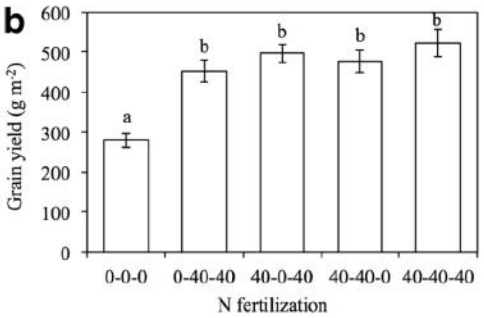

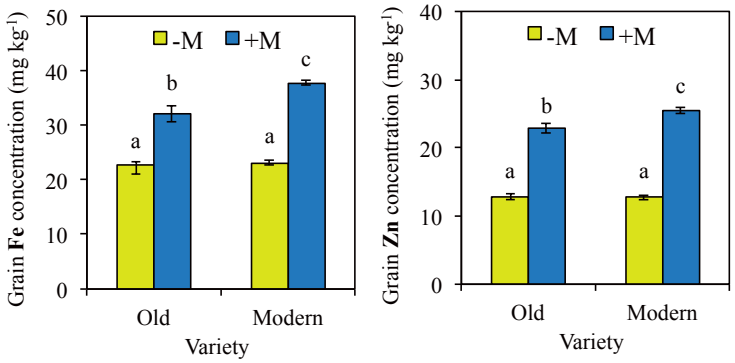

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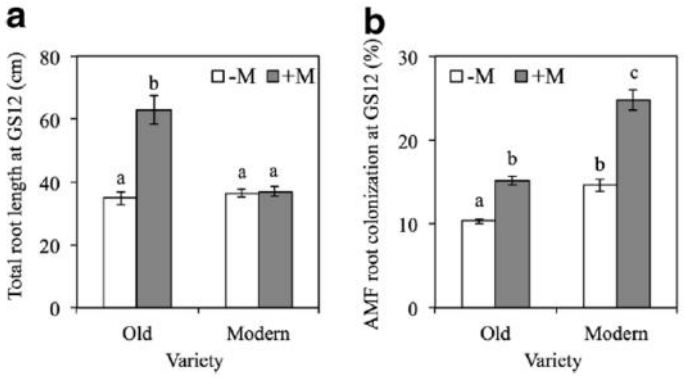

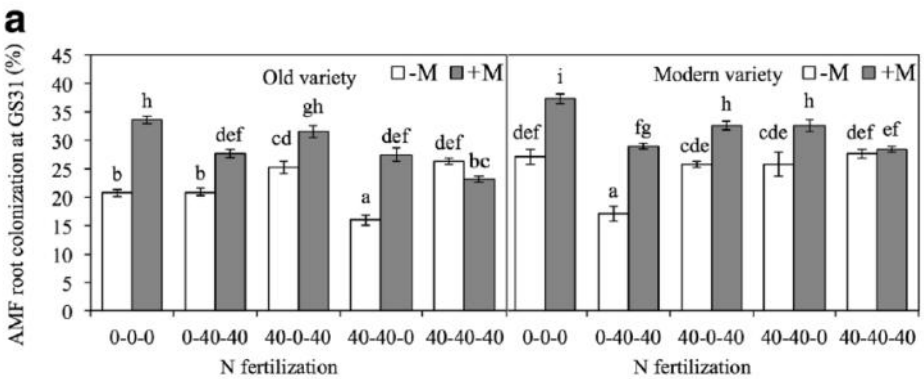

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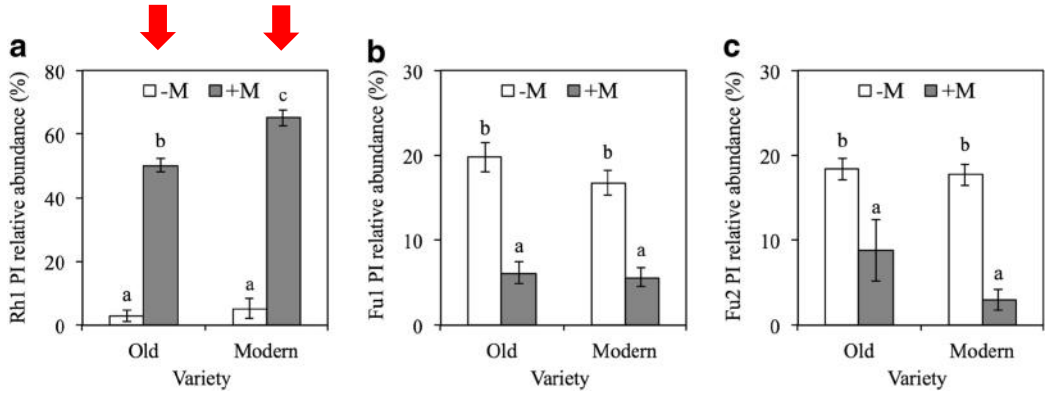

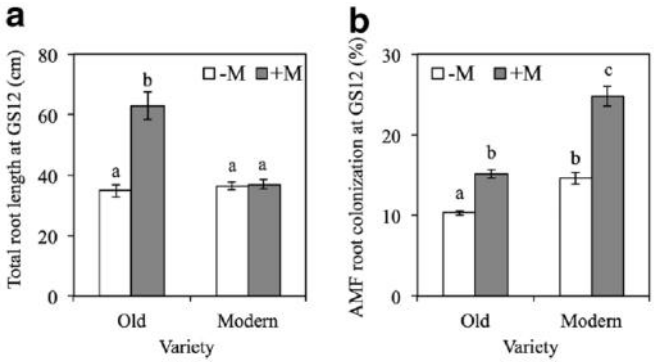

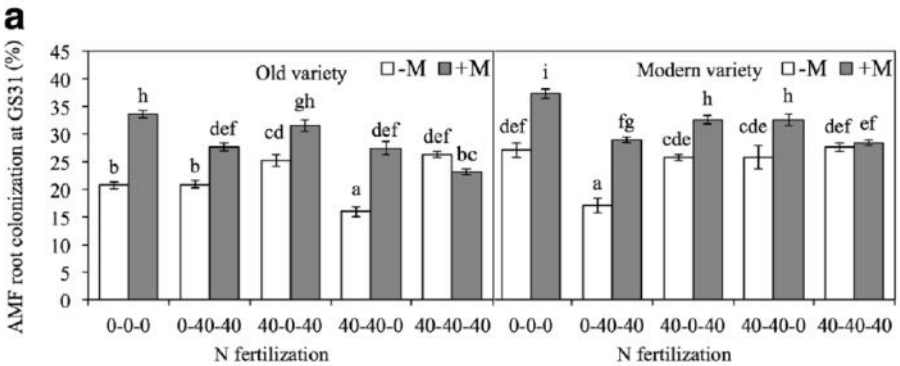

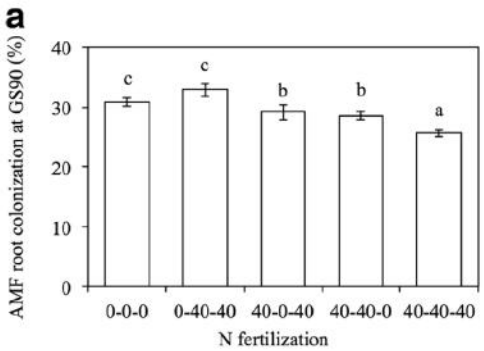

Ercoli et al., 2017

Assorbimento di Zn tramite AMF

Coccina et al. BMC Plant Biology (2019) 19:133
https://doi.org/10.1186/s12870-019-1741-y

BMC Plant Biology

RESEARCH ARTICLE Open Access

The mycorrhizal pathway of zinc uptake contributes to zinc accumulation in barley and wheat grain

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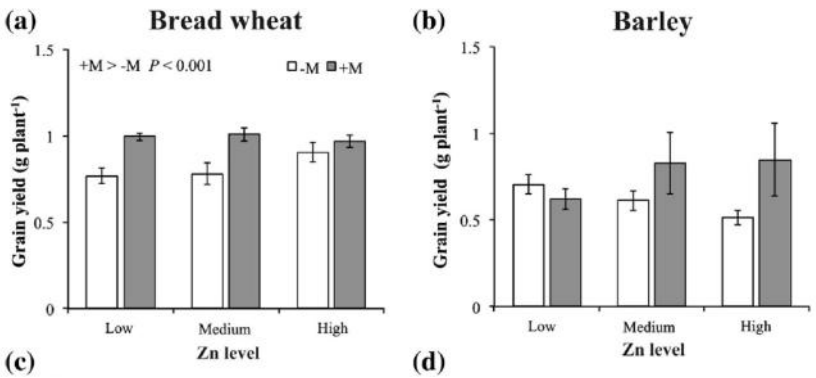

Coccina et al., 2019

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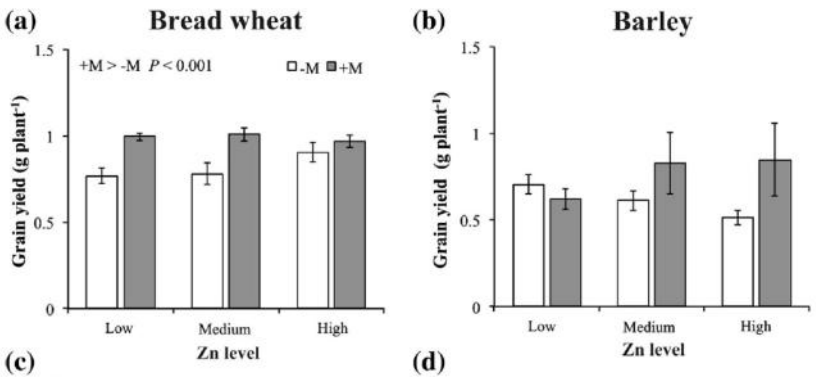
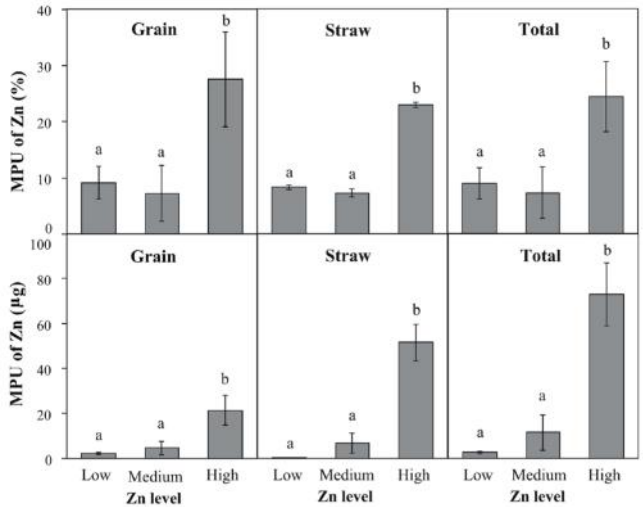
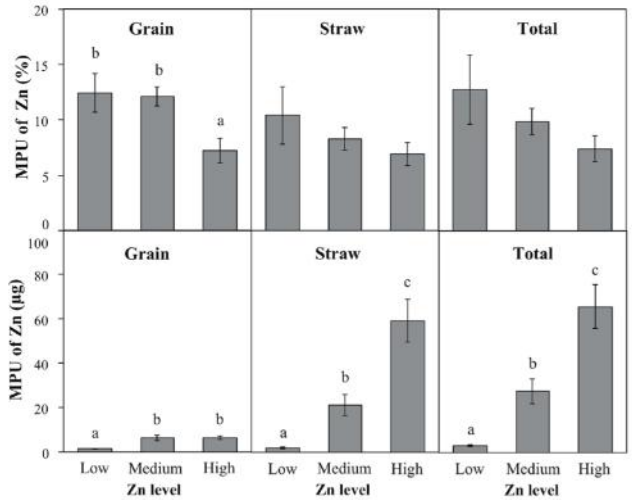






Coccina et al., 2019

Inoculazione in campo di AMF

agronomy

MDPI

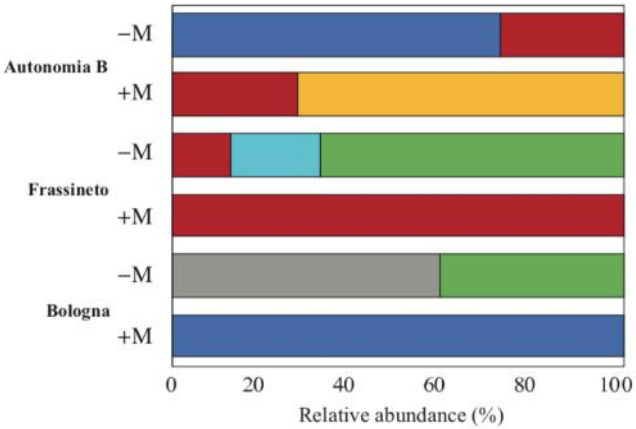
Article

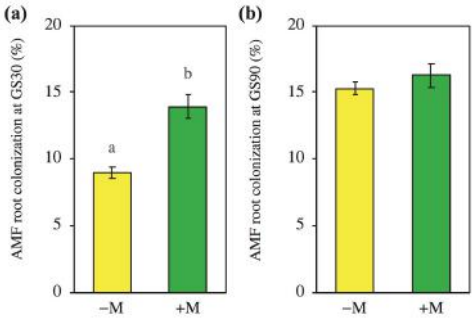
Field Inoculation of Bread Wheat with *Rhizophagus irregularis* under Organic Farming: Variability in Growth Response and Nutritional Uptake of Eleven Old Genotypes and A Modern Variety

Elisa Pellegrino [1,*], Gaia Piazza [1], Iduna Arduini [2] and Laura Ercoli [1]

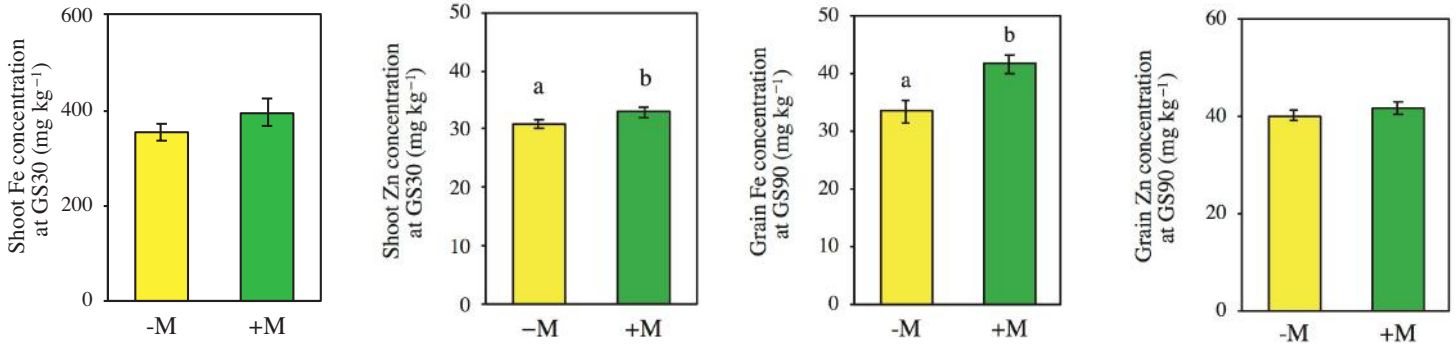
MOTUs:

1. Fun_Alb - *Funelliformis* sp.
2. Glo_Alb - *Glomus* sp.
3. Rhizo1_Alb - *Rhizophagus* sp.
4. Rhizo2_Alb - *Rhizophagus* sp.
5. Claro1_Alb - *Claroideoglomus* sp.
6. Claro2_Alb - *Claroideoglomus* sp.





Bassa disponibilità di Zn
Media disponibilità di Fe



Pellegrino et al., 2020

Trasferimento di Zn tra piante mediante il micelio extraradicale

environmental microbiology

Environmental Microbiology (2021) 00(00), 00–00 doi:10.1111/1462-2920.15542

Direct transfer of zinc between plants is channelled by common mycorrhizal network of arbuscular mycorrhizal fungi and evidenced by changes in expression of zinc transporter genes in fungus and plant

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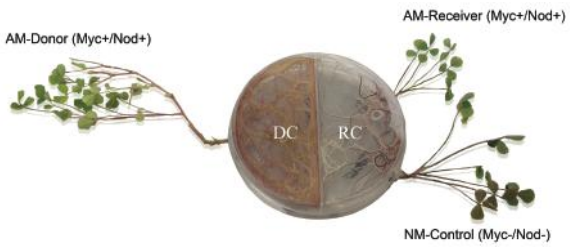

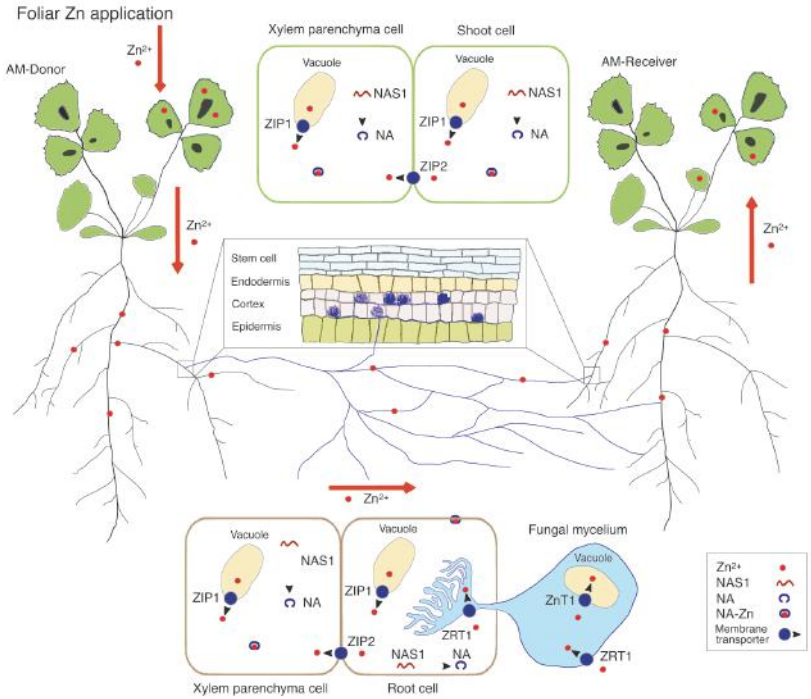

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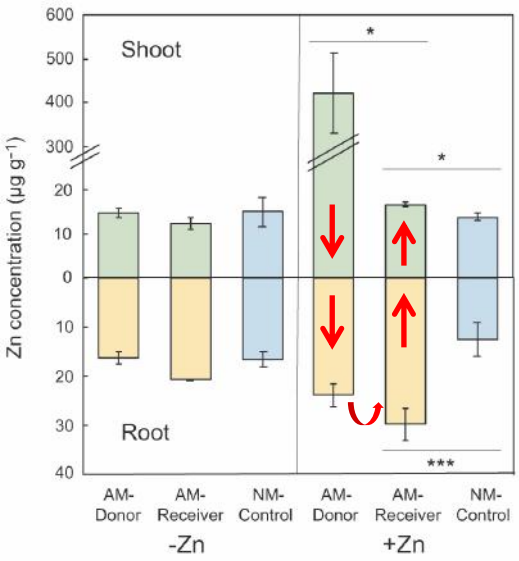

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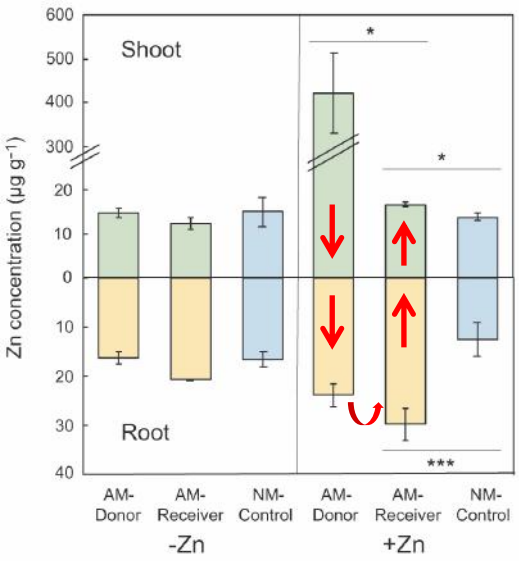

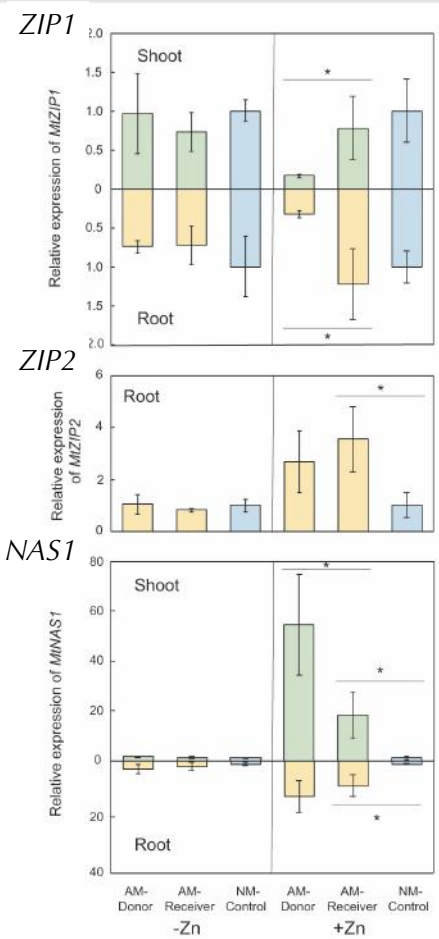

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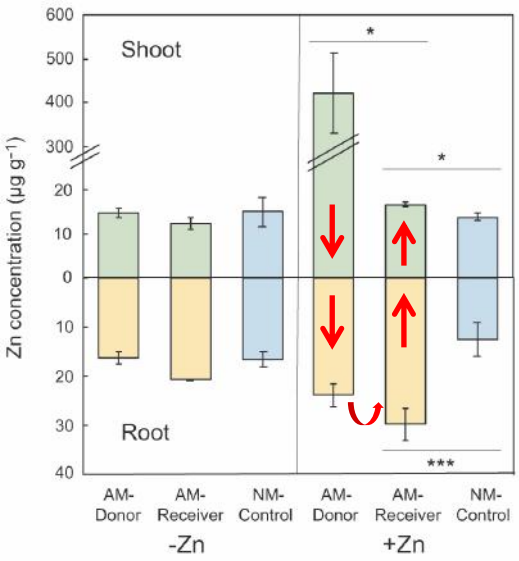
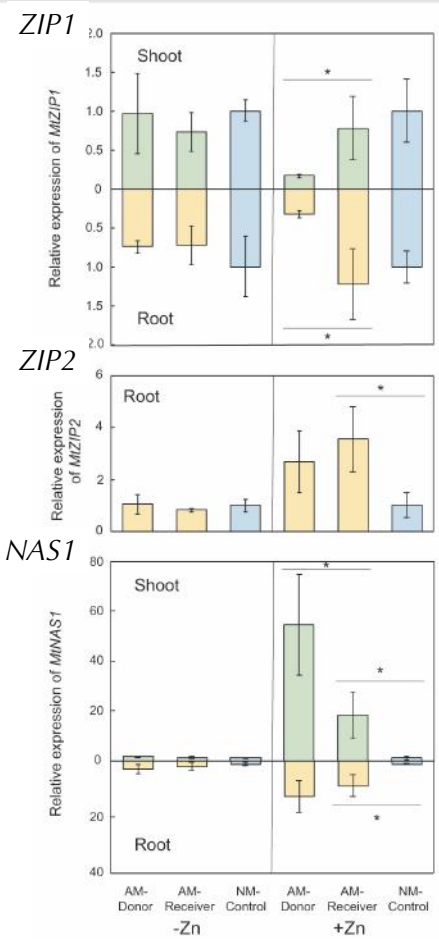
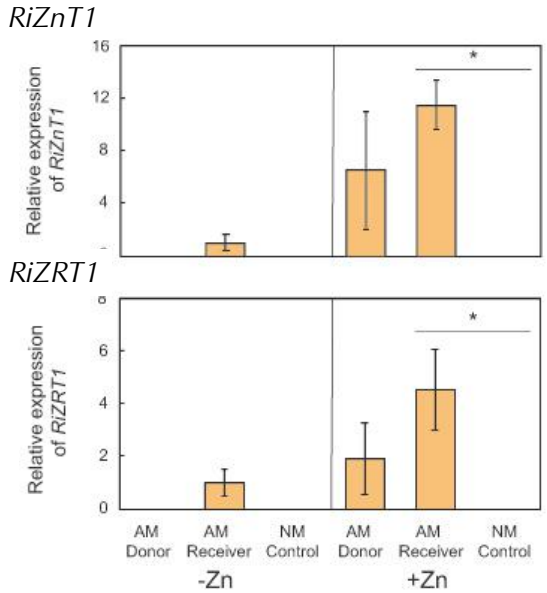
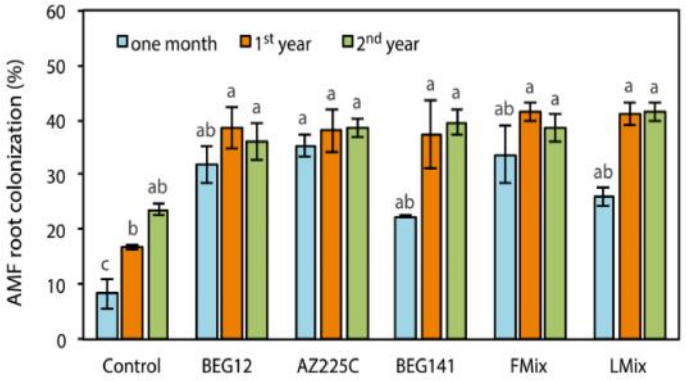


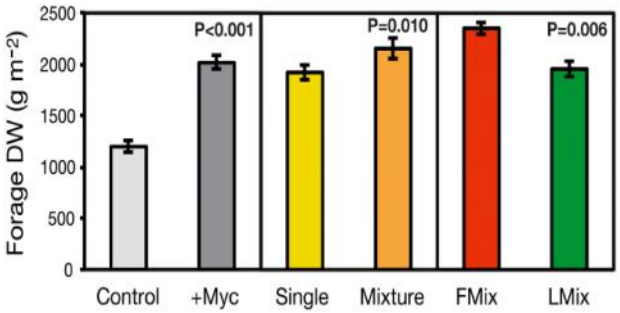




Cardini et al., 2021

Inoculazione in campo con isolati singoli e consorzi di AMF





Multiple Arbuscular Mycorrhizal Fungal Consortia Enhance Yield and Fatty Acids of *Medicago sativa*: A Two-Year Field Study on Agronomic Traits and Tracing of Fungal Persistence

Elisa Pellegrino, Marco Nuti and Laura Ercoli

Pellegrino et al., 2022

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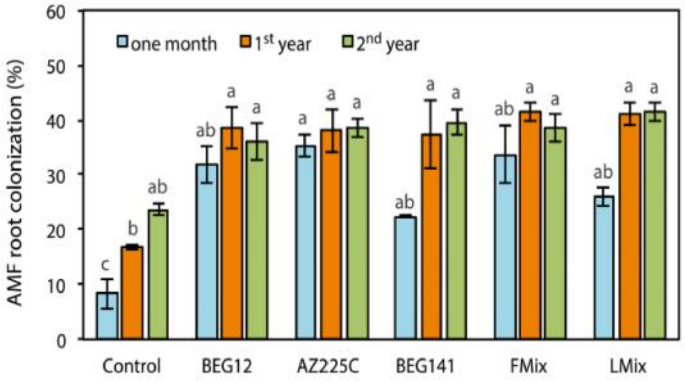
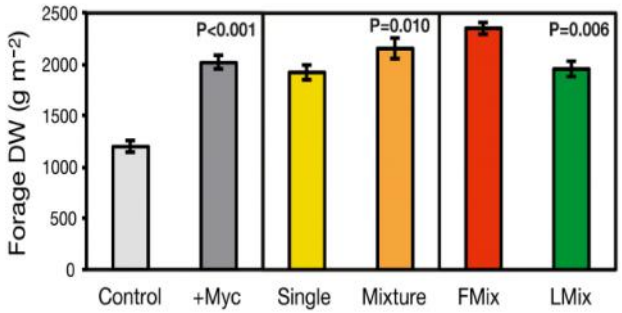
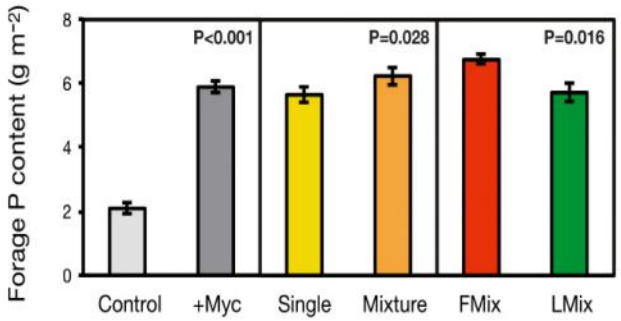
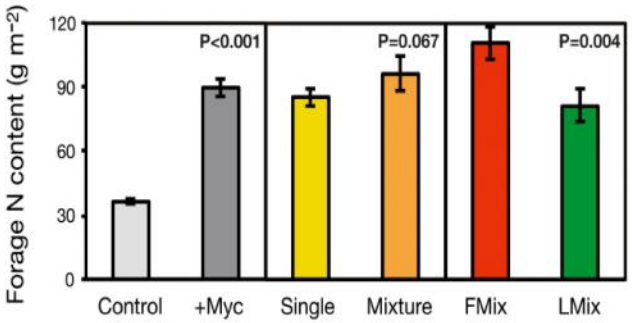


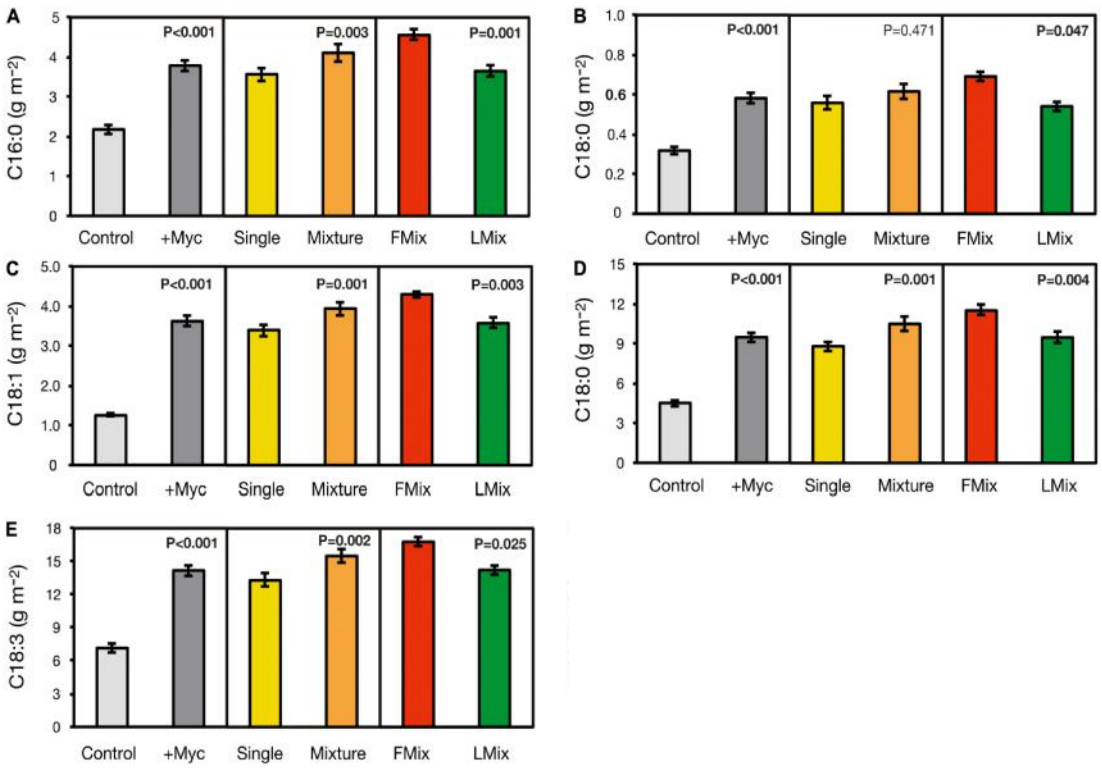


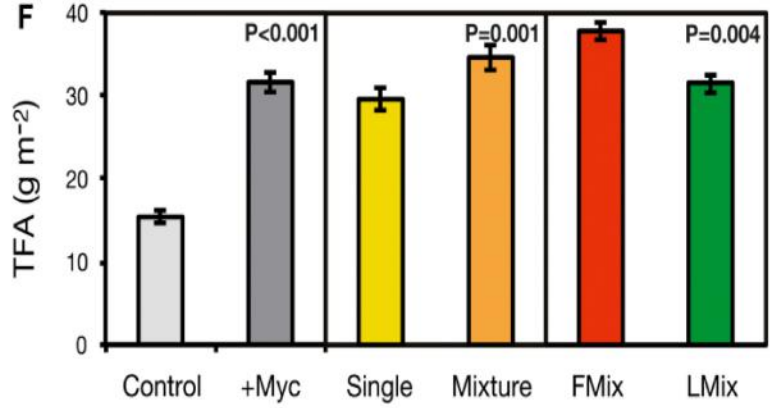




Pellegrino et al., 2022

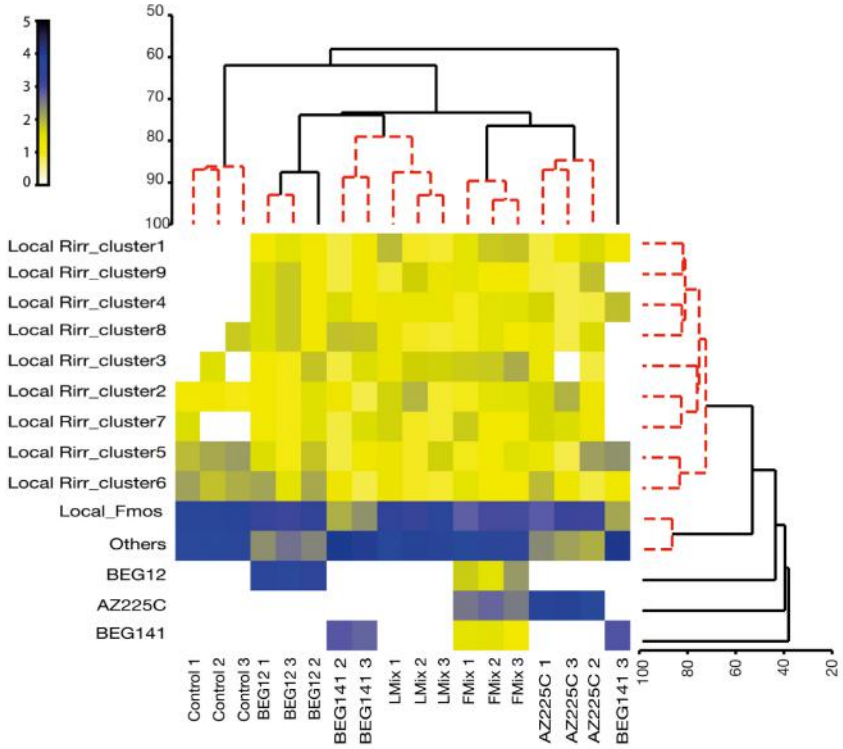
Inoculazione in campo con isolati singoli e consorzi di AMF





Pellegrino et al., 2022

Inoculazione in campo con isolati singoli e consorzi di AMF




frontiers in Plant Science

ORIGINAL RESEARCH

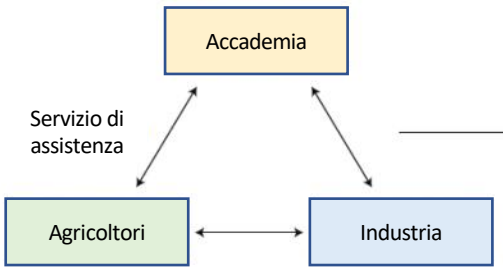
Multiple Arbuscular Mycorrhizal Fungal Consortia Enhance Yield and Fatty Acids of *Medicago sativa*: A Two-Year Field Study on Agronomic Traits and Tracing of Fungal Persistence

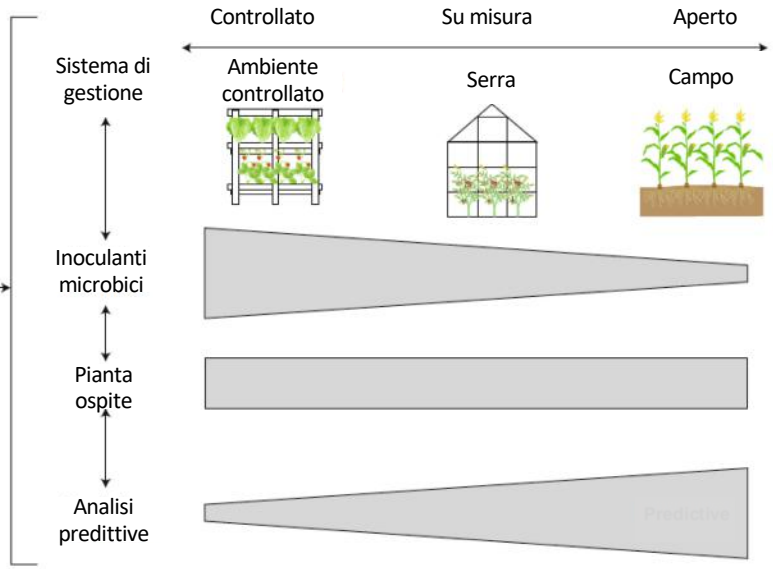
Elisa Pellegrino, Marco Nuti and Laura Ercoli

Pellegrino et al., 2022

Conclusioni

- E' possibile identificare i **componenti del biota del suolo** utili al supporto delle produzioni e qualità
- Gli strumenti molecolari sono essenziali per la comprensione delle interazioni tra **biota del suolo** e **pratiche agronomiche**
- Sono necessari **investimenti** (ricerca – compagnie private – finanziatori pubblici e privati)
- Queste nuove tecnologie supportano la **moderna agricoltura** ma l'agricoltura deve adattarsi per trarre i maggiori benefici possibili dai microorganismi





Grazie per l'attenzione