Soil–Plant Interaction in Rice (*Oryza sativa* L.): Effect of Native *Trichoderma* Strains from Mauritania and Microbial Consortia on Vegetative Growth and Rhizosphere Chemical Properties

Safa Oufensou1,2*, **Matteo Garau**1,2 , Leonardo Piseddu1, Martina Zanda1, Carmelina Bianco3, Maria Laura Amenta3, Giovanni Garau1,2

1 Dipartimento di Agraria, Università degli Studi di Sassari, Sassari, Italy | 2 Nucleo di Ricerca sulla Desertificazione, Università degli Studi di Sassari, Sassari, Italy | 3 Istituto di Bioscienze e BioRisorse, CNR, Napoli, Italy

**Corresponding author: soufensou@uniss.it*

Introduction

Italy is the leading rice producer in the European Union. Maintaining the quality and productivity of this key Mediterranean crop calls for sustainable agricultural practices.

The transition toward sustainable rice cultivation requires sustainable strategies that stimulate crop development while optimizing nutrient availability in the rhizosphere.

Objective

To evaluate the effects of single and combined microbial treatments, native *Trichoderma* strains, a commercial biofungicide and a bacterial consortium on the vegetative performance of pot-grown hybrid rice and on rhizosphere chemical dynamics.

Materials & Methods

Pot-grown hybrid rice, cv. RTH74 (FullPage® technology).
Six treatments compared:



C	Untreated control
AAF1	*Trichoderma longibrachiatum* — native strain, Mauritania
AAC5	*Trichoderma erinaceum* — native strain, Mauritania
R	Remedier® (commercial: *T. gamsii* + *T. asperellum*)
S	SynCom — consortium of 6 PGPR strains
RS	Remedier® + SynCom combination

Assessed variables: agronomic and biometric parameters at harvest; rhizosphere soil pH, Electrical Conductivity (EC), available Phosphorus and Dissolved Organic Carbon (DOC); leaf chlorophyll content (SPAD) monitored through the growing season.

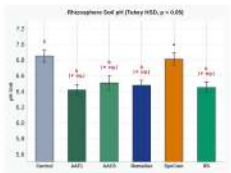
Workflow

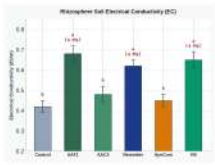
Pot set-up & inoculation → Growing season SPAD monitoring → Harvest biometrics → Rhizosphere soil analysis

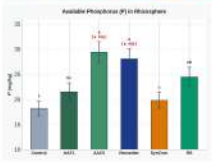
Experimental Design

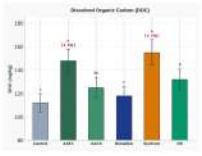


Results — Rhizosphere Chemistry





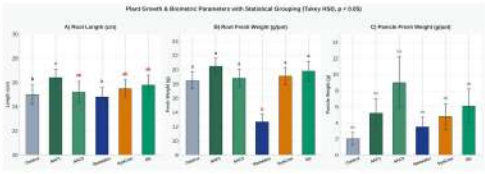




Results — Leaf Chlorophyll (SPAD)

SPAD readings differed significantly among treatments through most of the growing season. **SynCom-treated plants (alone and combined with Remedier®) showed the highest values**, although differences were no longer significant at the end of the crop cycle.

Results — Growth & Biomass



+5.6%
Root length
(AAF1 vs C)

+11%
Fresh weight
(AAF1 vs C; +61% vs R)

+42%
Root dry biomass
(RS vs C) — n.s.

+350%
Panicle fresh weight
(AAC5 vs C) — n.s.

n.s. = not statistically significant despite the large absolute increase.

Discussion

AAF1 and the **RS combination** reshaped the rhizosphere environment, lowering soil pH and increasing nutrient availability.

AAF1 showed the best biostimulant activity overall, boosting root length and fresh weight relative to both the control and the commercial product Remedier®.

Despite some non-significant biometric trends, these extreme-adapted, Mauritania-sourced *Trichoderma* isolates are promising candidates for next-generation biofertilizers in sustainable rice production.

Conclusions

The biostimulant response was strongest for the native, extreme-adapted isolate **AAF1**, which combined favorable rhizosphere chemistry with measurable gains in root growth and fresh biomass , outperforming the commercial reference product Remedier® on fresh weight.





Take-Home Message

Native, extreme-adapted *Trichoderma* strains can outperform a commercial biofungicide in boosting rice growth while improving rhizosphere fertility.

Acknowledgements

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