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A Comparative Study of the effects of Native and Commercial Mycorrhizal Inoculants on the Growth and Physiological Performance of the "Picholine Marocaine" Olive Cultivar.

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INTRODUCTION & AIM

The **'Picholine Marocaine'** olive is the cornerstone of Moroccan agriculture, dominating national groves, yet it faces severe threats from abiotic stresses like drought and salinity, as well as biotic pressures like disease[1].

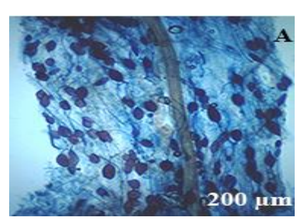
Arbuscular mycorrhizal fungi (AMF) are proven bioenhancers, improving plant nutrient uptake and stress resilience. Native AMF consortia, specifically adapted to local conditions, may offer superior benefits compared to standard commercial strains[2, 3].

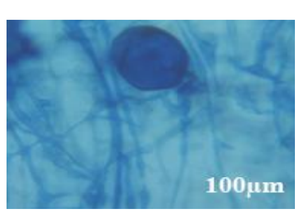
The aim of this work was to evaluate and compare the efficacy of a native AMF consortium ("Rhizolive") and a commercial AMF strain in enhancing the growth and physiological performance of the 'Picholine Marocaine' olive tree.

METHOD

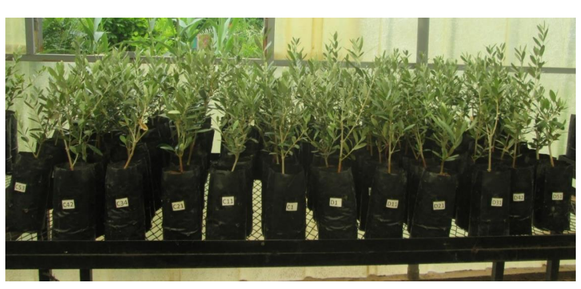
Olive cuttings (*Olea europaea* L. cv. 'Picholine Marocaine', clone Haouzia) were grown in pots in a research greenhouse at the Faculty of Sciences Semlalia, Marrakech, Morocco (25 ± 3 °C, 62% RH).

Inoculum and Production :





- **Rhizolive Consortium (RC):** An autochthonous multi-species consortium (26 spp.) isolated from Moroccan olive groves.
- ***Rhizophagus irregularis* (RI):** A commercial pure strain (DAOM 197198).
- **Multiplication**: Inocula were produced on corn (*Zea mays* L.) for 3 months in sterilized soil.



Plant treatments :
- **Control:** Non-inoculated plants
- **RI:** Plants inoculated with 50 g of *R. irregularis* inoculum
- **RC:** Plants inoculated with 50 g of the native "Rhizolive" consortium.

RESULTS & DISCUSSION

Table 1. Mycorrhizal frequency and intensity of inoculated olive plants with "Rhizolive consortium" or *R. irregularis* for one year.

Treatments	Mycorrhizal frequency (%)	Mycorrhizal intensity (%)	Arbuscules colonization (%)	Vesicles colonization (%)
Control	0 ± 0.00 [b]	0 ± 0.00 [b]	0 ± 0.00 [c]	0 ± 0.00 [c]
Rhizolive consortium	100.00 ± 1.92 [a]	72.76 ± 5.99 [a]	45.49 ± 0.85 [a]	36.64 ± 1.27 [b]
Rhizophagus irregularis	98.57 ± 0.34 [a]	83.53 ± 6.20 [a]	23.48 ± 0.76 [b]	41.57 ± 2.27 [a]
P-value	0.004	0.001	0.001	0.001

Both mycorrhizal treatments successfully colonized olive roots, with the native "Rhizolive consortium" (RC) showing a distinct, more active symbiosis structure.

•**Mycorrhizal colonization** reached ~100% in both RC and *R. irregularis* (RI) plants. **Arbuscule formation** (key for nutrient exchange) was significantly higher in **RC (45.5%)** than in RI (23.5%).

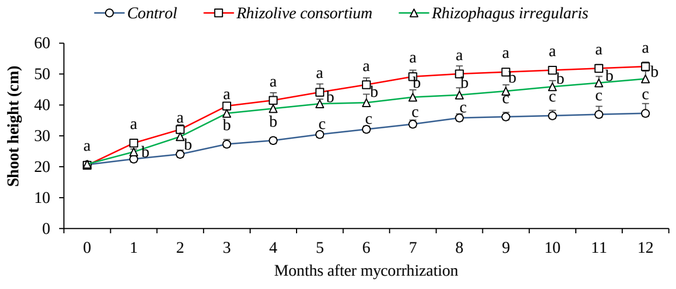


Fig 1. Kinetic of shoot height of inoculated olive plants with "Rhizolive consortium" or *R. irregularis* for one year. Means (n = 10) and standard deviation are compared using Tukey's HSD test at *P <0.05*, and different letters indicate significant differences.

Table 2. Fresh and dry biomass of inoculated olive plants with "Rhizolive consortium" or *Rhizophagus irregularis* for one year.

Treatments	Fresh shoot weight (g)	Fresh root weight (g)	dry shoot weight (g)	dry shoot weight (g)
Control	09.40 ± 0.10 [c]	5.83 ± 0.66 [b]	5.57 ± 0.39 [b]	1.78 ± 0.24 [b]
Rhizolive consortium	12.60 ± 0.17 [a]	8.06 ± 0.32 [a]	7.03 ± 0.57 [a]	3.05 ± 0.69 [a]
Rhizophagus irregularis	11.60 ± 0.52 [b]	6.20 ± 0.36 [b]	6.09 ± 0.42 [b]	2.03 ± 0.31 [ab]
P-value	0.037	0.189	0.154	0.393

•**Plant growth** was enhanced by inoculation. RC-inoculated plants achieved the highest **shoot height, leaf number, and biomass** (e.g., fresh shoot weight: RC 12.60 g > RI 11.60 g > Control 9.40 g).

•**Physiological performance** was superior in RC plants, showing the highest **stomatal conductance (g_s)**, **chlorophyll fluorescence (Fv/Fm)**, and **total chlorophyll content**.

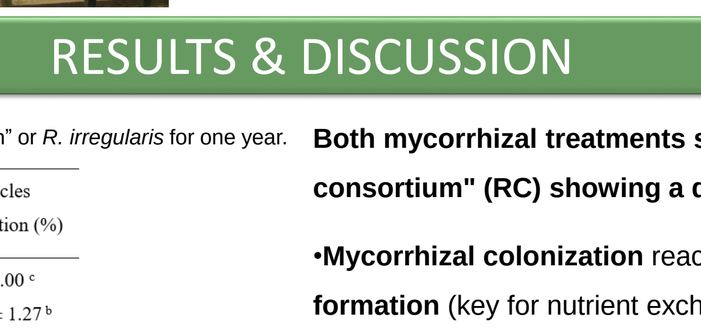


Fig 3. Kinetic of stomatal conductance of inoculated olive plants with "Rhizolive consortium" or *R. irregularis* for one year. Means (n = 10) and standard deviation are compared within each month using Tukey's HSD test at 5 %, and different letters indicate significant differences. Bars with the same lower case letter do not differ significantly between times (0-12 months) of each treatment. Upper-case letters (A, B C and D) designate significant differences between treatments.

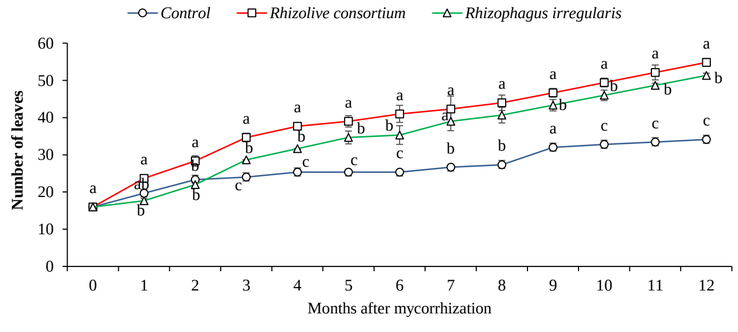


Fig 2. Kinetic of leaves number of inoculated olive with "Rhizolive consortium" or *R. irregularis* for one year. Means (n = 10) and standard deviation are compared using Tukey's HSD test at *P <0.05*, and different letters indicate significant differences.

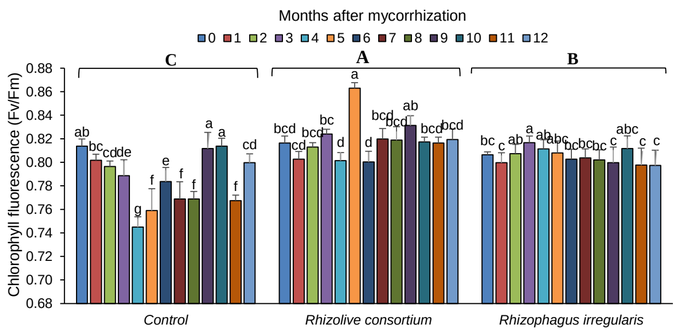


Fig 4. Kinetic of chlorophyll fluorescence of inoculated olive plants with "Rhizolive consortium" or *R. irregularis* for one year. Means (n = 10) and standard deviation are compared within each month using Tukey's HSD test at 5 %, and different letters indicate significant differences. Bars with the same lower case letter do not differ significantly between times (0-12 months) of each treatment. Upper-case letters (A, B C and D) designate significant differences between treatments.

CONCLUSION

•The native **"Rhizolive consortium" (RC)** consistently outperformed the commercial strain *R. irregularis* in promoting growth and physiological performance in 'Picholine Marocaine' olive trees.

•RC's superiority is linked to establishing a more active symbiotic structure, leading to enhanced biomass, photosynthetic capacity, and water-use efficiency.

•These results validate **native AMF consortia as superior, sustainable biofertilizers** for Moroccan olive cultivation, with future research needed to quantify their benefits under specific field stresses like drought and salinity.

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