



*1<sup>st</sup> International Webinar*

# Biodiversity in Plant Protection in Arid Region

ID:BD0025

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## IMPACT OF NATIVE ARBUSCULAR MYCORRHIZAL FUNGI ON *Tamarix articulata* GROWTH AND RHIZOSPHERIC MICROBIOTA BIODIVERSITY

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# Introduction

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- **Soil degradation is an increasingly important problem in many parts of the world, particularly in Mediterranean arid and semiarid areas.**



Soil desertification in Algerian steppe



Revegetation programmes in degraded Algerian areas

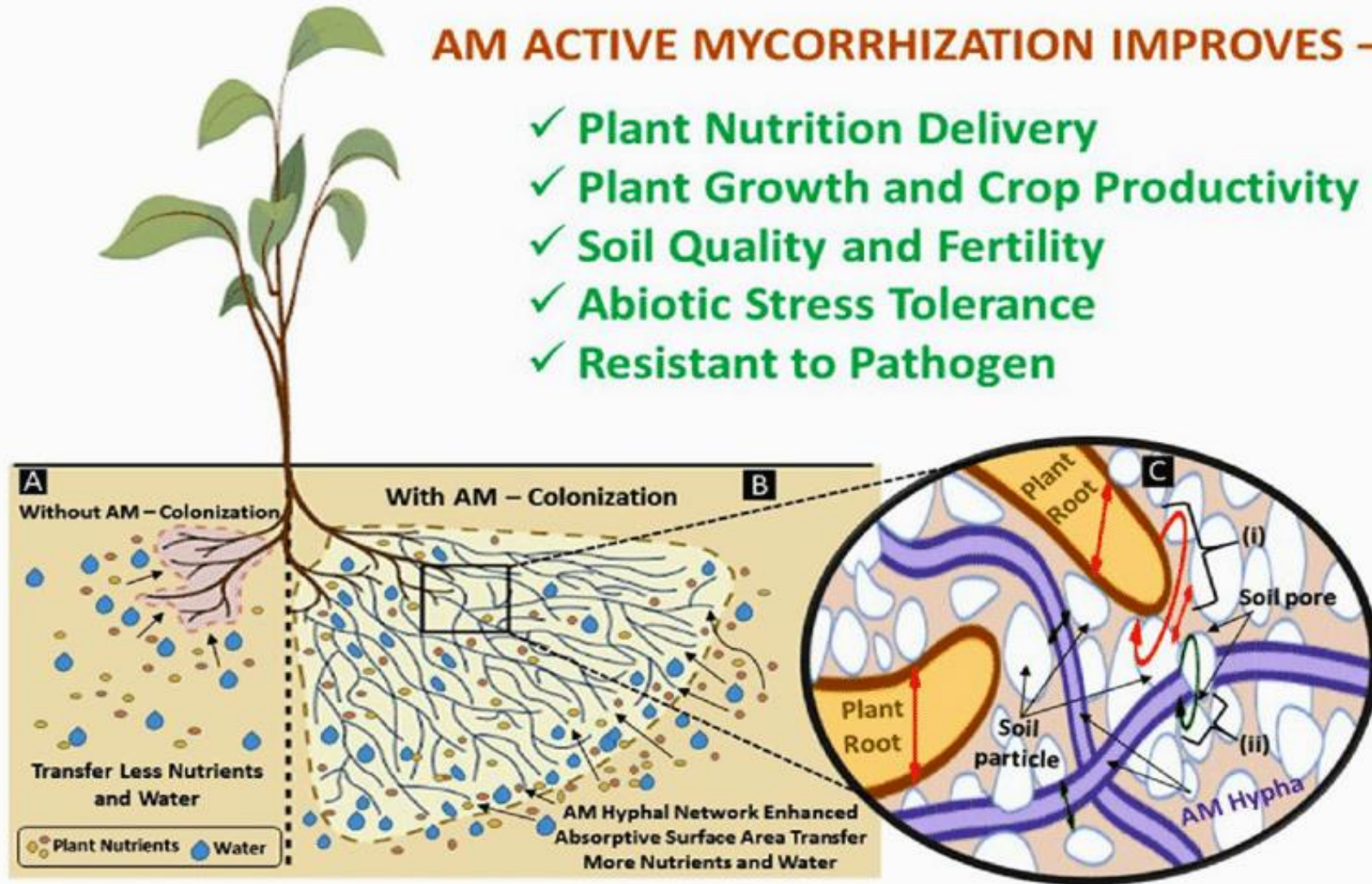


Failure of revegetation programmes in Algerian areas



## AM ACTIVE MYCORRHIZATION IMPROVES –

- ✓ Plant Nutrition Delivery
- ✓ Plant Growth and Crop Productivity
- ✓ Soil Quality and Fertility
- ✓ Abiotic Stress Tolerance
- ✓ Resistant to Pathogen



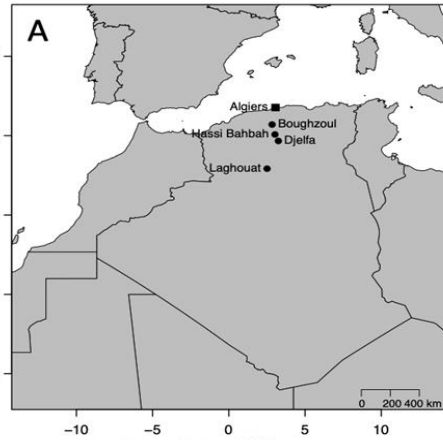


In the other hand, *Tamarix articulata* is one of the proposed halophytic shrubs in Algerian revegetation programs. This species has ecological and medicinal values, such as erosion control, wind break, and application in apiculture and cosmology.

Nevertheless, little is known about the importance of AMF inoculum sources on *Tamarix articulata* development in natural saline soils. Therefore, the current study aims at investigating the efficiency of two AMF-mixed inoculums on *T. articulata* growth, with consideration of its rhizosphere microbiota.

# Material and Methods

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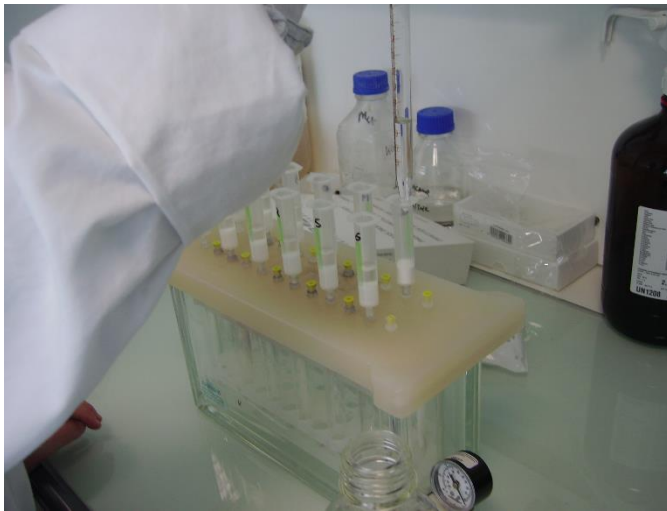
- Indigenous inoculum made of strains originating from Algerian saline soils: (from Boughzoul region) and a commercial one were used to inoculate *T. articulata* in four saline soils with different salinity levels under microcosm conditions with evaluation of rhizosphere microbial biomasses. The studied soils were sampled from: Laghouat, Djelfa, Boughzoul and Hassi bahbah, they have different salinity level ranging between: **1.1 and 4.5 dS.m<sup>-1</sup>**.



A) Map showing the distribution of the sampling sites in Northern Algeria. Graduations on the Y and X axes are latitudes and longitudes. B to D) Pictures showing the type of environment for the sites sampled at Boughzoul, Hassi Bahbah and Laghouat.



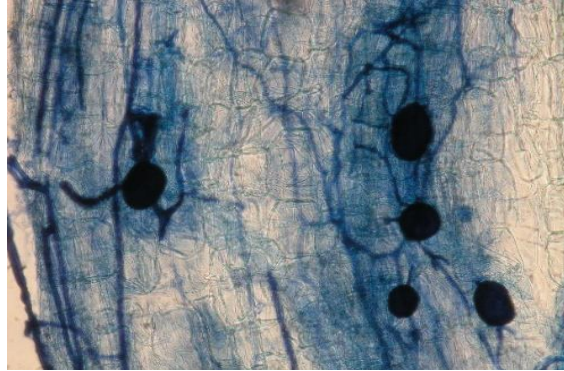
**Total mycorrhizal rate and plant biomasses were evaluated after six months of cultures.**



**The impact of soil salinity on AMF establishment and on rhizospheric biomass microbiota were evaluated using specific lipid biomarkers**

**Data were analyzed statistically by means of comparison by multivariate analysis with Excel stat 2020.**

## 1. AMF *T. articulata* Colonization



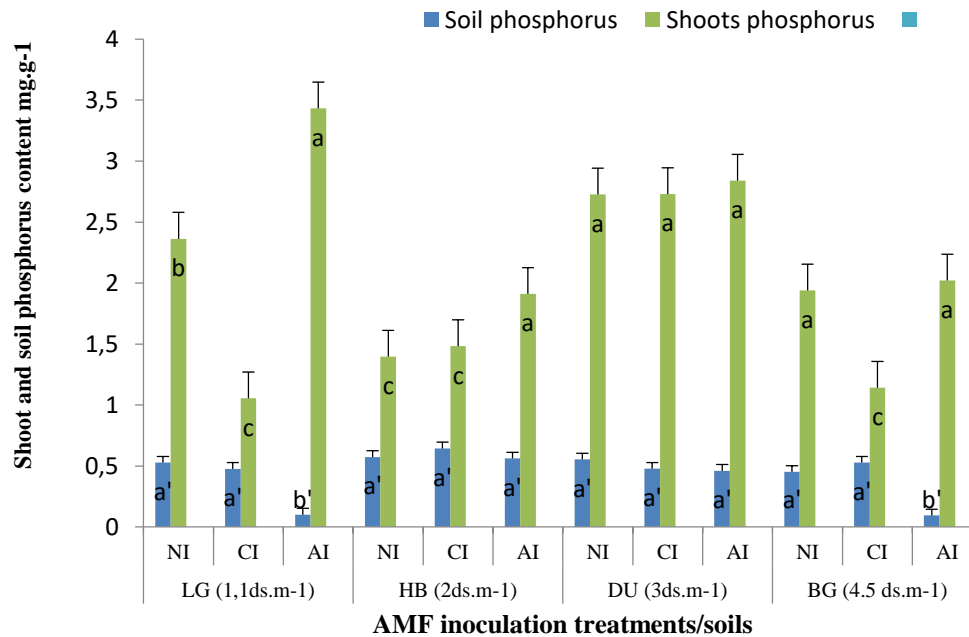
**Table 1.** Effect of AMF treatments on total AMF colonization of *T. articulata* cultivated in the four studied soils.

Treatment	LG (1.1 dS.m <sup>-1</sup> )			HB (2.1 dS.m <sup>-1</sup> )			DU (3.1 dS.m <sup>-1</sup> )			BG (4.5 dS.m <sup>-1</sup> )		
	NI	CI	NI	NI	CI	NI	NI	CI	NI	NI	CI	NI
Mycorrhizal rate	15.4	15.1	21.9	14.7	10.9	26.7	12.2	11.8	29.1	9.4	15.4	33.2
Plant biomasses	1.26	0.92	1.49	1.21	1.15	1.87	1.16	0.94	1.18	0.98	1.14	1.36





## 2. Phosphorus Contents in Soil and Shoots



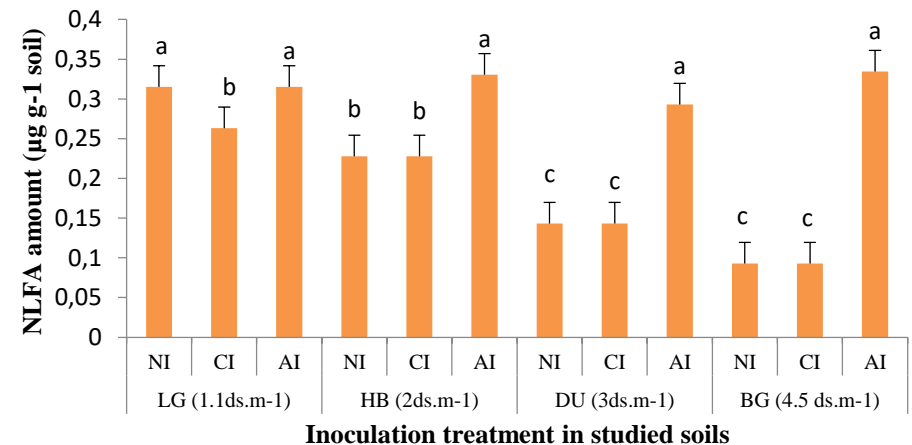
Plant biomasses are correlated with increasing shoot phosphorus content. In addition, Analysis of variance indicated that shoot phosphorus content was affected positively by indigenous AMF inoculation.

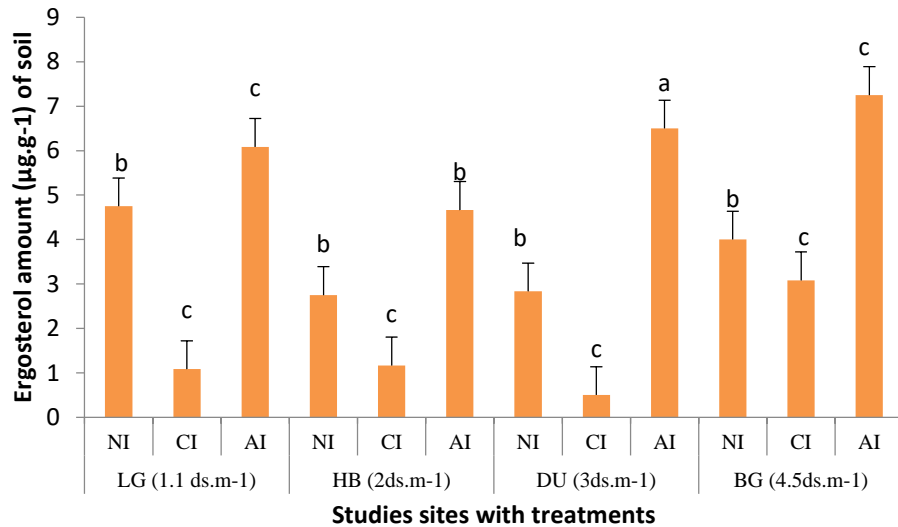
Impact of AMF inoculum sources on *T. articulata* shoots phosphorus content in the four studied soils. NI: non-inoculated. CI: commercial inoculum. AI: Indigenous inoculum.

## 2. Soil microbial biomasses:

Increase by 46% for AMF

Impact of AMF inoculum sources on C16:1w5 soil content of *T. articulata* in the four studied soils. NI: non-inoculated. CI: commercial inoculum. AI: Indigenous inoculum.



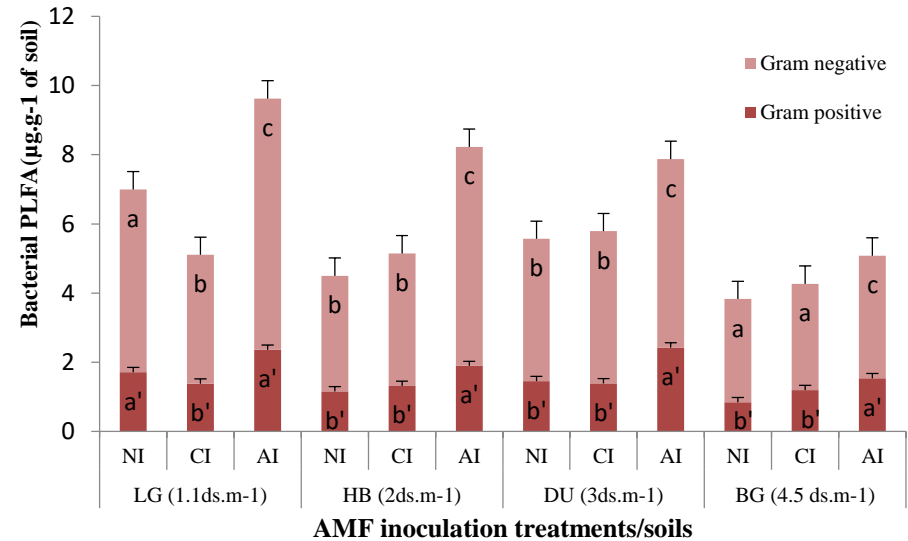


25% for saprotrophic fungi evaluated by ergosterol amount.

Impact of AMF inoculum sources on ergosterol soil content of *T. articulata* in the four studied soils. NI: non-inoculated. CI: commercial inoculum. AI: Indigenous inoculum

and 15% for bacterial biomasses.

Impact of AMF inoculum sources on PLFA C16:1w5 content of *T. articulata* in the four studied soils. NI: non-inoculated. CI: commercial inoculum. AI: Indigenous inoculum



Pearson's correlation coefficient between mycorrhizal colonization rate, shoot dry weight and the different measured parameters under AMF inoculation treatments:

	NI Treatment		CI Treatment		AI Treatment	
	MCR	SDW	MCR	SDW	MCR	SDW
SDW	0.5*	-	0.7*	-	<b>0.9**</b>	-
RDW	0.6*	-	-0.2	0.9***	<b>0.8**</b>	<b>0.9***</b>
Shoot Phosphorus	0.6*	0.6*	0.7*	0.5*	<b>0.9**</b>	0.7*
Soil phosphorus	-0.3	0.9***	0.3	0.7**	-0.8**	0.2
Shannon index	0.3	0.1	0.3	0.2	0.9**	0.4**
AMF species richness	0.5	0.3	-0.4	-0.5	<b>0.9**</b>	0.2**
NLFA C16 :1ω5	0.6*	0.4*	-0.1	-0.5	<b>0.7*</b>	0.5*
PLFA C16 :1ω5	-0.00	0.6	-0.00	0.5	<b>0.6*</b>	0.2*
NLFA/PLFA C16:1ω5	0.6*	0.3**	-0.1	-0.3	0.6*	0.00*
Ergosterol	0.4	0.6	0.0	0.3	<b>0.6*</b>	0.2*
Gram positive bacteria	0.5	0.0	0.2	0.1	<b>0.5*</b>	0.2*
Gram negative bacteria	0.4	0.3	0.00	0.1	<b>0.6*</b>	0.2**

MCR: Mycorrhizal colonization rate. SDW: Shoot dry weight. RDW: root dry weight. \*Correlation is significant at the 0.05 level. \*\* Correlation is significant at the 0.01 level. \*\*\* Correlation is significant at the 0.0001 level. NI: non-inoculated. CI: commercial inoculum. AI: indigenous inoculum

- Present results open the way towards the preferential use of mycorrhizal inoculum, based on native AMF, to perform revegetation and to restore the saline soil microbiota biodiversity.





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*Thanks for your attention*



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