Introduction of Exogenous AMF Species Alters the Diversity and Functionality of AMF Communities in Cowpea

Leal, V.C.[1], Brígido, C.[2*], Souza, I.J.S.[1], Júnior, G.V.L.[3], Carvalho, M.[2], Fernandes-Júnior, P.I.[4], Martins, L.M.V.[1]

[1]Programa de Pós-Graduação em Agronomia: Horticultura Irrigada, Universidade do Estado da Bahia (UNEB), Juazeiro, Bahia, Brazil; [2]MED – Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute, Institute for Advanced Studies and Research, Universidade de Évora, Pólo da Mitra, Ap. 94, 7006-554 Évora, Portugal; [3]Embrapa Meio Ambiente, Jaguariúna, São Paulo, Brasil; [4]Embrapa Semiárido, Petrolina, Pernambuco, Brazil

* ccb@uevora.pt

Abstract

Salinity in arid and semi-arid regions is rapidly increasing due to climate change and human activities [1]. The use of inoculants containing beneficial microbes, such as arbuscular mycorrhizal fungi (AMF) and rhizobia, offers a promising alternative for enhancing plant production in these areas [2]. This study investigates the effects of common agricultural practices, specifically microbial inoculation and crop rotation, on cowpea growth and its interaction with soil microbes under both non-stressed and salt-stressed conditions. Experiments were conducted in a greenhouse using non-sterilized soil, with and without NaCl supplementation. Inoculants included the *Bradyrhizobium yuanmingense* BR 3267 strain and a commercial AMF mixture (Endoplant Riego). Additionally, cowpea growth was assessed following the succession of buffelgrass (*Cenchrus ciliaris*) with or without prior soil disturbance. We evaluated plant and symbiotic parameters, nutrient content in leaves, and AMF and root nodule communities through DNA metabarcoding. Under non-stressed conditions, inoculation with AMF and/or the BR 3267 strain significantly increased cowpea biomass and enhanced N and P content in leaves. Although salinity negatively impacted cowpea growth, it did not significantly affect symbiotic parameters. Moreover, the increase of AMF propagules available through the inoculation of commercial AMF in the soil at buffelgrass sowing played a crucial role in mitigating the effects of soil tillage and salinity on cowpea growth. Interestingly, bacterial communities in the root nodules were more influenced by AMF communities than by rhizobia inoculation. The benefits of commercial AMF are likely due to changes in the biological composition and functionality of the AMF communities associated with cowpea. Overall, this study demonstrates that microbial inoculation and crop rotation are effective strategies for improving cowpea growth and mitigating the adverse effects of salinity.

References

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