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Native soil bacteria and biocrust cyanobacteria inoculation improve seedling emergence of native plants on saline dryland soils

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Soil salinity can result in osmotic and ionic stresses that critically impede seedling emergence, especially in drylands. Novel microbial-based technologies are emerging in the context of ecosystem restoration as a promising strategy to improve seedling establishment in saline environments. However, with recent concerns and the potential adverse impact of the use of exogenous microorganisms as bio-inoculants, much work is needed to develop groups of native microorganisms that can overcome soil salinity stress during restoration. In this study, we tested the effect of bio-inoculants individually composed of halophilic bacteria, biocrust cyanobacteria, and a consortium combination of both, on improving seedling emergence in soils with three salinity levels (low, moderate, and high salinity). Seedling emergence was assessed in four Australian native plants, *Triodia epactia, Triodia pungens, Acacia ampliceps* and *Canavalia rosea,* all inoculated with each of the inoculants and a control treatment without microbial inoculation. Our results showed that the highest seedling emergence was recorded in soils with low salinity, followed by moderate salinity soil and high salinity soil. Both *Triodia* spp. were severely impacted by salinity with very low emergence in all soil types. *Acacia* sp. emergence was higher when inoculated with halophilic bacteria in low and moderate salinity soils while *Canavalia* sp. emergence was higher under cyanobacteria inoculation in moderate salinity soils. Overall, our study shows that individual inoculation of halophilic bacteria and cyanobacteria improves the emergence of *Acacia* sp. and *Canavalia* sp. seedlings in low and moderate saline soils, while seedling emergence in high salinity soils can only be enhanced when using the combined consortia composed of halophiles and cyanobacteria. The analyses of the soil bacterial community composition by 16S rRNA gene amplicon sequencing showed that the inoculants did not negatively affect the resident bacterial soil communities. In conclusion, poor seedling emergence from salinity stress during the restoration of some plant species can be ameliorated with the inoculation of native halophilic bacteria and cyanobacteria. Grass species such as *Triodia* might need additional treatments to overcome salinity stress.