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From arid wild legume shrubs to food legume: Application of non-rhizobial bacterial endophytes to improve *Cicer arietinum* L. growth under salinity

R. Ben Gaied[1,2], I. Sbissi[1], M. Tarhouni[1], C. Brígido[3]

[1]Institute of Arid Land, Laboratory of Pastoral Ecosystems and Promotion of Spontaneous Plants and Associated Micro-Organisms, University of Gabes, Tunisia.
[2]MED – Mediterranean Institute for Agriculture, Environment and Development, Universidade de Évora, Pólo da Mitra, Ap. 94, 7006-554 Évora, Portugal.
[3]MED – Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustain-ability Institute, Institute for Advanced Studies and Research, Universidade de Évora, Pólo da Mitra, Ap. 94, 7006-554 Évora, Portugal.

Email: roukaya.gaied@uevora.pt

Chickpea (*Cicer arietinum* L.) is an important grain legume with a high nutritional value. Being the third-largest food legume produced worldwide, chickpea is mainly cultivated in developing countries where crop farming suffers the impacts of various biotic and abiotic constraints such as heat, salinity, and drought. In such vulnerable areas, the increase of soil salinity results in an annual loss of 8-10% of chickpea yield. Salt stress induces not only anatomic and biochemical changes in chickpea plants, but also inhibits the symbiotic interaction with *Mesorhizobium* resulting in impaired biological nitrogen fixation. In this context, the present study evaluates the effects of salinity on the early molecular events of the *Mesorhizobium*-chickpea interaction and presents the use of non-rhizobial bacterial endophytes, isolated from wild legume shrubs, as a biological alternative to mitigate the negative impacts of salinity on chickpea growth and symbiosis.

As expected, salinity had a negative effect on both symbiotic partners. In chickpea, a significant decrease of 44% of seeds germination was registered under 0.2% NaCl. In addition, a significant reduction of the plant growth was observed in uninoculated plants supplemented with synthetic nitrogen. Similarly, results showed a significant decline in the symbiotic performance of the *Mesorhizobium* strain under salt stress. Both *in vitro* and *in vivo* assays revealed a significant negative impact of salinity on i) the expression of specific symbiotic genes and, ii) the formation of nodules in chickpea plants inoculated with *Mesorhizobium* alone. Interestingly, the combination of chickpea microsymbiont with different non-rhizobial bacterial endophytes consortia showed to promote i) the plant growth under salinity and ii) the *Mesorhizobium*-chickpea symbiosis in co-inoculated plants submitted to salt stress. The present study highlights the sensitivity of the early signalling molecular events between both partners to salt stress and reveals the potential application of non-rhizobial bacterial endophytes from wild legume shrubs as plant-growth promoting bacteria in salinized soil.

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