Seventh Article: (Sharing with another inside and outside the specialization-published).

Article title	*Spirulina platensis*-inoculated humified compost boosts rhizosphere soil hydro-physico-chemical properties and *Atriplex nummularia* forage yield and quality in an arid saline calcareous soil
Participants	Sameera A. Alghamdi[1], Hesham F. Alharby[1], Mahmoud A. Abdelfattah[2], Ibrahim A. A. Mohamed[3], Khalid R. Hakeem1, Mostafa M. Rady[3], **Ahmed Shaaban**[4] [1]Department of Biological Sciences, Faculty of Science, King Abdulaziz University, Saudi Arabia [2]Soil and Water Department, Faculty of Agriculture, Fayoum University, Egypt [3]Botany Department, Faculty of Agriculture, Fayoum University, Egypt [4]**Agronomy Department, Faculty of Science, Fayoum University, Fayoum, Egypt**
Article status	Sharing with another inside and outside the specialization- Published in International Journal
The Journal	Journal of Soil Science and Plant Nutrition 23, 2215–2236.
Impact factor	3.600

ABSTRACT

In arid and semi-arid climates, soil salinization and calcareousness are increasingly serious problems, threatening agricultural sustainability. Using bio-organic amendments to improve rhizosphere hydro-physico-chemical properties of saline calcareous soils is necessary to hasten restoration processes. This study aimed to explore the impact of bio-organic amendments on rhizosphere hydro-physico-chemical properties and nutrient status of saline calcareous soil along with oxidative stress biomarkers, antioxidant capacity, morpho-physiological attributes, nutritive value, and forage yield of multi-stressed *Atriplex nummularia*. A two-field experiment (2020 and 2021), comprising of five treatments replicated thrice, was conducted in a completely randomized block design. The treatments were un-amended control, leguminous compost (LCt), LCt supplemented with humic acid (HA), LCt inoculated with *Spirulina platensis* (SP), and LCt supplemented with HA+SP. Each bio-organic amendments, with a rate of 20 t ha^{-1}, were applied to amend saline calcareous soil characterized by electrical conductivity of saturated soil past extract (ECe=8.5 dS m^{-1}), 32.5% $CaCO_3$, and poor organic matter for growing *Atriplex nummularia*. Applying bio-organic amendments, particularly *Spirulina platensis*-inoculated humified leguminous compost, ameliorated soil defects through improvement of hydro-physico-chemical properties by lowering soil reaction (pH), ECe, $CaCO_3$ content, and exchangeable Na^+ and Ca^{2+}, increasing cation exchange capacity, organic matter, and water retention at field capacity, thus maintaining higher nutritional status. These findings were positively reflected in morpho-physiological attributes, forage yield, and nutritive value (increased soluble protein and nutrients). B-group vitamins (e.g., thiamin, riboflavin, niacin, pyridoxine, folic acid, and cyanocobalamin) of multi-stressed *Atriplex nummularia* forage were also improved. Further, this treatment significantly boosted non-enzymatic and enzymatic antioxidants, detoxifying reactive oxygen species (i.e., superoxide and hydrogen peroxide), nitrite and nitrate contents, and reducing malondialdehyde and electrolyte leakage, associating with greater stress tolerance in *Atriplex nummularia*. Overall, application of *Spirulina platensis*-inoculated humified leguminous compost is a promising sustainable approach in amending rhizospheric soil properties, nutrient availability, and exchangeability of Na^+ and Ca^{2+}, thus maximizing forage yield and quality of *Atriplex nummularia* in saline calcareous arid region.