Fifth Article: (Sharing with another inside and outside the specialization-Published).

Article title	Incorporation of compost and biochar enhances yield and medicinal compounds in seeds of water-stressed *Trigonella foenum-graecum* L. plants cultivated in saline calcareous soils
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Abstract

Background: The combination of compost and biochar (CB) plays an important role in soil restoration and mitigation strategies against drought stress in plants. In the current study, the impact of CB was determined on the characteristics of saline calcareous soil and the productivity of fenugreek (*Trigonella foenum-graecum* L.) plants. The field trials examined CB rates (CB0, CB10 and CB20 corresponding to 0, 10, and 20 t ha–1, respectively) under deficit irrigation [DI0%, DI20%, and DI40% receiving 100, 80, and 60% crop evapotranspiration (ETc), respectively] conditions on growth, seed yield (SY), quality, and water productivity (WP) of fenugreek grown in saline calcareous soils. Results: In general, DI negatively affected the morpho-physio-biochemical responses in plants cultivated in saline calcareous soils. However, amendments of CB10 or CB20 improved soil structure under DI conditions. This was evidenced by the decreased pH, electrical conductivity of soil extract (ECe), and bulk density but increased organic matter, macronutrient (N, P, and K) availability, water retention, and total porosity; thus, maintaining better water and nutritional status. These soil modifications improved chlorophyll, tissue water contents, cell membrane stability, photosystem II photochemical efficiency, photosynthetic performance, and nutritional homeostasis of drought-stressed plants. This was also supported by increased osmolytes, non-enzymatic, and enzymatic activities under DI conditions. Regardless of DI regimes, SY was significantly ($P \leq 0.05$) improved by 40.0 and 102.5% when plants were treated with CB10 and CB20, respectively, as similarly observed for seed alkaloids (87.0, and 39.1%), trigonelline content (43.8, and 16.7%) and WP (40.9, and 104.5%) over unamended control plants. Conclusions: Overall, the application of organic amendments of CB can be a promising sustainable solution for improving saline calcareous soil properties, mitigating the negative effects of DI stress, and enhancing crop productivity in arid and semi-arid agro-climates.