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Article title	Filter mud enhanced yield and soil properties of water-stressed *Lupinus termis* L. in saline calcareous soil.
Participants	**Ahmed Shaaban**[1]; Omar A.A.I. Al-Elwany[2]; Nasr M. Abdou[3]; Khaulood A. Hemida[4]; Ahmed M.A. El-Sherif[1]; Mohamed A. Abdel-Razek[3]; Wael M. Semida[2]; Gamal F. Mohamed[5]; Taia A. Abd El-Mageed[3] [1]**Agronomy Department, Faculty of Agriculture, Fayoum University, Egypt** [2]Horticulture Department, Faculty of Agriculture, Fayoum University, Egypt [3]Soil and Water Department, Faculty of Agriculture, Fayoum University, Egypt [4]Botany Department, Faculty of Science, Fayoum University, Fayoum, Egypt [5]Botany Department, Faculty of Agriculture, Fayoum University, Egypt
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ABSTRACT

Filter mud (FM) as an organic ameliorant might benefit in improving soil- and water-stressed crop productivity. However, the beneficial FM's effects on soil and crop performance under deficit irrigation have not yet been fully comprehended. Our objective was to investigate the effect of FM under two irrigation regimes on soil quality, morpho-physiological and stem anatomical responses, antioxidant capacity, and ionic homeostasis of lupine grown under saline calcareous soil conditions. FM with three rates (0, 10, and 20 t ha^{-1}) under two irrigation regimes (deficit irrigation water; DIW = 60% of crop evapotranspiration; ET_c and full irrigation; FI = 100 of ET_c) on soil quality, lupine crop, and water productivity (WP) in saline calcareous (ECe = 7.12 dS m^{-1} and $CaCO_3$ = 15.3%) soil in both 2019–2020 and 2020–2021 seasons. Compared with FI, DIW drastically reduced lupine's morpho-physiological responses, leaf nutrients (nitrogen, N; phosphorus, P; potassium, K^+; and calcium, Ca^{2+}) except sodium (Na^+), and stem anatomical aspects, resulting in a 29.6% reduction in seed yield (SY), respectively. Amending soil with 10 or 20 t FM ha^{-1} noticeably attenuated the negative influences of DIW stress through recovering various physiological and anatomical responses, antioxidant defense system, and ionic homeostasis, resulting in higher SY (by 72.4 or 116.4%) and WP (by 92.7 or 112.2%), respectively. This is primarily due to FM's positive effects on soil physicochemical properties, which include decreasing ECe, pH, and bulk density and increasing total porosity, cation exchange capacity, and water and nutrient retention capacities, which improved root nodulation. Lupine's growth and stem anatomical responses, nutrient uptake, and SY were improved by soil amending with 10 or 20 t FM ha^{-1} under FI or DIW strategies. Conclusively, 20 t FM ha^{-1} may be recommended as a soil amendment, even under DIW strategy, for improving lupine yield and WP in saline calcareous soil.