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A novel compost alleviate drought stress for sugar beet production grown in Cd-contaminated saline soil

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Taia A. Abd El-Mageed[a], Ahmed M.A. El-Sherif[b], Shimaa A. Abd El-Mageed[b], **Nasr M. Abdou**[a]

[a] Soil and Water Department, Faculty of Agriculture, Fayoum University, 63514, Fayoum, Egypt

[b]Agronomy Department, Faculty of Agriculture, Fayoum University, Fayoum, Egypt

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Abstract

Supplying novel compost [70:30 w/w sugarcane bagasse and animal blood used as composting raw materials] under deficit drip irrigation conditions could be a practical solution to avoid the detrimental effects of irrigation shortage on sugar beet grown in cadmium (Cd) - contaminated salty soil. In this regard, two experiments were conducted in open field during 2016/17 and 2017/18 at El Fayoum region, Egypt. Three novel compost (NC) rates (0, 10 and 20 t ha^{-1}) were supplied as a soil amendment combined with three irrigation levels [100, 80 and60% of crop evapotranspiration (ETc)]. The NC improved soil properties and reduced leaves and roots Cd uptake. Sugar beet yield, quality, and irrigation use efficiency (IUE) were positively affected by irrigation regime and by NC rates. Leaf area, dry matter, relative water content (RWC %), chlorophyll fluorescence, chlorophyll content (SPAD), harvest index (HI) and membrane stability index (MSI %), were also positively affected by irrigation quantity and by NC rates. The highest yields [root yield (97.2, t ha^{-1}), biomass yield (32.3, t ha^{-1}) and white sugar (15.2 t ha^{-1}) were recorded under fully irrigated and 20 t ha^{-1} of NC. Novel compost of 20 t $ha^{-1}$and 10 t ha^{-1} significantly ($p \leq 0.05$), in particular, increased root yield by 53.49 and 15.93% compared to control. The results revealed that the detrimental impacts of drought stress can be greatly reduced by using NC as a soil amendment for sugar beet production. The results also revealed Combining deficit irrigation and NC maximized crop water productivity.