Green waste-derived compost alleviates drought stress and promotes sugar beet productivity and biofortification

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Green waste-derived compost (GWC) is a valuable soil amendment for improving soil organic matter and decreasing waste products and potential pollutants. This study was carried out to evaluate the effect of GWC application on the yield and quality of sugar beet under deficit irrigation conditions using different irrigation systems. A field experiment was conducted using the commercial sugar beet variety 'Gazelle' in sandy soil. Two doses (0 and 14 ton ha^{-1}) of GWC were applied to the soil. Three water deficiency levels (60%, 80% and 100% of the soil field capacity) under either drip or sprinkler irrigation systems were applied. The application of 14 ton ha^{-1} of GWC resulted in the highest root and recoverable sugar yields, especially under the well-irrigated conditions under drip irrigation. Sugar beet root biofortification and juice quality were also significantly improved under drip irrigation in response to the application of 14 ton ha^{-1} of GWC by increasing sucrose content, quality index (Qz)% and recoverable sugar (RS)%. The application of GWC under drip irrigation enhanced water use efficiency for root and recoverable sugar yields, in particular under drip irrigation and water deficit conditions (60% of the soil field capacity). The soil physicochemical properties were significantly improved in response to the application of GWC. GWC application promoted the yield and biofortification of sugar beet by improving the soil physiochemical properties, and nutrient mobilization and uptake. The application of GWC is essential for sustainable sugar beet production and efficient irrigation water use in sandy soils.