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Effect of Clay Deposits on Physicochemical and Intermittent Evaporation Characteristics of Torripsamment

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Clay minerals are the key component controlling water storage and movement in irrigated arid soils. This research aims to evaluate the effect of different rates of deposits varied in the clay minerals on physicochemical properties and intermittent evaporation of Torripsamment. Four clay deposits, bentonite, zeolite (clinoptilolite) and treated sewage sludge (TSS) samples were selected and mixed with sandy calcareous soils (five concentrations) followed by saturation with water for 5 wetting and drying cycles. Moisture losses in each cycle were monitored daily; after the 5th cycle penetration resistance and physicochemical properties were measured. Results indicated that increasing application rates alter most of the studied soil properties including cation exchange cpapacity (CEC), electrical conductivity (EC), clay%, silt%, and exchangeable Ca, Mg and Na. The extent of changes in sandy soil properties was variable depending on the deposits type and application rates. Increasing zeolite rates dramatically increase CEC and exchangeable Ca of the treated sandy soil while the corresponding increase of clay contents as a result of zeolite applications was relatively low. Increasing TSS application increased dramatically EC values (dS/m) and exchangeable K compared with all other deposits. TSS showed the lowest average pH, 7.92, whereas the highest pH value, 8.58, was found in Torripsamment-treated bentonite. Bentonite applications significantly increased exchangeable Na in treated sandy soils, followed by Sharqiah and Khulays deposits. Penetration resistance (PR) values of the untreated soil increased significantly with increasing application rate particularly in smectite-rich deposits. Data revealed that 10% application rate of smectite-rich deposits reflected on some physicochemical characteristics of Torripsamment. Application rates of 5% and 10% had the lowest and the highest evaporation (E), respectively. Smectite-rich deposits caused extensive cracking on the surface and consequently increased evaporation. The order of E during the first cycle was zeolite > TSS > Khulays >

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