

## Comparison of chemical fertilizer and sewage sludge application on some nutrients' bioavailability in three textural classes of a calcareous soil after harvesting spinach (*Spinacia oleracea* L.)

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### Abstract

Sewage sludge (SS) as a source of macro- and micro nutrients has been utilized in many countries for crop and vegetable production. To compare the influence of SS with chemical fertilizer on macro- and micro nutrients bioavailability in three textural classes of a calcareous soil after harvesting spinach (*Spinacia oleracea* L.), a factorial experiment was carried out in a completely randomized design with two factors and three replications under glasshouse conditions. The first factor was SS levels (0, 10, 20, 40, and 80 mg per kg soil) and the second factor was soil textural classes (sandy, sandy loam, and clay loam). A chemical fertilizer treatment was used for comparison with the applied SS treatments. Results indicated that total nitrogen (N) and available phosphorus (P) was significantly higher in SS amended soils compared to fertilizer treatment. Effect of increasing soil potassium (K) due to addition of SS was less than P and N, which is probably due to low content of K in SS. Soil DTPA extractable iron, zinc, copper, and manganese were significantly increased in SS treatments in all soil textures and were higher than fertilizer treatment. Based on nutrients' bioavailability in soil after harvesting spinach, especially at high rates of SS, addition of most nutrients is not necessary for the next crop. Concentration of DTPA extractable cadmium (Cd) and lead (Pb) was not detectable in all treatments. Therefore, because of low contents of Cd and Pb in the utilized SS, reaching to a toxic level of these elements in soil is unexpected. However, if high levels of SS are applied frequently, soil test is recommended for monitoring heavy metals concentration in amended soils. Prior to any SS recommendation, the results of this research need to be verified under field conditions.

**Keywords:** Macronutrients, Micronutrients, Heavy metals.

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