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SALINE-SODIC SOIL RECLAMATION WITH STABILIZED SEWAGE SLUDGE AND RECYCLED WASTEWATER

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Abstract

Saline-sodic soil reclamation can be enhanced with a sustainable and environmental approach by using organic waste materials. Moreover, wastewater can be used in leaching processes to protect freshwater resources in regions with water shortages. The aim of this study was to reclaim saline-sodic soil by using recycled wastewater and stabilized sewage sludge together with gypsum. The experiment was designed with three replicates using four different sewage sludge doses (0, 4, 8 and 12 kg m^{-2}), and four different leaching variants from alternative applications of freshwater and wastewater (4 sludge doses × 4 leaching variants × 3 replicates = 48 columns). The soil depth tested was 30 cm and sewage sludge was mixed in the top 15 cm of soil. While leaching variants had no effect on improving reclamation, sewage sludge introduced important effects. Soil salinity was reduced by 79% and 86% in the top and sub layer, respectively. Wet aggregate stability, organic matter, and exchangeable Ca+Mg content were increased in the upper layer, while pH, exchangeable Na, and exchangeable sodium percentage (ESP) were decreased. Sodium removal ratio reached 64%, whereas this ratio was 41.7% for the columns with no sewage sludge. Hydraulic conductivity was negatively affected due to high ESP, low electrolyte concentration and weak aggregate stability in the sub layer. The total N and P accumulation in the columns was restricted due to leaching effects. Although it was observed that heavy metals tended to accumulate in the sub layer, the concentrations did not exceed the pollution limit values.

Keywords: aggregate stability, heavy metal, hydraulic conductivity, saline-sodic soil, sewage sludge

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