

Effects of straw returning and nitrogen addition on soil quality and physicochemical characteristics of coastal saline soil: A field study of 4 consecutive wheat-maize cycles

Hongjun Yang¹, Jiangbao Xia¹, Wenjun Xie¹, Shoucai Wei¹, Qian Cui¹, Pengshuai Shao¹, Jingkuan Sun¹, Kaikai Dong¹, and Xingchao Qi¹

¹Binzhou University

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Abstract

The effects of different straw returning and nitrogen addition levels on soil quality are important for proper coastal saline soil remediation. Two maize/wheat straw returning levels ($1.0 \times 10^4 \text{ kg ha}^{-1}$ (2S) and $5.0 \times 10^3 \text{ kg ha}^{-1}$ (S)) and three inorganic nitrogen addition levels (300 kg ha^{-1} (N2), 150 kg ha^{-1} (N) and 75 kg ha^{-1} (N1/2))—were studied, with 150 kg ha^{-1} inorganic nitrogen and without straw addition treatment as the control (CK), to elucidate the response of soil physical and chemical properties to the two factors. Dry-sieving technique was applied to fractionate the soils into silt-plus-clay particles ($< 0.053 \text{ mm}$, CS), microaggregates ($0.053\text{--}0.25 \text{ mm}$, MI), small macroaggregates ($0.25\text{--}2.0 \text{ mm}$, SM), and large macroaggregates ($> 2 \text{ mm}$, LM). After four consecutive wheat-maize cycles, different straw and N fertilizer treatments obviously decreased the salinity contents, increased the total nutrient contents, and optimized the soil structure of the saline soil. The saline soil reclamation effects showed significant distinctions among the different straw and N fertilizer treatments. The 2SN2 treatment displayed the greatest effects in regard to decreasing salinity, increasing the total soil nutrient contents and optimizing the soil structure, which resulted in the best remediation effect. Straw returning play a major role in decreasing soil salinity and enhancing saline soil aggregate formation. N fertilizer addition supplies rich nutrients for straw decomposition, and promotes soil microbial growth and reproduction, which brought about C sequestration in coastal saline soil. During the coastal saline soil remediation process in the Yellow River Delta, it is suggested to prioritize straw returning and moderate N fertilizer addition, and live together with moderate P fertilizer application.

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