

Subsurface organic amendment with plastic film mulching reinforced soil organic carbon through altering saline soil aggregate structure and regulating fungal community

Hongyuan Zhang¹, Huancheng Pang¹, Jiashen Song¹, Fangdi Chang¹, Jing Wang¹, Yitao Zhang², and Li Yuyi¹

¹Chinese Academy of Agricultural Sciences Institute of Agricultural Resources and Regional Planning

²Institute of Geographic Sciences and Natural Resources Research Chinese Academy of Sciences

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Abstract

The combination of plastic film mulching and subsurface organic amendment is a novel strategy for saline soil amelioration and utilization in China. However, how the strategy affect soil organic carbon (SOC) contents directly and indirectly (physical protection and microbiological regulation) were still not-documented. Therefore, four treatments, i.e., no amendment with and without plastic film mulching, subsurface (10-30 cm soil depth) organic amendment with and without plastic film mulching, were arranged and sampled after three-year field experiment. Compared with no amendment with and without plastic film mulching, subsurface organic amendment increased the SOC content in the 0-40 cm soil depth by 70% and 90%, respectively. Plastic film mulching decreased SOC by 16% without organic amendment. Subsurface organic amendment transformed the dominant aggregation particles from <0.053 mm to 0.25-2 mm, indicating that both direct carbon input and indirect physical protection contributed to SOC increment. Conversely, SOC decreased with plastic film mulching due to the 14% lower fungal diversity compared with soil without plastic film mulching, was supported by the positive path coefficient from fungal diversity to SOC. Therefore, the combination of plastic film mulching and subsurface organic amendment increased SOC by 61% by direct carbon input and indirect physical protection and microbial regulation. In conclusion, subsurface organic amendment with plastic film mulching reinforced soil organic carbon increment through altering saline soil aggregate structure and regulating fungal community, and confirmed it is a feasible way to increase SOC for saline soil amelioration.





