



## Combination of subsurface organic fertilization and film mulching could effectively optimize soil structure in saline alkali soil

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**Abstract**□Saline soil has a serious negative effect on crop growth in the world, subsurface organic fertilization combined with plastic film mulching (OMP) is one of the effective measures to solve this issue, which could alleviate salt stress, increase nutrient content and microflora diversity, then furtherly improve crop productivity. However, its impact on soil structure especially soil pore structure has not well documented, so a three-year experiment was conducted to analysis effect of OMP on aggregate distribution and stability, aggregate organic carbon distribution and pore size distribution, during 2015-2017 in Wuyuan Country, Inner Mongolia, China. Four treatments were set in the experiment, including plowing without plastic mulching (CK), plowing plus plastic mulching (PM), subsurface (10–30 cm) treatment with organic manure (OM), and OM plus plastic mulching (OMP). The results showed that in condition of no mulching OM significantly increased the 0.25-2mm aggregates content (18.09%) in 10-30cm soil layer, and significantly increased the organic carbon content of > 2mm (30.79-158.76%) and 0.25-2mm aggregates (161.27-290.94%) in each soil layer compared with CK. In condition of mulching, only OMP can significantly increase the average weight diameter (21.58% for 0-10 cm and 55.95% for 10-30 cm) and the organic carbon content (2.44-94.35% for 0-10 cm and 23.23-215.29% for 10-30 cm) of soil aggregates compared with CK. Under the condition of subsurface organic fertilization (OM, OMP), the dominant particle size of each soil layer changed from < 0.053 mm aggregate to 0.25-2 mm aggregate, which increased the content of large aggregate and water stability. Compared with OM, the average weight diameter of soil aggregates in 0-10cm and 10-30cm soil layers of OMP increased by 21.58% and 14.36% respectively, but the content of organic carbon in each particle size aggregate in 0-10cm and 10-30cm soil of OMP decreased by 4.24-24.89% and 19.35-40.26% respectively. Furtherly, the large porosity (greater than 30 μm) of 10-30cm and 30-40cm soil layers of OMP increased by 10.52% and 0.71% than that of CK, and the porosity of each equivalent pore size range also increased significantly. Therefore, combination of subsurface organic fertilization and film mulching could effectively optimize soil physical structure by increasing the stability of soil aggregates, maintaining higher organic carbon content, enhancing soil respiration and improving soil pore structure.

**Key words**□Saline alkali soil; organic fertilizer; soil aggregate; soil pore structure; micro CT