SOIL ORGANIC PROPERTIES AS AFFECTED BY LONG TERM TILLAGE PRACTICES

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Abstract

Crop residue management practices have been shown to alter soil organic properties such as soil organic carbon (SOC) and nitrogen (SON). These properties have been recognized as indicators of soil quality. This study was performed to monitor the effect of various long-term tillage practices on selected soil organic properties such as SOC, soil microbial biomass nitrogen (SMBN), and SON.

An Orelia scl was the test soil which received the same cultural practices for the past 18 years. Cotton was grown for 10 years, and corn and sorghum for 8 years in 4-year rotations. Soils were sampled at planting and again at harvest at depths of 0-1", 1-3", 3-5", 5-7", and 7-12". The fertilizer rates were the same for all the treatments (80-20-0). The tillage treatments used were: CT-conventional, MB-12" moldboard, CH-12" chisel, MT-minimum till, and NT-no-till. The Walkley-Black procedure was used for organic carbon determination and the Horiba Cardy meter was used for $N0_3$determination. Microbial biomass N and C were determined using the chloroform fumigation-incubation method and total organic nitrogen was determined by the Micro-Kjeldalh procedure.

Both conservation tillage systems (NT, MT) produced the highest surface organic residue. Organic carbon, SMBN, SON and $N0_3$-N decreased with soil depth. The No-till soil had significantly greater SOC, SMBN, and $N0_3$-N in the surface layers compared to soil in the CT system. The MT and NT soil contained significantly higher SMBN compared to the CT soil at all depths at seeding. At this same time SMBN was considerably higher than at harvest for all tillage systems and depths. The tillage effect on soils sampled at harvest was nonsignificant, except for the moldboard treatment which showed the lowest SMBN at both samplings. Total organic N showed nonsignificant effects due to tillage but appeared positively influenced by NT and MT tillage practices. SMBN showed greatest sensitivity in reflecting treatment effects on soil nitrogen properties.

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