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Soil Aggregate Stability and Components of Organic Matter Affected by Tillage.

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Soil organic matter (SOM) is important to soil function. Increased tillage intensity has been implicated in loss of SOM. Objectives were to determine effect of tillage on components of SOM and water stability (WSA) of soil aggregates. Measurements were made on adjacent farms in eastern South Dakota. One farm used no tillage (NT) and the other used chisel tillage (CT). Soil is a clay loam. On each farm, approximately 10 kg of soil from the top 5 cm was collected from four locations. Soil was separated into six aggregate groups using a rotary sieve. Aggregate size ranges for groups 1-6 were: <0.4, 0.4-0.8, 0.8-2, 2-6, 6-19, and >19 mm. We measured: dry aggregate stability, WSA, soil carbon (SC), SOM, fine particulate organic matter (POM), coarse POM, immunoreactive total glomalin (IRTG), and soil basidiomycete fungi (BF). Quantitative solid-state ^{13}C NMR was used to examine humic acid (HA), humin, and whole soil. Soil C was greater ($p=0.001$) under NT, compared with CT. Basidiomycete population and IRTG were greater ($p=0.003$) under NT. There was a difference ($p=0.01$) in C:N of HA between NT and CT. Fine POM and WSA were greater ($p=0.001$) under NT, compared with CT. Degree of SOM decomposition, defined as the ratio of alkyl carbon to O-alkyl carbon, was higher for humin and whole soils, indicating increased decomposition upon tillage. Multiple regression identified that fine POM, C:N of HA, and BF accounted for 63% ($p<0.001$) of the variability in WSA. Differences in properties among aggregates indicate that SOM was not uniformly distributed among aggregate groups. Reduction of tillage increased fPOM and WSA and this may curb soil loss by maintaining surface conditions resistant to erosion.

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