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Riley Mabe

Kaeden Mollett

Marcus Robertson

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Riley Mabe, Kaeden Mollet, Marcus Robertson, I.P. Handayani and B. Parr

Murray State University, Hutson School of Agriculture

ABSTRACT

Soil properties are affected by tillage practices. Tillage practices that provides an adequate growing environment for crops and maintains good soil structure is crucial. The objective of this study was to compare selected soil properties collected from no-till (NT) and conventional tillage (CT) systems in Kentucky, Indiana, and Illinois. Three undisturbed and three disturbed soil samples were taken from the topsoil at the depth of 0 to 7.5 cm. The samples were analyzed for bulk density (BD), water holding capacity (WHC), field capacity (FC), soil pH, soil organic matter (SOM), and compaction. Bulk density, WHC, and FC of the soil was determined from the undisturbed soil samples. Disturbed soil samples were used to determine soil pH and SOM levels. In addition, a penetrometer was used to measure compaction levels in the soil. Statistical analysis was performed to test the significant effect of tillage practices on soil properties in questions. The soils had average bulk density of 1.24 g/cm3 in the no-till fields compared to 1.33 g/cm3 in conventionally tilled fields in both the Indiana and Kentucky sites, while no-till was 1.32 g/cm3 in Illinois. Conventional tillage fields had a higher average of 45.28% of soil water holding capacity compared to no-till which was 44.33%. Soil water holding capacity for no-till fields in Perry County (42.64%) and Henderson County (49.06%) were higher than the conventionally tilled fields at these sites. There was a significant difference between two tillage systems in SOM content at the Kentucky site which displayed 3.8% SOM in conventional till and 4.7% SOM for no-till. However, there was no significant effect of tillage systems on soil pH in Kentucky and Illinois. The average of soil pH of Indiana's conventional tillage site was 8.8, while no-till was 6.6. Compaction results varied between the three sites: Kentucky had the highest compaction rating at 280 psi at no-till fields at 30 cm. However, the Kentucky site also had the lowest compaction at conventional tillage from 15 cm which was 136.6 psi. The Indiana site displayed a very small significant difference between either conventional or no-till tillage systems from 15 or 30 cm. For Illinois, both no-till depths had less compaction than either of the conventional tillage depths. Macroporosity showed no significant difference among the three sites. For the ratio macroporosity over microporosity, the Indiana and Illinois sites showed similar results (4.55%) and (4.27%), respectively, for conventional tillage. For no-till, Indiana and Illinois were (3.22%) and (3.26%), respectively. In general, the aeration for all fields are considered good for crops as indicated by macroporosity, bulk density and compaction level. These findings show that implementing no-till systems into the farming operations has improved soil quality indicators which eventually reduces soil erosion rate and thus maintains the crop production sustainability. The results of this study would help farmers justify whether implementing a no-till or conventional tillage practices can improve soil properties indicators to promote crop production and sustainability.

Keywords: Bulk Density, Compaction, Macroporosity, Organic Matter, Water Holding Capacity