

Impact of Tillage Systems and Organic Manure Application on Some Soil Physical Properties and Grain Yield of Oats (*Avena sativa* L.) Under Semi-Arid Climate Conditions

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Abstract

A field study was carried out at the Agricultural research station of the College of Agriculture - University of Basrah, located at Karama Ali, south of Iraq in silty clay loam soil at the semi-arid climate to study the impacts of tillage systems (i.e., conventional tillage CT, deep tillage DT, reduced tillage RT, and no-tillage NT) and organic manure contented with 10% maize straw, 20% chicken manure, and 70% cow manure at a rate of zero (M0), 20 (M1), 40 (M2), 60, and 80 Mg ha⁻¹ (M4) on some soil's physical properties and oat grain yield. The experiment was carried out in a split-block design with three replications. Bulk density (BD), aggregate mean weight diameter (MWD), penetration resistance (PR), water content (MC), and saturated hydraulic conductivity (Ks) were measured in two periods at the beginning and end of the growing season. The results showed that DT achieved lower BD and PR, as well as higher Ks and grain yield, than CT, RT, and NT at both periods of the growing season. The highest MWD and MC values were achieved by NT, followed by RT in both periods. However, the addition of manure M1, M2, M3, and M4 resulted in a significantly increased in MWD, MC, and Ks, while decreasing BD and PR in both periods as well as increasing grain yield by 37.50, 74.34, 82.89, and 97.37 respectively, compared to M0. The interaction between the tillage system and the addition of manure had a highly significant effect ($p < 0.01$) on BD, PR, and Ks in both periods. According to the t-test, the results showed that there was a significant effect of the sampling period on the soil properties studied. BD, MWD, PR, and MC increased at the end of the season by 9.68, 10.13, 15.18, and 55.32% compared to the beginning of the season, while Ks decreased by 14.58% at the end of the season. The highest and lowest grain yields of oat achieved by (DT * M4) and (NT * M0), were 6.70 and 2.75 Mg ha⁻¹, respectively.

Keywords: Tillage system, organic manure, soil physical properties, oat grain yield.

