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# Assessment of the yield and yield attributing characters of oat (Avena sativa L.) grown under different tillage methods and NPK fertilizer rates in semi-arid conditions

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**ABSTRACT**

Field experiments were conducted to determine the effect of tillage practices and inorganic sources of different combinations of nitrogen, phosphorus, and potassium fertilizers on some physical properties of soil and the yield of oats. The main plots were tillage techniques of no-till (T1), tillage with a cultivator (T2), twice-disc harrow (T3), and moldboard plowing (T4). Split-plots were fertilizer treatments of F1 control without fertilizer, 70:45:50 kg ha$^{-1}$ NPK (F2), 140:90:100 kg ha$^{-1}$ NPK (F3), 210:135:150 kg ha$^{-1}$ NPK (F4), and 280:180:200 kg ha$^{-1}$ NPK (F5). Soil density, acidity, electrical conductivity, and soil organic carbon increased under T1, while saturated hydraulic conductivity decreased compared with other tillage practices. Soil bulk density and pH increased with increasing sampling depth, while electrical conductivity and soil organic carbon declined with depth. Results from this study indicated a reduction in saturated hydraulic conductivity with time. The highest grain yield was found in the T4 and T3. In contrast, the highest grain yield was observed under F4 and F5 fertilization treatments at location 1 and F5 and F4 treatments at location 2. There were significant differences in growth characteristics and yield components due to the influence of tillage practices and fertilization levels in both experiment locations.

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## Introduction

The primary outcome of crop production is yield. Yield is affected and limited by many factors. The determinants of productivity in field crops can be divided into a few basic groups: soil conditions, soil fertility, factors of agricultural techniques, and meteorological conditions (Karing et al. 1999; Ramadhan 2013). Some of these cases can be affected by agricultural technology. Soil tillage is an important part of farming activities, it affects the properties of the soil, the growth of crops, the revenue of the farm, and the environment. Tillage practices should avoid the degradation of soil properties and help create a sustainable environment without a reduction in crop yield.

Inadequate management practices might have an impact on soil degradation. Continuous moldboard plow (CMT) had the highest bulk density (1.49 g cm$^{-3}$), the lowest soil organic content (3.68 g kg$^{-1}$), and the lowest ability of soil moisture retention in an area of cultivated soil that has recently been reclaimed. Furthermore, no-till, followed by sub-soiling and no-till (NT) was linked to the highest soil moisture content (20.42%) and the largest soil organic matter (6.48 g kg$^{-1}$) in the surface layer. Moreover, NT and subsoiling followed by moldboard afterwards subsoiling enhanced maize yield by 12.9% and 14.9%, respectively, over CMT, reaching 8512.6 kg ha$^{-1}$ and 8740.9 kg ha$^{-1}$ (Liua et al. 2021). In two different soil conditions in a semi-arid region of Morocco, the influence of the no-till approach on the physical attributes of the soil was explored. The shift from a conventional tillage technique to a no-till approach enhanced the soil's organic content and bulk density, which improved the tolerance of these regions to the impact of climate change (El Mekkaoui et al. 2023). After four cropping cycles, an investigation of the effects of medium-range tillage practices in gray terrace soil of Bangladesh revealed that the conservational tillage practices had the highest organic content buildup and the highest value of root mass density of wheat and

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