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Effect of Nano Phosphorus Fertilizer Levels and Seed Rates on Barley Growth under Different Tillage Equipment

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ABSTRACT

Background: The major benefits of using tillage technology to agriculture are mainly in soil management and fertilizer application. These can help attack major problems such as soil degradation and increase agricultural productivity. The effect both of nutrients and of the quantity of seed have a major effect on the barley growth and the yield. Nanofertilizers can improve the uptake of nutrients and crop performance.

Methods: A field experiment was conducted in Al-Qurna District aimed at determining the growth characteristics and yield of barley. Two different tillage systems (Chisel and Moldboard plow) and quantities of seed (40, 60 and 80 Kg/ha) (Sr1, Sr2 and Sr3) were compared under the influence of three levels of the nano-phosphorus fertilizer (0, 1.25 and 2.5 ml/litter) (Nf1, Nf2 and Nf3).

Result: The chisel plow outperformed the moldboard plow in terms of flag leaf area, number of spikes per square meter and grain yield. The moldboard plow outperformed in terms of plant height and biological yield. SR2 achieved the highest average number of spikes per square meter, grain yield and biological yield. As for nano-phosphorus fertilizer levels, the Nf3 outperformed in terms of plant height, flag leaf area, number of spikes per square meter, grain yield and biological yield.

Key words: Chisel plow, Flag leaf area, Grain yield, Moldboard plow, Soil penetration resistance.

INTRODUCTION

Various tillage techniques, such as chiseling and moldboard plowing, greatly influence the growth and production of barley. Chisel plowing lessens the soil bulk density, resulting in improved aeration and rooting of the crops while it retains moisture which is of utmost importance in the production of barley. Turning the soil with the moldboard plow also helps control weeds and bury remaining crops. In deeper layers, though, it can occasionally result in soil compaction, which can negatively affect root development. Even though the moldboard plow can improve early soil conditions, the chisel plow might have a bigger long-term effect on barley yields (Wasaya *et al*., 2019). The choice between a moldboard plow and a chisel plow depends on specific crop requirements and soil conditions.

Since cereal grains are a staple food for people and a source of energy since their high carbohydrate content provides the body with the calories it needs, they are extremely significant (Lazim and Ramadhan, 2020). Knowing the amount of seed is essential for estimating crop performance in terms of resilience to various environmental conditions and agricultural pests, as well as its nutritional content and yield.

The application of nanotechnology in agriculture has grown in recent years and it is a helpful instrument for reaching the objective of sustainable food production. By supplying nutrients more effectively, these fertilizers seek to solve the problems with conventional fertilizers. This technique is a successful sustainability approach because it can boost production and nutritional value while lowering environmental impacts (Samreen and Rasool, 2025).

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Since phosphorus is a structural element of plant nucleic acids in addition to biofilms and is necessary for plant development, it plays a significant role in tissue and cell division (Navea *et al*., 2024). Because leaves absorb nutrients far more quickly than roots do, foliar sprays are now a quick and efficient way to correct nutritional issues. Quick nutrient absorption through the leaves is necessary for quick deficit correction since it gives the plant the nutrients it lacks and fortifies it. Although conventional tillage systems and common fertilization practices have been studied in cereal crops, there is a lack of studies examining the interactive effect of tillage system type (chisel versus moldboard plow), seed application quantities and nano-phosphorus fertilizer levels on barley growth and yield. The effectiveness of nano-fertilizer applications and their response to different soil preparation methods also remain insufficiently explored in barley cropping systems. A large proportion of the agricultural land in the study area suffers from soil salinity and fertility deterioration due to repetitive