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**INVESTIGATION OF THE EFFECT OF DIFFERENT TILLAGE METHODS ON SOIL
PHYSICAL PROPERTIES**

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ABSTRACT

Tillage as a mechanical operation on soil is used for soil preparation. In fact, a proper tillage operation improves soil structure, increases porosity, makes better distribution of aggregates and eventually modifies the soil physical properties. Different methods of tillage have different effects on soil physical properties such as bulk density, infiltration rate and permeability index. The present study aimed to evaluate the effect of tillage (as treatments) 1. Moldboard plowing as a conventional method (M) 2. Moldboard plowing with a heavy disk (MD) 3. Subsoiler and hard disk (SD) 4. Subsoiler and moldboard (SM). In order to evaluate soil physical properties, the research station (Samian) was a potato field chosen from Agriculture Organization of Shoushtar and the soil structure was Loamy-sandy soil in a complete random block design in four replications. Measuring four physical properties including soil moisture content, bulk density, infiltration rate and permeability of soil in three stages: before tillage, after tillage and post-harvest tillage. The results showed that the soil bulk density decreased in all treatments after the tillage; however, the largest reduction was from 1.22 gr/cm³ to 1.051 gr/cm³ which is 13.9 percent in SM treatment. In this treatment soil was loose and pores increased. Different tillage methods have a different effect on water infiltration rate, so that permeability rates in tillage M and SM were higher than MD method. But in general, changes in the measured infiltration rate after tillage showed a significant

difference with its rate before tillage. The permeability of the soil in four different methods, especially in the depths of greater than 150 mm were significantly different and this difference was significant at three measurement stages.

Keywords: Tillage, Sandy-Loamy Soil, Cone Index, Soil Bulk Density, Infiltration Rate

INTRODUCTION

Tillage as a mechanical operation on soil is used for soil preparation. In fact, a proper tillage operation improves soil structure, increases porosity, makes better distribution of aggregate and eventually modifies the soil physical properties. Different methods of tillage have different effects on soil physical properties such as bulk density, infiltration rate and permeability index. ASAE et al. conducted a study to improve the quality and yield of potatoes that named "Relationship between deep plowing and soil physical properties" studied properties such as specific gravity and bulk, cone index, the infiltration rate, and runoff and water erosion in irrigation with string and stack in a field with loamy-silty soil structure

MATERIALS AND METHODS

The sandy-loam research in the field of agricultural research station in Shoushtar (Sami station) (48 ° 15'E, 38 ° 21'N) was implemented. Before tillage farm on 16 plots (6 × 22 m) in a randomized complete block design was divided, so that the plots in width of 4 meters and a length of 8 meters for the

traffic of tractors and implements away empty, and then tests to determine soil hydrometer method, moisture content using standard bulbs, soil bulk density, velocity measurement of water infiltration into the double ring method [1] and the permeability of the soil by hand penetrometer was digitally. A Farvgzary primary tillage plot was set-up in the fall. These tests were repeated after tillage. After harvesting operations in September next year, the above experiments were repeated for the third time. And the data obtained with the software MS-Excel and SPSS12 were analyzed.

RESULTS AND DISCUSSION

The results of the soil moisture content in the conventional moldboard plow treatments 1 (M) 2- heavy moldboard plow and disk (MD) 3- subsoiler and heavy disk (SD) 4- subsoiler and moldboard (SM) in **Figure 1** summarizes. Due to the moisture in the soil and knock all treatments due to its inversion tillage is reduced after the treatments was not significant, however, the mean reduction in moisture. According to **Figure 2**, after the

tillage of the soil bulk density was significantly reduced in all treatments. The greatest decrease from 22.1 to 13.9% in the treatment of SM was 051.1. The treated soil was loose and pores increased.

The plot of the cumulative infiltration data over time on a line before tillage have adopted the measurement data after tillage treatments on four separate line is drawn. Figure minimal influence on the treatment of SD and MD is the greatest influence on treatment. Measurement data in all treatments after harvest is almost consistent state before tillage.

A review of the chart shows the average permeability of the treated plots SM and MD, 2 MPa and treatments M and SD, 5.1 is MPa. In **Figure B**, the effect of tillage on the permeability of all treatments decreased about 50% to a depth of 22 cm. The greatest decrease is related to the treatment of SM. In **Figure C**, the permeability is almost back to pre-tillage which **Figure C**, the field is much weaker than before tillage. The results of these three curves are plotted in **Figure 2** is consistent with what is.

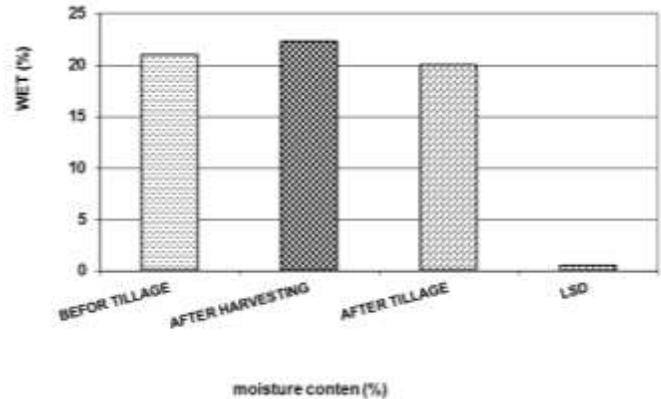


Figure 1: Compares the results of measuring the moisture content in three steps

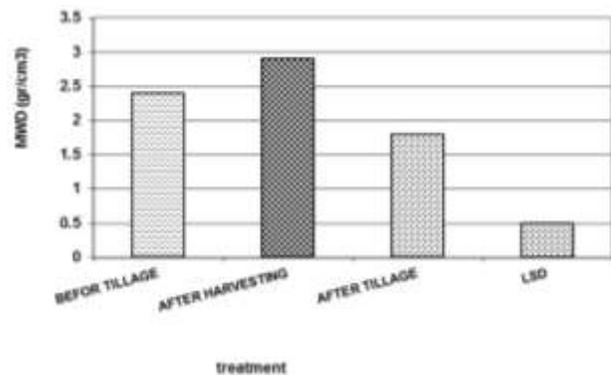


Figure 2: compares the results of the three measurements of soil bulk density

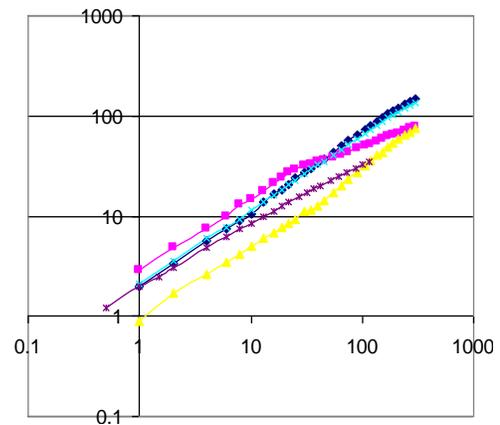
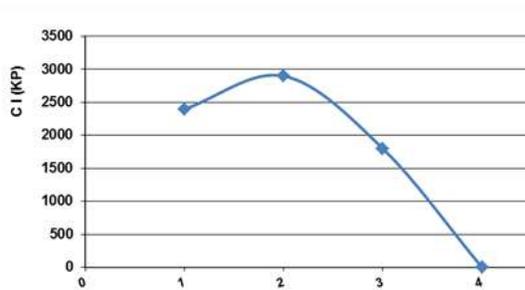
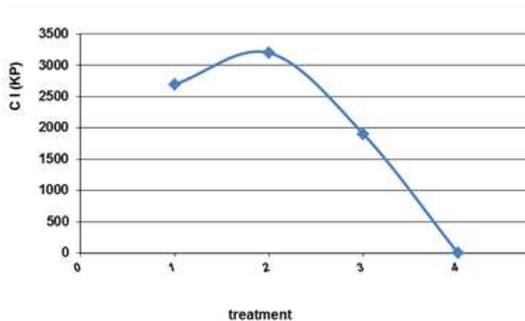


Figure 3: Compares the rate of water infiltration between tillage treatments before and after tillage

(a)



(b)



(c)

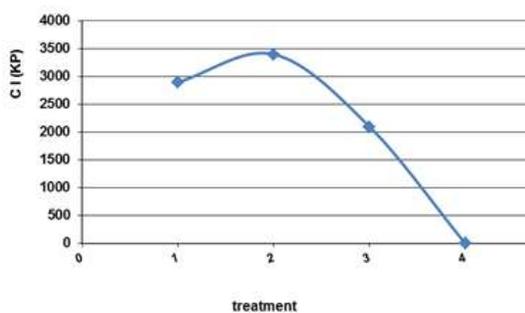


Figure (a) (b) (c). The results of the measurement of cone index among treatments in three stages: a) before tillage b) after tillage c) Post harvest

CONCLUSION

Based on the results of various tillage practices (tillage combined) had a different effect on soil physical properties. As the reduction of soil bulk density and increase

soil porosity after plowing in all treatments occurred. Although these changes are not uniform among treatments.

REFERENCES

1. Ekebreg, H. C. F. Riley, 1996, Effects of mouldboardploughing and direct planting on yield and nutrient uptake of potatoes in Norway, *Soil & Tillage Research*, 39. 131-142.
2. Emmanuel C. Canillas, Vilas M. Salokhe, 2001, Regression analysis of some factors influencing soil compaction, *Soil & Tillage Research*, 61. 167-178.
3. Pierce, J. C. Gaye Burpee, 1995, Zone tillage effects on soil properties and yield and quality of potatoes (*Solanumtuberosum l.*), *Soil & Tillage Research*, 35. 135-146.
4. J. K. AASE, E. Sojka Robert, L. Bjerneberg David, 2000, Zone-Subsoiling relationships to bulk density, cone index, infiltration, runoff and erosion on a furrow irrigated soil, Agricultural Research Service. AASE. TEKTRAN.