MERIT RESEARCH JOURNALS
www.meritresearchjournals.org

Merit Research Journal of Agricultural Science and Soil Sciences (ISSN: 2350-2274) Vol. 1(4) pp. 058-061, November, 2013
Available online http://www.meritresearchjournals.org/asss/index.htm

Full Length Research Paper

Effect of different tillage methods (conventional and conservation) on some of soil physical properties in Varamin Province

Hamid Reza Ghanbaryan Alavijeh[1*], Hossein Ahmadi Chenarbon[2] and Behnam Zand[3]

[1]Department of Agronomy, Faculty of Agriculture, Islamic Azad University, Varamin-Pishva Branch, Iran.

[2]Member of Scientific Staff, Islamic Azad University, Varamin-Pishva Branch, Iran.

[3]Member of Scientific Staff, Varamin Agricultural and Natural Resources Research Center, Iran.

***Corresponding Author's E-mails: hghanbaryan@yahoo.com**

Abstract

One of the factors affecting the physical properties of soil and crops is tillage systems. The experiment was conducted in summer 2012 at the research farm of Islamic Azad University. This study was performed by experiment a split plot in a randomized complete block design with three replications. The factors in this study, four different tillage methods were considered. For soil physical properties statistical analysis, randomized complete block design was used. Based on the results، different tillage methods on soil physical properties showed significant differences at 1%. According to the results, the high amount of humidity in after plowing and postharvest respectively of conventional tillage methods, and twice the disk and the lowest bulk density after tillage in the conventional tillage was obtained. Also the highest rate of crushed soil tillage with rotary plow was calculated.

Keywords: Soil, Soil physical properties, Tillage methods.

INTRODUCTION

When a person is dependent to a group of animals for supply some of own needed nutrients, produced some useful and valuable forage plants for animal feeds and was more noteworthy. One of these plants is corn. This valuable product of agriculture provides nearly 70 percent of the poultry feed, useful grain to produce edible oil, starch, glucose, and raw material in the industry and many other products (Hosseini and Abedi, 2007). Studies show that each year a large area of arable land in the world due to compaction and soil erosion disappears. For this reason, use of appropriate strategies to reduce nutrient loss and soil erosion is necessary. Conservation tillage includes reduced tillage and no-tillage is one of the useful methods to avoid these problems (Limousin and Tessier, 2007). on the other hand adopt special measures to address the concerns of due to lack of food, For a growing world population, it seems necessary. In this regard, proper land preparation and tillage operations, one of the issues that are important to increase production. Research results indicate that tillage systems Is effective on yield of the different crops. Wright and colleagues in year 2007 reported that cotton yield in reduced tillage system compared with conventional tillage system increases. They stated that the reduced tillage systems soil phosphorus and nitrogen availability in the soil increases that associated with higher performance (Wright *et al*., 2007). Another study that was conducted in 5 years, observed that cotton yield in the first three years in conservation tillage systems was significantly higher than conventional tillage while the last two years, cotton yields in the system of protective tillage with conventional tillage was equivalent (Blaise and Ravindran, 2003). Conservation tillage can with increase soil moisture and reduce soil temperature, lead to increased performance

Table 1. Physical and chemical soil analysis

Type of test	pH	Clay (%) Hydrometer	Silt (%) Hydrometer	Sand (%) Hydrometer	Texture Hydrometer	N (%) Kjeldahl	K (ppm) Flame Photometer	P (ppm) Spectrophotometer
Optimum range	6.5	25	25	50	loam loam clay	> 0.2	400	15
Results	7.78	22	36	42	Loam	0.06	406.6	12.8

yield of corn (Afzalinia *et al*., 2011). Keep soil in good physical condition is one of the aspect protective of it that depends heavily on the proper use of agricultural machinery management and soil conditions. the tillage systems with effect in the rate of previous crop residue on soil surface and pores soil, are important role in maintaining moisture and yield in arid and semiarid regions (De Vita *et al*., 2007).

MATERIALS AND METHODS

This research in crop year 2012 at agricultural research station, university of Varamin located in the city of Varamin (Tehran province), with longitude 51 degrees 39 seconds and latitude 35 degrees and 19 seconds and elevation 1000 meters above sea level and features loam soil - clay loam (Table 1), was conducted and during that effect of different methods of tillage on soil physical properties and yield and forage maize cultivars were evaluated. This research was conducted By split-plot experiments design was a randomized complete block with three replications. The factors of this project, four different tillage methods including**:** 1-tillage with rotary tiller in depth of 8 to 10 cm **(**S_1), 2-cultivator with blade and light disk with depth of 8 to 10cm (S_2), 3-twice disk with depth of 10 to 15 cm (S_3), 4- moldboard plow and light disk with depth of 8 to 10 cm **(**S_4).. For statistical analysis of physical properties of soil, completely randomized block design was used.

Humidity at two times after tillage and after harvest In depth 10-15 cm three points of each main plot was measured. The sampling by a special cylinder that also were used to calculate the bulk density was performed. In all cases, soil samples at 105 ° C, in the oven were dried for 24 hours. meanwhile, wet and dry weight of soil before and after placing the sample in the oven was measured. Weighing by digital scale accurately 0.01 and then for moisture content measurement was calculated from equation 1.

$$\Theta m = \frac{A - B}{B - C}$$

Equation 1- content humidity measurements

Where: Θm= moisture content, A= weight of empty container and wet soil weight, B= weight of empty container and dry soil weight, C= weight of the empty container.

For sampling and determination of bulk density of the soil after tillage, from three points of each main plot randomly in depth of 10-15 cm as undisturbed soil, by a special cylinder was conducted. In order to calculate the bulk density from equation 2 was used.

$$Pb = \frac{Weight\ of\ dry\ soil}{Undisturbed\ soil\ volume}$$

Equation 2- Soil bulk density measurements

Soil fragmentation measurements at the end of tillage before planting were done. The index that commonly used In this case mean weight diameter (MWD) is hunk. for measuring a frame with dimensions 15 × 15 × 30 cm in depth of 15 cm was inserted in the soil. the frame removed and the soil was transported to the laboratory in plastic bag after pouring. This work was carried out randomly in each plot three times. by equation 3 was used for to calculate the mean weight diameter (MWD) hunk.

MWD = (1/W) (0.25A + 0.75B + 1.25C + 1.25D + 1.75E) + NE)

Equation 3- measurement of mean weight diameter (MWD) hunk

Where: W= weight of soil comminuted in per sample from experiment, A= weight of soil transmission from sieve 0.5 inch, B= weight of clod between sieve of 0.5 and 1 inch, C= weight of the clod between sieve of 1 and 1.5 inch, D= weight of clod between sieve of 1.5 and 2 inch, E= weight of the clod on sieve of 2 inch, N= mean of clod diameter on the upper sieve according to millimeters.

Statistical analysis was performed for all traits using SAS software and for draw the graphs and tables excel software was used also all mean comparison using duncan's multiple range test was performed. For the analysis of soil physical properties, randomized complete block design was used. and data were collected and analyzed separately.

RESULTS AND DISCUSSION

The results showed that tillage methods had significant effect on seed weight and number of grains per ear, wet weight of leaf, stem and grain quality traits such as soluble sugars and protein. Also the effect of tillage on

Table 2. Statistical analysis of soil physical properties under different tillage methods (mean square)

Sources of change	Degrees of freedom	Soil bulk density in depth of 10-15 cm	Soil moisture after tillage	soil moisture after harvest	Mean weight diameter
Repeat (R)	2	0.0001	0.0001	0.007	0.0001
Tillage (S)	3	0.210 **	5.289**	0.110**	0.962**
Error (E)	6	0.0001	0.0001	0.005	0.0001
The coefficient of variation (c.v%)	-	5.75	1.05	2.82	4.77

*and**: Significant at 0.05 and 0.01 Probability level, respectively

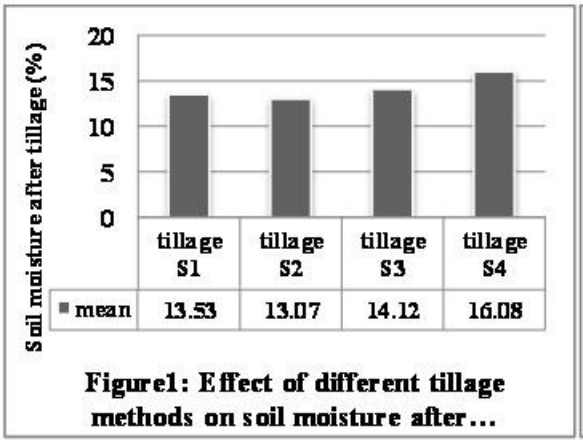

Figure1: Effect of different tillage methods on soil moisture after…

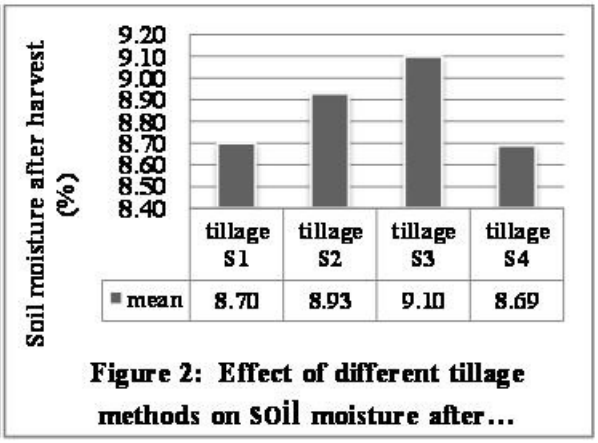

Figure 2: Effect of different tillage methods on soil moisture after…

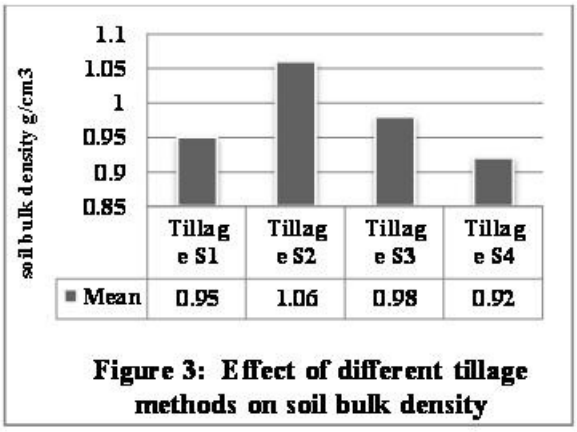

Figure 3: Effect of different tillage methods on soil bulk density

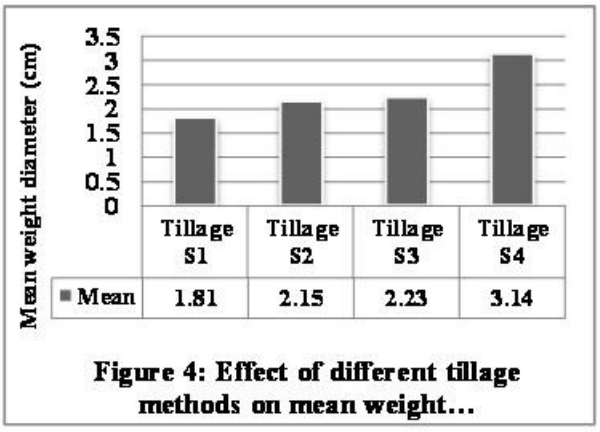

Figure 4: Effect of different tillage methods on mean weight…

soil physical properties such as soil moisture after tillage and after harvest, soil bulk density and the mean weight diameter (MWD), was meaningful. Result analysis of variance for the study is reported in tables 2.

Changes in soil moisture (after tillage and after harvest)

According to results (Figure 1 and 2), the maximum amount of moisture after tillage for type 4 of tillage methods (S4) and lowest amount of moisture for type 2 of tillage methods (S2) and respectively to amount of 16.08 and 13.07 percent, was obtained. Also the highest soil moisture after harvest with type 3 of tillage methods (S3) and the lowest of soil moisture from type 4 of tillage methods (S4) and respectively to amount of the 9.10 and 8.69 percent was calculated. According to the results in dry conditions, reduced tillage, with maintain of soil moisture is the best way to prepare the substrate (Rusu *et al*., 2009). These results indicate that in dry conditions and in areas with limitation of moisture, whatever the soil is less disturbed, moisture losses are lower and the reason is reduce evaporation from the soil surface.

Soil bulk density after tillage

according to the results (Figure 3), the lowest bulk of density soil with type 4 of tillage methods (S4) and amount of 0.92 g/cm^3 and maximum amounts for type 2 of tillage methods (S2) with amount of 1.06 g/cm^3 was calculated. this result is consistent with the findings of Jin et al in tests that lasted respectively 10 and 11 years corresponded, they reported that by plowing with moldboard plow, the bulk density of soil was reduced (Jin *et al*., 2011). probably in moldboard plow, through making the large of lumps and disarrange of soil also the rotary plow because of complete disruption the soil and increases soil porosity, the bulk density decreased.

Mean weight diameter of soil

Base on the results (Figure 4), the highest amount of crushed soil with mean diameter 1.81 cm from type 1 of tillage methods (S1), and lowest amount of crushed soil with mean diameter 3.14 cm by type 4 of tillage methods (S4) was obtained. Loghavi and colleagues in their research, compared the rotivator with disk, showed that the rotivator in depth more than 5 cm, aggregate soil with less mean weight diameter and more uniform provides (Rouzbeh and Loghavi, 2006).

CONCLUSION

The results of this research show that though initially, conventional tillage due to the low bulk density and greater porosity of soil, was more water storage space and greater volume of water in its placed but over time and end of the growing season the reduced tillage methods to reason of minimal manipulation and disturbing the soil, caused diminished the rate of moisture evaporation the soil surface and thus will able to prevent the loss of moisture stored in the soil. so with conservation tillage practices, water needed to satisfy various products is stored also the water used in agriculture is reduced.

REFERENCES

Afzalinia S, Karami A, Talati MH, Alavimanesh SM (2011). Effect of tillage on the soil properties and corn yield. CSAE Paper No. 11-204, July 10-13, Winnipeg, Manitoba.

Blaise D, CD Ravindran (2003). Influence of tillage and residue management on growth and yield of cotton grown on a Vertisol over 5 years in a semi-arid region of india. Soil.Till. Res. 70: 163-173.

De Vita P, Di Paolo E, Fecondo G, Di Fonzo N, Pisante M (2007). Notillage and conventional tillage effects on durum wheat yield, grain quality and soil moisture content in southern Italy. Soil and Tillage Research, 92: 69-78.

Hosseini S, Abedi (2007). Assessment of market factors and government policies in determining the price of corn in Iran. J. Agric. Econ. 1 (2): 33-21

Jin H, Li Hongwena G, Rabi AB, Rasaily W, Qingjiea C, Guohuaa S, Yanboa Q, Xiaodonga, L Lnijic (2011). Soil properties and crop yields after 11 years of no tillage farming in wheat–maize cropping system in North China Plain. Soil & Tillage Research 113: 48–54.

Limousin G, Tessier D (2007). Effects of no-tillage on chemical gradients and topsoil acidification. Soil. Till. Res. 92: 167-174.

Rouzbeh M, M Loghavi (2006). Comparison of different methods of seedbed preparation under dry condition on corn yield followed wheat. J. of Agric. Eng. Res. 7(29): 19-32.

Rusu T, Gus P, Bogdan I, Moraru P, Pop A, Clapa D, Pop L (2009). Soil tillage conservation and its effect on erosion control, water management and carbon sequestration. Geophys. Research. *Abs*. 11: 1481.

Wright AL, Hons FM, Lemon RG, McFarland ML, Nichols RL (2007). Stratification of nutrients in soil for different tillage regimes and cotton rotations. Soil. Till. Res. 96: 19-27.