Plant Archives Vol. 21, Supplement 1, 2021 pp. 851-853 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
doi link : https://doi.org/10.51470/PLANTARCHIVES.2021.v21.S1.129

THE EFFECT OF PLOWING AND PULVERIZATION SYSTEMS ON SOME PLANT INDICATORS OF ONION

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ABSTRACT

An experiment was carried out on the fields of the college of Agriculture - Abu Ghraib, of a silty clay loam soil that has moisture of 15-16%, to study the effect of plowing and pulverization systems on some plant indicators of onion. The experiment included plowing systems with three levels (plowing with a moldboard plow, plowing by chisel plow and zero tillage plowing) as a primary factor. The second factor was that pulverization for only one time and repeating the pulverization twice through the use of the rotary tiller. The plant indicators of onion that are studied: plant length, onion diameter, onion weight and onion neck diameter. The experiment has carried out according to SPLIT PLOT design according to RCBD design by three replications. The results were statistically analyzed mean is tested in the least significant difference (LSD) $p < 0.05$ probability level. The results show that the moldboard plow recorded the highest average for each onion diameter of 5.7 cm, the length of the plant was up to 54 cm, the onion weight is 153.3 g and the highest average diameter of onion neck was 13 mm. The results show that the repeated pulverization twice recorded the highest average diameter of the onion at 4.8 cm, the highest average length of the plant up to 46.2 cm, the highest average weight of the onion was 133.6 g and the highest average diameter of the onion neck is 10.1 mm. The results of the research conclude the superiority of the moldboard plow and the repeated pulverization twice in giving the best indicators of vegetative growth and production of onion crop.

Keywords: Moldboard plow, chisel plow, rotary tiller, pulverization repeat, plowing.

Introduction

Agricultural mechanization is considered the backbone of agricultural production, that complete. Most agricultural operations. Hence, it directly contributes to the preparation of the soil and the establishment of a suitable shed seedbed.

As well as, the process of fertilization is done through it in addition to the control of agricultural pests, the service of the crop from hoeing, and spraying the pesticide to the processes of harvesting, sorting and storage (Al-Tahan and Abdul Wahab., 1991). Soil preparation must be carried out in scientific ways to improve the ventilation of the root growth area and to facilitate the supply of water, air and nutrients to the plant and to obtain those characteristics suitable for plant growth. Plowing the soil for fragmentation and dismantling and mixing with previous plants to prepare a suitable shrine for seed growth. Therefore, tillage is one of the main processes for preparing the soil. Also, it works to increase the area exposed to direct sunlight by forming small earth blocks that facilitate the movement of air and water, which leads to improving the physical properties of the soil. The type of tillage equipment is the moldboard plow, chisel plow and rotary tiller. The soil surface roughness of the tillage and softening equipment varies according to the type of tillage equipment and the moldboard plow gives a rougher surface than the plow. Also, the increased frequency of pulverization using the rotary tiller led to an increased level of the soil surface and less roughness as a result of the repeated cracking of earthen blocks and stacking of all plows (Al-Zubaidi and Al-Ajili, 2010). Therefore, the research aims to study the impact of plowing systems with moldboard and chisel plow and compare them with a system zero tillage plowing as well as the effect of pulverization once and repeated pulverization on the plant indicators of onion crop. Further, it aims at finding the best combination of interference between plowing systems and pulverization times.

Material and Method

The experiment is carried out in one of the fields of the College of Agriculture/ University of Baghdad/ Abu Ghraib in silty clay loam soil on an area of 12 * 60 m. The ground is divided into three parts. The first part is plowed with a moldboard plow (3-bottom, working width 500 mm, plowing depth 270 mm, total length 2180 mm, total width 1195 mm and height 1130 mm). The second part is left zero tillage plowing. Whereas the third part is plowed with the chisel plow (11 rolls, working width 2160 mm, plowing depth 220 mm, total length 1216, total width 1216 mm and height 1125 mm) where it represents the tillage systems of the first factor. Each part is softened by rotary tiller (tine weight 365.2 kg, depth Max tine 200 mm, design work piece width 1720 mm,

number of knives in each disc 6 and total knives number 54) once and twice and it represents the second factor. After the tillage and pulverization process is completed, the furrow is opened by furrower and the onion is planted in the upper part of the soil under the salts line with a distance of 30-35 cm between the dusk and another. After watering the field, two types of fertilizer. For the first time, Urea fertilizer is added. The second time, the fertilizer of (NPK) is added. After then, the plant measurements and indicators are marked. The Massey Fierx 650-MF tractor is used at 2200.rpm of a 142-horsepower four-stroke four-cylinder direct injection diesel engine. The rotary tiller was used in the softening process. The angle of the rotary tiller hood was fixed to 45 Italian origins weighing 365.20 kg and the speed of the knife shaft was fixed to 450 rpm at P.T.O 285 rpm. The following plant indicators are measured:

1. The diameter of the onion (cm): The diameter of the onion is measured from the width area by taking five random samples from each experimental unit and divided by five to extract the rate (Aisha *et al.*, 2007)

2. Plant Length (cm): Measured by a metric ruler, starting from the soil surface to the end of the longest leaf before extraction, for five random samples from each experimental unit, divided by five to, extract the rate (Ali *et al.*, 2008).

3. Onion weight (g): Five random samples are taken for each experimental unit and weighed with a sensitive scale to determine the weight of the onion by dividing the product by five by a sensitive scale (Grag *et al.*, 1984).

4. The diameter of the onion neck (mm): Five random samples have taken for each experimental unit, dividing the product by five to extract the average to measure the diameter of the onion neck and a height of 1 cm from the surface of the onion (Al-Khafaji, 2010).

Results and Discussion

Table (1) shows the significant effect of the tillage systems and the frequency of pulverization and the overlap between them in the diameter of the onion. The moldboard plow recorded the highest rate of an onion diameter of 5.7 cm. (Pigment 1990) and (Banna 1990).

Table 1 : Effect of tillage systems, pulverization times and overlap between them on onion diameter

Pulverization times / Tilling systems	Once	Twice	Average
Moldboard plow	5.5	5.9	5.7
Zero tillage	3.4	3.4	3.4
Chisel plow	4.9	5.1	5.0
L.S.D 5%	0.3		0.17
Rate	4.6	4.8	
L.S.D 5%	0.14		

The frequency of pulverization recorded the highest rate of 4.8 cm. The overlapping plow with repeated pulverization recorded the best combination of 5.9 cm for the diameter of the onion.

Table (2) shows the significant effect of tillage systems, pulverization times and overlap between plant lengths.

Table 2 : Effect of tillage systems, pulverization times and overlap between them on plant length (cm)

Pulverization times / Tilling systems	Once	Twice	Average
Moldboard plow	49.8	58.2	54.0
Zero tillage	30.6	30.2	30.4
Chisel plow	46.4	50.2	48.3
L.S.D 5%	3.5		2.7
Rate	42.2	46.2	
L.S.D 5%	2.2		

The recurrence of pulverization recorded a higher rate of plant length of 46.2 cm. The system interfered with no-tillage with a pulverization frequency with the lowest rate of 30.2 cm.

Table (3) indicates the significant effect of the tillage systems and the frequency of pulverization and the overlap between them in the weight of the onion.

Table 3 : Effect of tillage systems, pulverization times and overlap on bulb weight (g)

Pulverization times / Tilling systems	Once	Twice	Average
Moldboard plow	132.3	174.3	153.3
Zero tillage	99.4	102.1	100.8
Chisel plow	114.0	127.0	120.5
L.S.D 5%	10.7		7.2
Rate	116.2	133.6	
L.S.D 5%	5.9		

From the overlap, we obtained the highest rate of 174.3 gm in the treatment of the plow with repeated pulverization. It leads to an increased level of the soil surface and less roughness as a result of the increase in the crushing of soil blocks (Talabani 2012) and (Jassim *et al.*, 2006). Interference of the system without plowing with one-time pulverization recorded the lowest rate of 99.4 g onion weight.

The results of Table (4) showed a significant effect on tillage systems, pulverization times and overlap between them in the diameter of the onion neck.

Table 4 : Effect of tillage systems, pulverization times and overlap between them on onion neck diameter (mm)

Pulverization times / Tilling systems	Once	Twice	Average
Moldboard plow	12	13.3	13.0
Zero tillage	5.7	6.7	6.2
Chisel plow	11	11	11.0
L.S.D 5%	1.7		1.1
Rate	10	10.1	
L.S.D 5%	0.9		

The frequency of pulverization recorded a higher rate of the one-time pulverization of 10.1 mm. This resulted in an increase in the quality and quantity of production (Al-Sabbagh 1990), (Al-Banna 1990) and (Jassim *et al.*, 2006).

Conclusions

The experiment includes tillage systems with three levels (plowing with a moldboard plow and plowing with a chisel plow and zero tillage plowing) as the primary factor. The second factor is pulverization for the first time and another is pulverization twice through using the rotary tiller. Plant indicators are studied for onion crop: plant height, onion diameter, onion weight, and onion neck diameter.

1. The moldboard plow recorded the highest onion diameter of 5.7 cm and the lowest rate of 3.4 cm for a no-till system while the pulverization frequency gives the highest rate of 4.8 cm. The overlapping plow with repeated pulverization gives the best combination of 5.9 cm for the diameter of the bulb.
2. The tillage system with a moldboard plow recorded the highest rate of plant length (54.0 cm) while the no-till system gave the lowest rate of 30.4 cm. Of the overlap, the highest rate of overlapping plowing system with mowing plow was recorded with a softening frequency of 58.2 cm while the overlap of the system without plowing with repeated pulverization gave the lowest rate of 30.2 cm.
3. The tillage system with a moldboard plow recorded the highest mean weight of 153 dolomites and 153.3 g, while the pulverization frequency gives the highest rate of 133.6 g.
4. The interfering system zero tillage plowing with one-time pulverization gives the lowest rate of 99.4 g of onion weight.
5. The system with the moldboard plow system recorded the highest rate of onion neck diameter of 13.0 mm and the lowest rate of onion neck diameter in a no-till system was 6.2 mm while the frequency of pulverization gives a higher rate of the one-time pulverization of 10.1 mm and we obtained the highest rate of 13.3 mm of interference between tillage system and pulverization frequency, while without plowing interference system with one-time pulverization is recorded with the lowest rate of 5.7 mm.
6. The system zero tillage plowing recorded the lowest rate for all the studied indicators. Therefore, we recommend the use of plowing with moldboard plow with repeated pulverization twice when planting onions. And exclude the cultivation of onions zero tillage plowing because it is useless since the onion needs to disassembled soil and well plowed.

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