

QUALITY EFFECT OF ORGANIC FERTILIZERS ON SOME SOIL PROPERTIES, GROWTH AND YIELD OF GARLIC (*ALLIUM SATIVUM* L)

MOHAMMED ALI ABOOD¹, ADNAN ASOUD JASIM², ALAA HASSAN FAHMI³ & THURAYA KHALIF
BADAWI⁴

^{1,2,3}College of Agriculture, Department of Soil Science and Water Resources, Diyala University, Diyala, Iraq

⁴College of Basic Education, Department of Geography, Diyala, Iraq

ABSTRACT

The aim of the study is to determine the effect quality of organic fertilizers kinds and their interaction on some soil properties and garlic plant growth. The experiment was conducted during winter season 2011. Plastic pots were filled with soil. Organic fertilizers have been added at rate of 2% weight of dry soil. The experiment include the treatment (100% poultry manure, 100% cow manure, 100% sheep manure, 50% poultry manure + 50% cow manure, 50% poultry manure + 50% sheep manure, 33% poultry manure + 33% cow manure + 33% sheep manure and control (without any addition), Each pot was planted with 3 garlic cloves and irrigated to the field capacity. The result showed a decreasing of bulk density while mean weight diameter of aggregate and available water were increased with addition of organic fertilizer compared with control, also the results indicated that some plants growth properties such as plant height, mean weight of bulb and number of cloves in each bulb were increased under favorable treatment and their interaction as compared with control.

KEYWORDS: Organic Fertilizer, Soil Properties, Garlic

INTRODUCTION

It is wellknown that organic farming system as an application of modern agricultural technology scientific underpinnings for the production of vegetable crops and provide nutrients needed by plants and balanced manner by adding organic matter to a certain level of decomposition and without addition of any chemicals fertilizer manufactured (Day, 1990). The scientific and practical indicators of organic farming is its role in maintaining soil nutrients with different organic matter contents relative to investment of agricultural and soil texture. The importance of organic fertilizers added to the soil necessary for its positive role effective improve qualities of soil physical, chemical and biological. To maintain appropriate levels of organic matter as a goal because of its importance in agricultural production, soil conservation and the emergence of environmental and health problems caused by heavy used of chemical fertilizers turn to sources of organic fertilizer and then organic agriculture. As explained by Ayous (1998) that organic fertilizers provide nutrition for a long time and slowly working to improve the properties of the soil due to the activation of biomass for soil microbes. The Study Cogger and Sullivan (2002) indicated that the addition of residues of plant and animal residues for various soil texture led to increase in the percentage of soil aggregates greater than 0.25 mm also added that the cows manure at 60 tons. ha⁻¹ led to the increase in the mean weight diameter of aggregate of 0.08 mm to 1.18 mm. Application of sewage sludge, compost, and cow manure at rates of 50 and 100Mgha⁻¹ to the soil of this study resulted in a significant increase in aggregate mean weight diameter (MWD), available water content, saturation hydraulic conductivity, and infiltration rate, and a decrease on BD (Bahremand *et al.*, 2003) and (Mosaddeghi *et al.*, 2000) reported that application of manure to the soil counteracted soil compaction, and decreased soil compactibility. Study by Shit (2010) indicated that the addition of sheep manure into

the soil led to increase in the means weight diameter aggregates 0.117 mm in the non -treated soil to 0.202 mm in the soil treatment , the increased about 72.65 %. In a study among Alwan *et al* (2011) that the addition of sheep manure to the soil calcareous salt led to an increase in the production of beans and components winning by improving the qualities of soil physical, chemical, biological and mitigating the impact of salinity which was relatively high and increasing the efficiency of plant roots to absorb nutrients as organic fertilizer reducing the bulk density of the soil and increase the infiltration rate of water significantly. (Ojeniyi *et al.*, 2013) indicated that the addition poultry manure in to the soil lead to decrease bulk density while porosity and moisture content increase. Razag (2003) was made field experiment in Bahrain added poultry manures to the sandy soil at levels 3, 6, 9 kg.m² led to an increase tomato yield properties (fruit number and weight), the reason for the increase attributed to improve the qualities of sandy soil and increase its available water and nutrients availability. Vegetable crops, including garlic need to large amounts of organic fertilizers to give big bulbs as the garlic is winter In Iraq planted garlic are limited size area despite which increased of recent years, we find clear progress of increasing the cultivated area must be interested to intensify the research and studies which lead to increase the productivity of this crop to find out the type of manure that achieves the highest yield of garlic and optimal ratio of animal manures. Khalid and Shafei (2005) indicated that treatment of dill plants with different combinations of organic fertilizers and its rates resulted in a significant increase in growth, yield characters and essential oil. Also, (Khalid *et al.*, 2006) reported that organic farming increased the vegetative growth and minerals content of calendula.

MATERIALS AND METHODS

A field experiment was carried out of potted plastic during the winter season 2011 and using soil sandy clay loam to see the effect the quality of organic fertilizers and interaction each other in some of the qualities of the soil and the growth and yield of garlic, as used pots large plastic mobilized soil in the pots with a capacity of 5 kg has been added organic fertilizers , including 2% of weight of dry soil and included the following treatments (100% poultry manure, 100% cows manure, 100% sheep residues, 50% poultry residues +50% cows manure, 50% poultry manure + 50% sheep manure, 50% cows manure + 50% sheep manure, poultry manure 33 % + 33 % cows manure + 33% sheep manure and without treatment as control). Table (1) illustrates some of the chemical properties of organic fertilizer added. The experiment was designed as complete randomized block design with three replications were planting 3 cloves garlic local variety in each pot was 5 mm diameter plastic starting on, 2/10/2011 and recounted all treatments to reduce the field capacity to 55% of the drained water when plants pulling out which was on 5 /4 / 2011 in the end of study measured some characteristics soil, including bulk density and available water as in Richards (1954) which also measured mean weight diameter of soil, and also measured characteristics of Garlic crop (plant height ,weight of the one bulb , number of cloves in the each bulb). The statistically analyzed results were chosen less significant difference at the 5% level for comparison between the averages of treatments as in Steel and Torrie (1980) Table (2) which shows some of the properties of the soil used before conducting the study.

Table 1: Some Chemical Properties of Organic Manure

Properties	Poultry	Cows	Sheep
Organic carbon gm.kg ⁻¹	265	323	310
Total nitrogen gm.kg ⁻¹	23	14	18
C/N Ratio	11.5	23.07	17.2
Total Phosphorus gm.kg ⁻¹	10.5	6.8	8.8
Total potassium gm.kg ⁻¹	9.8	16.1	17.2

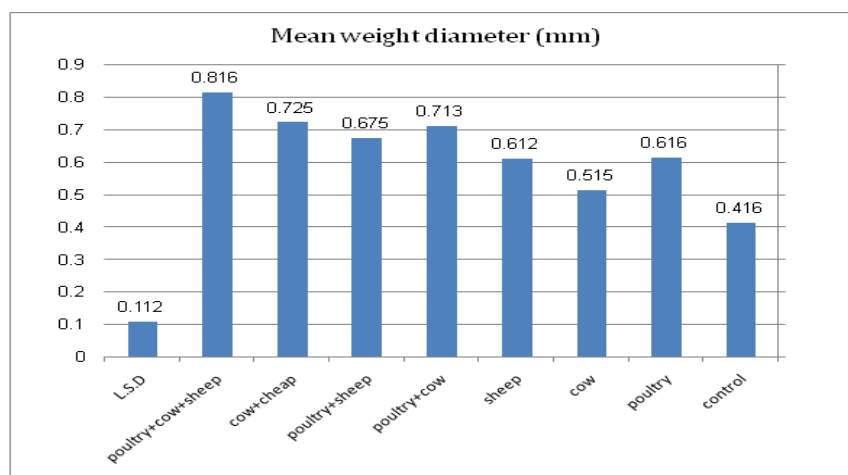
Table 2: Physical and Chemical Properties of the Soil before Planting Garlic Crop

Properties	Units	Value
pH	-----	7.62
EC	ds.m ⁻¹	1.3
OM	gm.kg ⁻¹	7.5
FC	%	22.5
Moist at 15 Bar	%	9.14
Particle density	Mg.m ⁻³	1.49
Clay	gm.kg ⁻¹	225.24
Silt	gm.kg ⁻¹	294.11
Sand	gm.kg ⁻¹	480.65
Texture	Sandy Clay Loam	

RESULTS AND DISCUSSIONS

Effect of Organic Fertilizers and the Interaction between them in Some Physical Properties of the Soil

The affecting of some physical properties improve of the soil by adding organic manure, which lead to improve structure of the soil, which is reflected the movement of water and air into the soil and therefore to further deep of the roots of plants to absorb more moisture and nutrients available in the soil depths. The quality of stability of soil aggregates, which expressed by the mean weight diameter, Figure 1 the existence of significant differences for the effect of adding organic manure and interaction between them in this capacity as it reached its highest mean weight diameter (0.816 mm), which reached in the soil treatment (33% poultry manure + 33 % cows manure +33% sheep manure) compared with less value (0.416 mm) in control treatment , due to the effect of adding organic fertilizer and the interaction between them which increased the mean weight diameter and increased the effectiveness of soil microorganisms which lead to a positive role in connecting soil particles with some packaging soil particles, which leads to increased stability of aggregates when moistened by water (Jassim and Abood,2010) and (Bahremand *et al.*, 2003) and (Mosaddeghi *et al.*, 2000) and (Ojeniyi *et al.*,2013).

**Figure 1: Influence of Organic Fertilizers and the Interaction between Them in the Mean Weight Diameter**

As shown in Figure 2, the significant differences between all treatments and control treatment in the percentage of available water reaching the highest value (15.11%) in the soil treated with cow manure compared with less value (12.12%) in the control treatment is due to the role of fertilizers which reduce the evaporation of water and increase soil moisture retention (Jassim and Abood, 2010) (Bahremand *et al.*, 2003) and (Mosaddeghi *et al.*, 2000) and (Ojeniyi *et al.*,2013) .

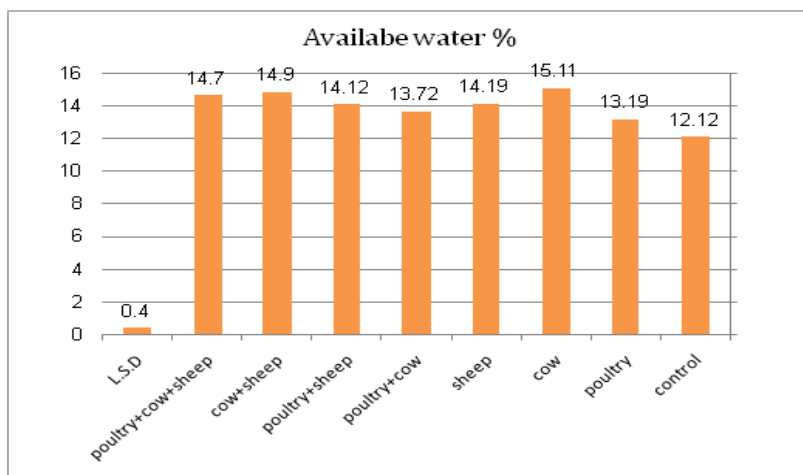


Figure 2: Effect of Organic Fertilizers and the Interaction between Them in Available Water (%)

In Figure 3 the significant differences effect of adding organic fertilizer and interaction between them in the bulk density of the soil and the lowest value for the density of virtual (1.21 Mg. M^{-3}) in the soil treated (33% cows manure + 33% sheep manure) compared to the highest value of the bulk density (1.45 Mg. m^{-3}) in the non-treated soil is due to the role of organic fertilizers and the interaction between them to improve upon and increase soil porosity, which reflected positively on reducing soil bulk density (Jassim and Abood, 2010) (Bahremand *et al.*, 2003) and (Mosaddeghi *et al.*, 2000) and (Ojeniyi *et al.*, 2013) .

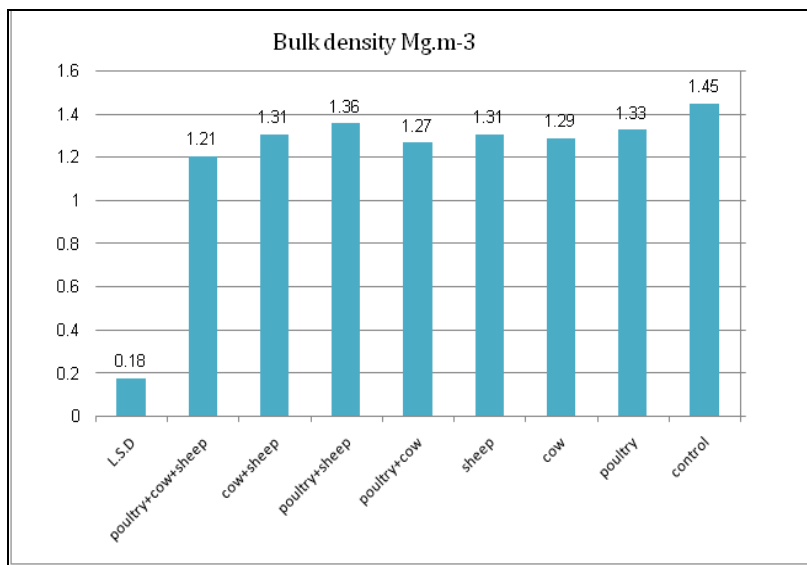


Figure 3: Effect of Organic Fertilizers and Overlap between Them in Bulk Density of Soil Mg.M^{-3}

Effect of Organic Manure Interaction between Them of Some Garlic Properties Yield

Figure 4 shows the effect of adding organic fertilizer of animal manure and the interaction between them in plant height, noting the absence of significant differences for treatments in this capacity, reaching the highest value of plant height (49.6 cm) in the soil treated with poultry manure 100% this is due to the speed of decomposition of poultry manure compared with other organic fertilizers, which helped to increase vegetative growth , and reflected positively status of plant height compared to the lowest value (46.1 cm) in the treatment of 100% cow manure were due to decomposition slow to these manure and contain a higher percent of C/N compared to other organic fertilizers , which led to competition between revival soil and nitrogen available to the roots of garlic plants in the soil lead to reduce the vegetative growth of

the plant garlic, which reflected negative state of plant higher (Razag, 2003), but other treatments were plant higher than treatment comparing of non -treated soil (control) , especially in the treatment of (33 % poultry +33 % cows + 33 % sheep manure) because increasing the amount of nitrogen added of poultry manure , which led to supply with soil microorganisms which plant roots increased the vegetative growth of the garlic crop (Razag, 2003) and Khalid and Shafei (2005) and (Khalid *et al.*,2006) . explain that the addition of poultry manure increase the height influenced plants tomato and attributed cause to increase nitrogen available in the soil.

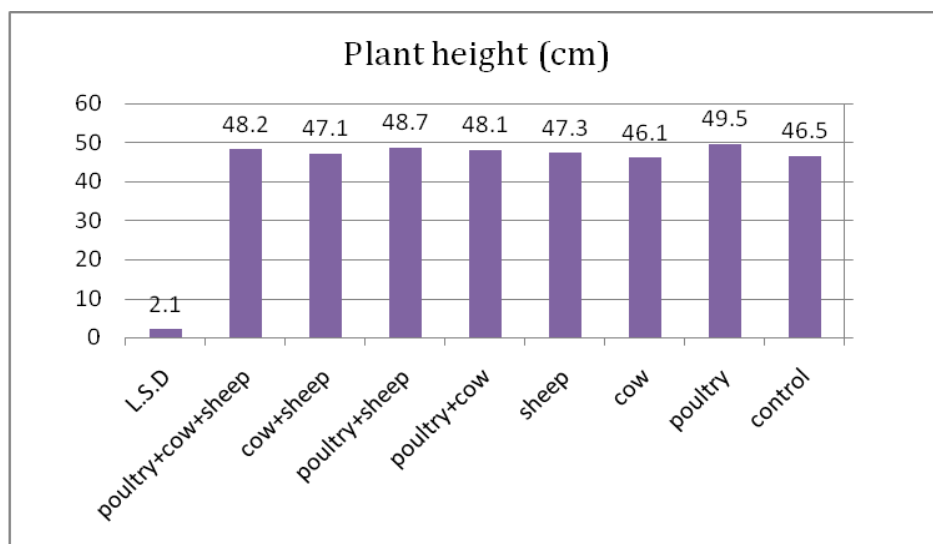


Figure 4: Effect of Organic Fertilizers and the Interaction between Them in Plant Height (Cm)

Figure 5 shows significant differences of adding organic fertilizer and the interaction between them in the weight of bulb, one of garlic reaching the highest value for the bulb weight (31.3 gm) in treatment (33% poultry + 33% cows + 33% sheep manures) comparing to lowest value (Alwan *et al.*, 2011) and Khalid and Shafei (2005) and (Khalid *et al.*,2006)

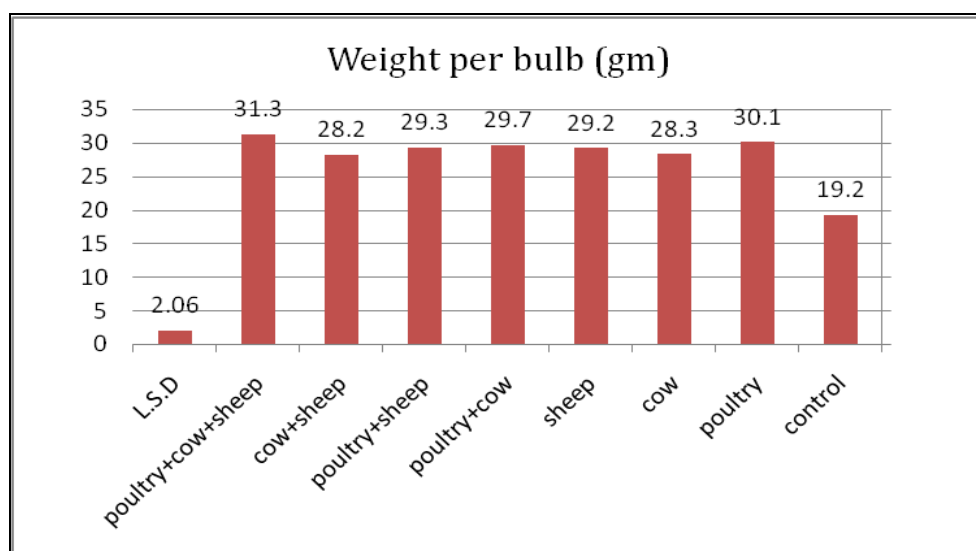


Figure 5: Effect of Organic Fertilizers and the Interaction between Them in Weight per Bulb (Gm)

Addition of organic fertilizers affect primarily fundamental to improve the structure of soil by reducing soil bulk density and increase the mean weight diameter of soil and increase available water (Figures 1, 2, 3) and thus led to an increase depth of garlic plants roots, which make the most of nutrient absorption, which reflected positively increased weight per bulb (Jassim and Abood, 2010). Figure (6) shows that all treatments have led to a significant increased in the

number of cloves of the head, comparing with the highest number of cloves (18) in the soil treatment (50% poultry + 50% cows manures) as well as in treatment (33% poultry + 33% cows +33% of sheep manures) comparing with the lowest number (12) in the non-treated soil was mainly due to the effect of organic fertilizers on the shoot and root growth of garlic plants which was reflected the number of cloves per bulb (Razag,2003) and Khalid and Shafei (2005) and (Khalid *et al.*,2006) .

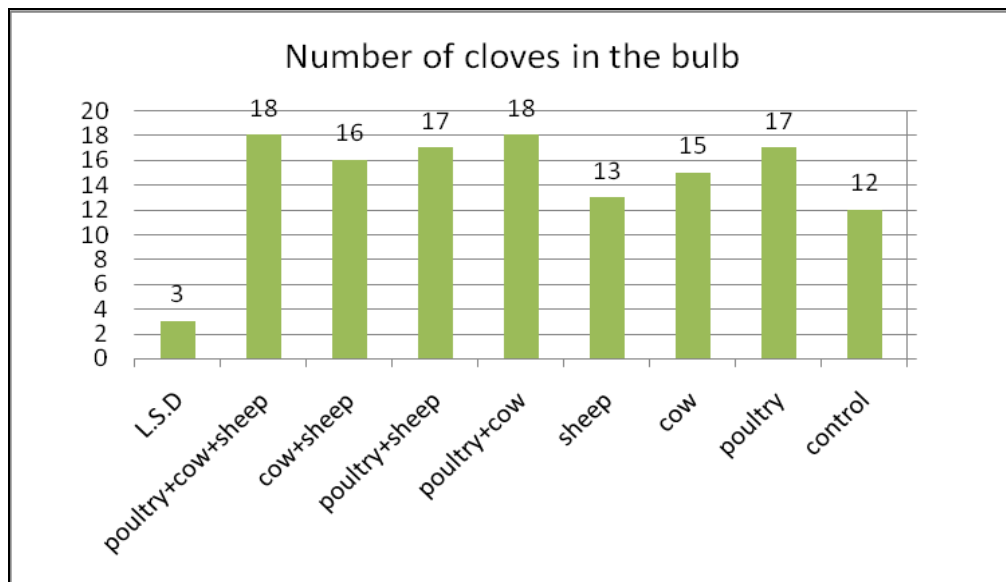


Figure 6: Effect of Fertilizer and Interaction between Treatments in Case of Cloves per Bulb Number

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