



THE EFFECT OF THE SOURCE AND THE LEVEL OF RESIDUES IN SOME OF THE CHARACTERISTICS OF THE SOIL AND YIELD OF BROAD BEAN (*Vicia faba* L.)

H.J. Mohammed, B.R. Sarheed, M.O. Salum and M.R. Alshaheen

College of Agriculture, University of Anbar, Iraq
Corresponding author: Bassamramadhn@gmail.com

Abstract

A field experiment was carried out during the 2014 season in Ramadi-Anbar, to investigate the effect of adding three levels of sheep's residues (0, 5 and 10 mega gr.h⁻¹) and three levels of dates residues (0, 5 and 10 mega gr.h⁻¹) in some physical properties of the soil and the yield of Broad bean. Factorial experiment was conducted using (RCBD) experiment design with three replicate. The addition of sheep's and dates residues was gave the highest level of ready water (16.67%), Water conductivity (8.23 cm⁻¹), soil saturation (19.99%) and total seed yield (1703 mega gr.h⁻¹). It was also observed that the level of 10 mega gr.h⁻¹ was recorded a significantly increased compared with the all of physical characteristic was studied, as well as the soil density and yield.

Key word: Organic waste, broad bean, sheep's residues, dates residues.

Introduction

Most of the arable land is located within the arid and semi-arid region, which is characterized by extreme climate in terms of high temperature (45-50 m) and a sharp drop in the rate of precipitation (not exceeding 150 mm annually), which negatively affected on the soil content of organic matter (0.5-1.5% (Because of the oxidation processes that get them in addition to the lack of growth of natural plant, so these soils require organic processing in order to improve their fertility, physical, chemical and biological and thus will be raise the agricultural production in order to cope with the growing needs of food this resulting from increasing population density.

The addition of organic residues efficiently ensures the continued high production of crops by improving the properties of different soil and increase the development of roots, with organic or added soil material leads to an important role in influencing the physical properties of soil by improving the structure, maintaining, their populations and improve ventilation, this Improves water-air relations in the soil as well as increases its positive exchange capacity and its water retention and nutrients, as well as protecting soil from wind and water erosion (Abou El-Magd, 2006; Ayoola and Makinde, 2009). Which made the organic residues (various kinds) many researchers to focus and attention to be used for the purpose of improving these qualities that will be reflected in the plant (Hillel, 1980) found Bipfubusa *et al.* (1985) The use of organic residues led to increased stability of soil concentrations by 45% compared to non-use. As found Alwan *et al.* (2011) Substantial superiority in the total number of the addicts when adding sheep residues, Note Jasem *et al.* (2007)

superiority of the sheep's sheep when added by the level of 10 mega gr.h⁻¹ for the broad bean in the total score compared with the treatment that was added a chemical fertilizers or non-additives. As noted Jassim and Al-Dulaimi (2014) The yield showed a significant superiority compared to the treatment when using a different organic waste, found Kamal *et al.* (2016) superiority in the total number of seeds when adding organic residues compared to non-addition.

Vicia faba L. Broad is one of the strategic crops in Iraq, they are grown all over Iraq for their green or dry seeds or seeds, which are used in many types of cooking. Their nutritional importance comes mainly from protein containing carbohydrates, oils and mineral salts especially calcium, iodine, fiber and vitamins such as vitamins A, B1 and B2. The rest are an important part of the food of the peoples as well as their importance in improving the properties of soil fertility through the process of fixing nitrogen by the bacteria in the soil (Katkot, 2009). Spreading the cultivation of the rest in the Middle East, The human animal industry is also used as organic green in poor soils as well as the biological effect of the activity of Rhizobia (Brady, 1974). Due to the importance of organic residues in impact of the quantity and quality of the product, the goal of the present study to comparing the effect of two types of organic residues in some Physical properties of the soil and its reflection in the total number of residues relative to chemical fertilization.

Materials and Methods

The study was carried out in the 2014 season in Silty loam soil classified in the Great Soil Group (U.S.D.A., 2010), described the physical and chemical

properties in Table 1, which were estimated according to what is stated in (Baohuna, 1993; Bipfubusa *et al.*, 2008; Hasan *et al.*, 2012; Page *et al.*, 1982). A percentage of moisture at 0 and 33 kPa was estimated using a pressure plate at 1500 kPa using a membrane device.

The field of experiment was plowed with a two-plow to 20 cm-30 depth. The soil of the experiment was smoothed and divided into experimental units, 1.5m 1.5m apart with 2.25 m², was leaving 1.5 m intervals between the sections to ensure there is no interaction between the treatments. Phosphorus was added at a rate of 80 kg P.h⁻¹. The nitrogen fertilizer was added at the rate of 40 kg N. h⁻¹ urea (46% N) in two batches first after germination and the second at the branches at the beginning of the stage of flowering buds (El-Desuki *et al.*, 2010). The application of the experiment according to the factorial design in accordance with the full sectors Randomized three replications, it represented the first factor the remnants of sheep with three levels was 0, 5 and 10. E-1 (S0, S1 and S2), respectively. The second factor was the residues of dates (residues of molasses production) at the level of 0, 5 and 10. E1 (D0, D1 and D2), respectively, the mixtures were mixed with soil

surface (0-30 cm) with the calculation of humidity in each type of waste. Table 2 shows some characteristics of the added waste.

Vicia faba L. seeds were planted on 20/10/2013 between the lines 30 cm and the distance between hole and another 25 cm and at a depth of 4-5 cm, 3 to 4 seeds per hole. The irrigation was carried out when 50% of the water was depleted using the weight method, Samples were taken of the irrigation water (Euphrates River). Some chemical analyzes were conducted as recorded in Table 3. The field of experiment was weeding manually as needed. At the end of the experiment 1/7/2014, soil samples were taken from the intermediate lines of each experimental unit after the election of five experimental units to study the following characteristics:

(%), Water conductivity (cm⁻¹ hour), virtual density, stability of soil concentrations and total mass (mega gr.h⁻¹). The study data were analyzed according to the analysis of variance (ANOVA) within the design of complete sectors randomized R.C.B.D. The mean of the treatments was compared with the least significant difference L.S.D at the 5% probability level and using the Genestat program.

Table 1 : Some physical and chemical properties of soil before planting.

Texture Category	Soil (g.kg ⁻¹) separators			CEC (Cmol.kgsoil ⁻¹)	Bulk density (mega gr.m ⁻³)	Organic matter (g.kg ⁻¹)	* pH	Electrical *Conductivity (ds.m ⁻¹)
	Sand	Silt	Clay					
Silty loam	620	200	180	10.10	1.45	7.60	7.31	1.80
Available water		Percentage of weight moisture			Aggregate stability (%)			
		(kPa)1500	33(kPa)	0(kPa)				
10.98		6.23	17.21	40.10	11.32			
Positive and negative dissolved ions(MM L ⁻¹) *								
Ca ⁺⁺	Mg ⁺⁺	Na ⁺	K ⁺	Cl ⁻	CO ₃ ⁼	HCO ₃ ⁼	SO ₄ ⁼	
9.0	7.2	1.4	5.1	5.0	1.8	4.5	11.01	

* Estimated in saturated soil paste extract

Table 2 : Some characteristics of added waste

Attributes Studied	Measuring Unit	Sheep's Residues	Dates Residues
pH	---	7.36	6.50
EC	ds.m ⁻¹	20.15	1.30
CEC	Cmol.kg ⁻¹	93.00	98.00
C/N	---	19.54	16.32
O.M	g.kg ⁻¹	480.70	88.50
N		10.75	---
P		8.40	4.25
K		17.20	13.80

Table 3 : Some chemical characteristics of irrigation water was used

Measurement Unit	EC	pH	Ca ⁺⁺	Mg ⁺⁺	Na ⁺	K ⁺	Cl ⁻	CO ₃ ⁼	HCO ₃ ⁼	SO ₄ ⁼	NO ₃ ⁻	SAR
Unit	ds.m ⁻¹	---	MM L ⁻¹									---
Value	1.00	7.10	2.10	2.30	1.90	2.07	3.00	Nil	1.30	3.10	0.50	1.28

Results and Discussion

Prepared Water Ratio (%)

Table 4 shows the effect of adding the remnants of sheep and dates (15.09%) and (16.67%) respectively, compared with the comparison treatment (without the addition of sheep remnants), which was recorded the lowest rate of moisture content was (11.85%) with an increase of 27.3% and 40.7%, respectively.

Table 4 : Effect of the adding organic remnants in prepared water ratio (%).

Dates residues (mega gr.h ⁻¹)	Sheep's residues (mega gr.h ⁻¹)			Average
	(S0) 0	(S1) 5	(S2) 10	
(D0) 0	10.90	11.20	12.65	11.58
(D1) 5	11.54	14.72	16.32	14.19
(D2) 10	13.10	19.35	21.04	17.83
Average	11.85	15.09	16.67	
L.S.D 0.05	SD=0.3431 D=0.1981 S= 0.1981			

The results of the statistical analysis showed a significant effect between the addition of date residues. Where the level 10 mega gr.h⁻¹D (D2) at 5 mega gr.h⁻¹ was significant superior compared with (D1) and the comparative treatment (D0, where it was recorded the highest percentage of Prepared Water Ratio was 17.83%, also the first level (D1) was recorded the higher ratio reached (14.19%) compared with the comparison treatment which gave the lowest rate was (11.58%).

The overlap between levels of sheep and date residues also had a significant effect on the water content. With the highest rate of 21.04% when using the level 10 (mega gr.h⁻¹) of sheep and date residues compared to the comparison treatment amounted to 10.90%, an increase of 93%. This may be attributed to the add the organic residues to the soil has increased the moisture of the root area because of the susceptibility of organic matter to retain water the humus was resulted from the decomposition of organic matter Classified from the hydrophilic (Hydrophilic colloids). Where the absorptive capacity of these materials is reached 300% of its weight because of high surface area compared to its size (Black, 1965). This corresponds with (Angers and Changeshn, 1992; Khalil, 2009).

Water Conductivity (cm⁻¹ hour):

Note from Table 5 There is a significant effect of the addition of sheep and date residues in increasing the values of water conductivity compared with the comparison treatment (without addition). Where it has recorded a significantly higher was 10 mega gr.h⁻¹ at the highest rate (8.23 cm⁻¹ hour) compared with the comparison treatment, which recorded the lowest rate of (6.90 cm⁻¹ hour) with increased 19%.

It was also observed that the level of 5 mega gr.h⁻¹ recorded a significantly exceeded compared with comparison treatment. The results of the statistical analysis showed a significant difference between the addition or not of date residues in water delivery. Where the level of 10 mega gr.h⁻¹ has recorded a significantly higher rate reached (8.17 cm⁻¹ hour) compared with the comparison treatment that gave the lowest rate (7.03 cm⁻¹ hour) with an increase 16%.

Table 5 : Effect of addition of organic residues in water conductivity values (cm⁻¹)

Dates residues (mega gr.h ⁻¹)	Sheep's residues (mega gr.h ⁻¹)			Average
	(S0) 0	(S1) 5	(S2) 10	
(D0) 0	6.20	7.00	7.90	7.03
(D1) 5	6.70	7.50	8.20	7.47
(D2) 10	7.80	8.10	8.60	8.17
Average	6.90	7.53	8.23	
L.S.D 0.05	SD=0.5762 D=0.3327 S= 0.3327			

As well the interaction was a significant between the addition of dates and sheep residues in this characteristic. The lowest water delivery rate (6.20 cm⁻¹ hour) in compared treatments (without adding any residues). The highest rate was recorded in the treatments was treated with 10 (mega gr.h⁻¹ (8.60 cm⁻¹ hour) with the sheep and date residues addition with an increase 39%. This may be due to the role of the amorphous part of the organic matter, either on the surface of the soil or mixed with it to protection of soil pores of the extension by the physical effect of rain or irrigation water (Hasan *et al.*, 2012). Or the increase in water conductivity may be due to increased organic carbon content in the soil. As there is a positive correlation between water delivery and the amount of organic carbon as well as the formation of aggregates in the soil and organic matter works the work of bonding soil minutes with each other and thus improve the construction and increase the permeability of the soil. This is consistent with (Al-Hadithy *et al.*, 2008) what he found.

Virtual density (mega gr.m⁻³):

Table 6 indicates the effect of the sheep and date residues addition and their interaction to reducing the soil density of the study soil compared with the comparison treatment. The addition of sheep residues at levels 5 and 10 mega gr.h⁻¹ was recorded insignificant reduced in the soil density, while the addition of date residues at the level of 10 mega gr.h⁻¹ reduced the values of soil density reached (1.36 mega gr.m⁻³) with decrease 5% compared with the comparison treatment which was recorded a highest ratio of soil density of 1.45 mega gr.m⁻³, also it was recorded the highest level of date

residues a significant increase in soil density at the level 5 mega gr.h⁻¹ (1.43 mega gr.m⁻³) with increase reached to 5% compared with the comparison treatment, which recorded the highest rate of soil density reached 1.45 mega gr.m⁻³.

Table 6 : Effect of addition of organic residues in virtual density (mega gr.m⁻³)

Dates residues (mega gr.h ⁻¹)	Sheep's residues (mega gr.h ⁻¹)			Average
	(S0) 0	(S1) 5	(S2) 10	
(D0) 0	1.47	1.45	1.44	1.45
(D1) 5	1.46	1.43	1.40	1.43
(D2) 10	1.34	1.38	1.35	1.36
Average	1.423	1.420	1.397	
L.S.D 0.05	SD=0.1070 D=0.0618 S= 0.0618			

There was also a significant interaction between the levels of sheep and dates residues was added on the soil density, where the ratio of 10 mega gr.h⁻¹. it was recorded the lowest rate of the soil density (1.34 mega gr.m⁻³) of the date residues without adding sheep residues while comparison treatment gave the highest rate reached 1.47 mega gr.m⁻³.

This effect may be due to the amount and the speed of materials was released from the organic matter, Therefore activation of microorganisms that was process the decomposition of the organic matter, also to the humus composition which works to paste the granules in to clusters which was increased the size of the pores, subsequently increased the soil cohesion, Then ventilation will be increases this leads to decrease the center density (Menary and Staten, 2000). This result consistent results (Alwan *et al.*, 2011).

Stability of Soil Concentrations (%):

Table 7 shows that the addition of sheep and date residues had a significant effect on the stability rate of soil concentrations. It has recorded the highest rate (19.99%) on the level of 10 mega gr.h⁻¹ sheep residues which has a significant differed compared with the level 5 mega gr.h⁻¹ was reached (18.06%), both of this levels (10 and 5 mega gr.h⁻¹) have a significant increase compared with the comparison treatment with an increase rate of 47 and 33% respectively, the lowest rate which recorded (13.63%) in the control treatment.

The results of the statistical analysis indicated a significant difference between the date residues where the highest rate of the stability of soil concentrations reached 21.64% with an increase of 67% compared with comparison treatment which gave the lowest ratio (12.94%). Also the D2 treatment was significantly higher than D1.

There was a significant interaction between the levels of sheep and dates in the stability of soil concentrations where the treatment of sheep and dates D2 S2 exceeded with the highest rate of reached 25.20% with an increased 123% compared with the lowest ratio of the stability of soil concentrations (11.32%) was achieved by the comparison treatment.

Table 7 : Effect of organic residues in the stability of the soil concentrations (%)

Dates residues (mega gr.h ⁻¹)	Sheep's residues (mega gr.h ⁻¹)			Average
	(S0) 0	(S1) 5	(S2) 10	
(D0) 0	11.32	12.40	15.10	12.94
(D1) 5	13.25	18.40	19.68	17.11
(D2) 10	16.32	23.40	25.20	21.64
Average	13.63	18.06	19.99	
L.S.D 0.05	SD=0.4485 D=0.2589 S= 0.2589			

It attributed the cause of the increase to the stability of the soil concentrations when adding the organic residues to its role in the formation of bond matter when analyzed by the activity of biochemistry, therefore launch the organic acids that was improved the soil building, through in production of gel materials that will working to connect the soil minutes together and then increasing the group stability. That increased of the concentrations of organic compounds such as fulvic acid and polysaccharides which play an important role with multiple-charge ions Ca⁺² and Mg⁺² which together contribute to increasing the stability of soil complexes (6). Organic matter also helps to increase the stability of soil concentrations in water this is done by reducing the speed of soil absorption and waterproofing subsequently reduce the solubility of soil granules. The Decomposition of the soil organic matter with the existence of calcium ion will be lead to formation of a substance (Ca-humate). This compound has a significant effect to increasing the stability of soil aggregates. This is consistent with what Hasan *et al.* (1979) and Sadiq and Aagol (2013).

Total Yield (mega gr.h⁻¹)

Table 8 shows the effect of sheep and dates and their interaction in the total yield. The results showed that there was a significant effect of adding sheep residues in the total yield compared with the control treatment. Where the first level (5 mega gr.h⁻¹) has given a significant increase reached 1.565 mega gr.h⁻¹ compared with the control treatment where give 1.309 mega gr.h⁻¹ which recorded the lowest rate of the total yield, While the second level (10 mega gr.h⁻¹) was singularity with the highest ratio for the total yield compared with first level and the control treatments by

achieving where it was gave 1.704 mega gr.h⁻¹ with an increase rate of 9 and 30%, respectively.

The results of the statistical analysis showed a significant difference between the addition of date residues in the total yield. Which the second (10 mega gr.h⁻¹) level gave the highest rate reached 1760 mega gr.h⁻¹ with a significantly increase compared with the first level 5 mega gr.h⁻¹, which reached 1.545 mega gr.h⁻¹ which recorded an increase of 14%.

Table 8 : Effect of addition of organic residues in the total yield (mega gr.h⁻¹)

Dates residues (mega gr.h ⁻¹)	Sheep's residues (mega gr.h ⁻¹)			Average
	(S0) 0	(S1) 5	(S2) 10	
(D0) 0	1.000	1.321	1.486	1.269
(D1) 5	1.400	1.544	1.690	1.548
(D2) 10	1.528	1.819	1.932	1.761
Average	1.309	1.565	1.704	
L.S.D 0.05	SD=0.1093 D=0.631 S= 0.631			

While it was recorded the lowest rate of the total yield in the control treatment reached 1.269 mega gr.h⁻¹ with an decrease of 22% for the first level and 39% for the second level. When comparing the levels of the sheep residues and the rate of date residues it has found insignificant differences between the source of organic matter in the effect on the yield.

It was noted that the interaction between the levels of adding sheep and dates residues had a significant effect on the total number of seeds with the highest rate of 1.932 mega gr.h⁻¹ by adding the 10 mega gr.h⁻¹ for both residues compared with the comparison treatment, which amounted to 1,000 Mg.h⁻¹ with an increase of 93%. It may be due to the outcome of growth indicators and other attributes which were influenced by the addition of organic residues which released the nutrients from decomposition (Adekiya and Agbede, 2009). This results consistent with (Chafi and Bensoltane, 2009; Shaaban and Okasha, 2007)

The humic acids produced by the organic residues during its decomposition will increase the permeability of the membranes, which facilitates and accelerates the absorption of nutrients through the roots or leaves and their transfer to the manufacturing areas (leaves) and the accumulation of materials manufactured in the seeds (Katkat, 2009) and this results consistent with (Jassim and Al-Dulaimi, 2014; Sabh and Shallan, 2008; Shafeek *et al.*, 2013).

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