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EFFECT OF SOME ORGANIC MATERIALS ON PRODUCTION OF WHEAT AND FABA BEAN PLANTS GROWN ON TWO DIFFERENT SOILS

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ABSTRACT: Two pots experiments were conducted under greenhouse conditions to study the effect of five organic soil amendments: Bitumen (Bit), Saw dust (SD), Farm yard manure (FYM), Chicken manure (CM) and Compost (Com) on yield, yield components and chemical components of wheat and faba bean plants grown on two different soils. The organic materials were used at rate of 20 Mg fad.$^{-1}$ (2%). In the first (wheat exp.) and second experiments (faba bean exp.), Ordinary super phosphate at a rate of 13.1 kg p fad^{-1} and Potassium sulphate at a rate of 41.5 kg k fad^{-1} were added to both soils before planting, while ammonium sulphate was added after planting at the rates of 75 and 30 kg N fad.$^{-1}$ to wheat and faba bean plants, respectively. The applied nitrogen was divided into three doses, the first dose was applied after planting (15 days) and the second and the third doses were added at tillering and booting stages (after 45 and 70 days, respectively) in the first experiment, while in the second experiment the added nitrogen was divided into two doses, the first dose was applied after planting and the second dose was added at tillering stage (45 days after planting). The results showed that the chicken manure treatment gave the greatest value for each of straw, grains of wheat, seeds of faba bean, roots dry weight, 1000-wheat grain and 1000-faba bean seed weights, biological yield, Harvest Index (%) and NPK uptake for wheat and faba bean plants grown in both of soil as compared to the other organic treatments. The greatest values of protein content were obtained for wheat and faba bean plants when treated with (CM) and found true in both soils under study. The superiority of used organic amendments effect on all the studied parameters can be arranged in the following descending order: CM > FYM > Com > Bit > SD > Control.

Key words: Bitumen, saw dust, farm yard manure, chicken manure, compost, sandy clay loam soil, sandy soil.

INTRODUCTION

Most of Egyptian soils such as the clayey and sandy soils suffer from the lack of available nutrients content; due to increase pH values and low of organic matter content as well as sandy soils are characterized by their poor physical and chemical properties beside their low capacity to retain water. Efficient use of fertilizers, optimizing crop yield and minimizing environmental pollution is therefore a critical issues. Increasing the ability of plant to take up minerals could have a dramatic impact on both plant and human health (**Rus *et al.*, 2005**). The Egyptian soils become a necessity to increase agricultural production and to overcome the deficiency in food requirements (**El-Kholy *et al.*, 2000; Hassanien *et al.*, 2007; Telep, 2008**) wheat and faba bean plants are considered of the most important crops which used as a food for both humans and animals all around the world . The using of natural organic soil amendments are considered as promising practices of improving the nutritive and productive capacity of such soils either directly or indirectly (**Chirevnje and Ma, 2002; Chen, 2006**). The present work aims at studying the effect of applying different sources of natural organic soil amendments (bitumen, saw dust, farmyard manure, chicken manure, compost) the growth, yield components

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and nutritional status of wheat and faba bean plants grown on two coarse textured soils

MATERIALS AND METHODS

Materials

Soil samples

Two surface (0-30cm) soil samples were collected from two different locations in Egypt, Sharkia Governorate to be used in this work. The first sample, represents a sandy clay loam soil from El-Korain county and the second sample, represents a sandy soil from the Farm of Faculty of Agriculture Zagazig University at El-khattara county. Soil samples were air dried, crushed, sieved through 2 mm plastic screen, thoroughly mixed and stored in plastic bags for analysis and experimental work. Table 1 shows some physical and chemical characteristics of the investigated soils

Soil analysis was performed according to the methods described by **Jackson (1973)**.

Organic Soil Amendments

Five types of organic soil amendments were used in this work, which are: bitumen (Bit), saw dust (SD), farm yard manure (FYM), chicken manure (CM) and compost (Com). Some characteristics of the tested amendments are shown in Table 2.

Methods

Greenhouse experiments

Two biological experiments were carried out to study the effect of different soil organic amendments (Bitumen, Saw dust, Farm yard manure, Chicken manure, Compost) on plant growth and some macronutrients uptake (N,P and k) by plants in two different soils under greenhouse conditions. The organic soil amendments were added and mixed with the soil of each pot before planting. The first experiment was cultivated by wheat (*Triticum aestivum,* L. Giza 6). Plastic pots of internal dimensions 20 x 20 cm were filled with 5kg of soil samples. The Previously mentioned treatments were mixed with the tested soil before planting and replicated three times. A randomized complete block design was used with three replicates. The organic residues were added at a rate of 2% (20 Mg fad.$^{-1}$). Fifteen seeds of wheat were seeded per pot. The pots were daily weighed and the soil moisture content was adjusted nearly the field capacity after germination, then plants were thinned to ten plants. Plant with their roots removed after 150 days from sowing gently and washed with tab water till the roots were freed of the soil particles and then washed with distilled water. Plant samples were dried at 70° C for 72 hours, then weighed, ground, and analyzed for total nitrogen, phosphorus and potassium. Total N, P and K content were determined according to **Jackson (1973)** for total N, **Watanabe and Olsen (1965)** for total P and according to **Jackson (1973)** for total K. Protein percent {yield quality} in grains was calculated by multiplying N% x 5.70 (**Bishni and Hughes, 1979**) and Harvest Index % [grains ÷ (straw +(grains or seeds))] x100, also was calculated.

The second experiment was cultivated with faba bean (*Vicia faba* L. Giza 3), plastic pots of internal dimensions 20 x 20 cm which filled with 5kg of the soil samples. Three replicates for each of the two indicated soil samples that previously mentioned were used. Organic soil amendments were used as in the first experiment with wheat. Fifteen seeds of faba bean were seeded per pot. The pots were daily weighed and the soil moisture content was adjusted nearly the field capacity. After germination, plants were thinned to three plants. Plants with their roots were removed after 150 days from sowing then, gently washed with tap water till the roots were freed of the soil particles and then washed with distilled water. Plants were divided into shoots and roots. Plant samples were dried at 70°C for 72 hours, ground and analyzed for available nitrogen, phosphorus and potassium. At harvest, plants were separated into straw, pods (shell and seeds) and roots. Yield and yield components were recorded. Protein content {yield quality} in seeds was calculated by multiplying N% x 6.25 (**Bishni and Hughes, 1979**) and Harvest Index [seeds ÷ (straw + pods)] x100, also calculated.

Methods of analysis used in this study were described according to **Chapman and Pratt (1961), Black *et al.* (1965) and Jackson (1972)**.

Table 1. Some Physical and chemical characteristics of the investigated soils

Characteristic	El-Korain	El-Khattara
Sand (%)	67.10	91.87
Silt (%)	3.40	6.03
Clay (%)	29.50	2.10
Textural class	Sandy clay loam	Sandy
Bulk density, Kg m^{-3}	1.26	1.60
Total porosity (%)	43.39	26.98
MWHC (%)	42.05	16.60
Water in air dry soil (%)	3.49	0.47
Expansion (%)	14.78	0
pH	8.13	7.67
EC dSm^{-1}	0.77	0.39
$CaCO_3$ (g kg^{-1})	16.00	5.00
OM (g kg^{-1})	12.70	4.80

*MWHC: Maximum water holding capacity pH: soil: water suspension (1:1) EC: soil paste extract

Table 2. Some characteristics of organic soil amendments

Property	Organic soil amendment				
	Bitumen (Bit)	Saw dust (SD)	Farmyard manure (FYM)	Chicken manure (Cm)	Compost (Com)
pH	--	7.50	8.20	7.10	4.50
$ECdSm^{-1}$	--	Traces	7.10	7.51	7.21
OC	--	87.4	23.2	14.9	4.5
C/N ratio	--	583	13.6	10.2	32.2
Total N(%)	--	0.15	1.71	1.46	0.14
Macronutrients (mg kg^{-1})					
Available-N	--	Traces	1.0	46.6	12.3
Available-P	--	Traces	3.4	19.0	6.51
Available-K	--	Traces	53.3	51.2	29.1
Total porosity (%)	30.65	78.57	35.35	50.58	61.64
MWHC (%)	2.76	534.2	95.71	228.5	83.71
Water in air dried manure (%)	355.66	12.68	9.39	22.82	10.63

OC: Organic Carbon in manure sample MWHC: Maximum water holding capacity
pH: in manure water suspension, 1: 5 EC: in manure water extract, 1:5

Mineral fertilizers

Ammonium sulphate (205 g N kg^{-1}) as nitrogen source at rate of 75 kg N $fad.^{-1}$ for wheat plant was divided into three doses, the first dose was applied after planting (15 days) and the second and the third doses were added at tillering and booting stages, respectively and 13.1 kg p $fad.^{-1}$ for faba bean plant was divided into two doses, the first dose was applied after planting and the second dose was added at tillering stage, ordinary super phosphate (6.76 g P kg^{-1}) as phosphorus sources a rate of 13.1 kg p $fad.^{-1}$ for both plants and potassium sulphate (400 g K kg^{-1}) as potassium source at a rate of 41.5 kg k $fad.^{-1}$ for both plants were used as a soil application.

RESULTS AND DISCUSSION

Effect of Tested Organic Amendments on Yield of Wheat and Faba Bean Plants, Grown on the Two Investigated Soils

The results given in Table 3 show the effect of organic soil amendments on straw, grain and root dry weights (g pot^{-1}) of wheat as well as straw, seed and root for faba bean plants grown on sandy clay loam soil and sandy soil.

Results in Table 3 show that all the treatments in both soils significantly increased the straw, grains, seeds and roots dry weight compared to the control treatment. This may be explained on the fact that the applications of organic soil amendments improve hydro physical, chemical and biological properties of the sandy clay loam and sandy soils as well as organic manures being a storehouse for essential plant nutrients. These findings were in well agreement with those obtained with **Basyouny (2002), Basyouny *et al.* (2003), Merwad (2009) and (2013)**.

Irrespective of the control treatments, the straw dry weight values ranged between 7.17 and 13.5 g pot^{-1} for wheat and between 8.84 and 18.5 g pot^{-1} for faba bean in sandy clay loam soil and between 5.35 and 8.93 g pot^{-1} for wheat and between 7.60 and 16.7 g pot^{-1} for faba bean in sandy soil. The lowest straw dry weight values were observed with the treatment of Saw dust (SD), while the greatest ones were obtained under the application of chicken manure (CM) in both tested soils. The values of grains dry weight ranged between 7.05 and 11.3 g $pot^{-1}$for wheat and between 5.16 and 10.5 g seeds pot^{-1} for faba bean in sandy clay loam soil and between 5.68 and 9.56 g pot^{-1} for wheat grains and between 4.80 and 6.19 g pot^{-1} for faba bean seeds in sandy soil. For the two tested plants grown in both soils, the lowest grains and seeds dry weight values were found with the treatment of saw dust (SD), while the highest ones were recorded with the treatment of chicken manure (CM). The roots dry weight values ranged between 5.09 and 6.03 g pot^{-1} for wheat plant and between 4.80 and 6.22 g pot^{-1} for faba bean plant in a sandy clay loam soil and between 3.69 and 4.84 g pot^{-1} for wheat and between 4.25 and 4.99 g pot^{-1} for faba bean in a sandy soil. The lowest roots dry weight values were obtained under addition saw dust (SD) for the two tested plants in both soils, while the greatest ones were observed with the treatments of chicken manure (CM) when applied to the two cultivated soils with both plants under study.

In general, the effect of organic soil amendments on the dry weights of straw, grains, seeds and roots of wheat and faba bean plants grown in both soils can be arranged for different treatments in the following descending order: (CM)>(FYM)>(Com)>(Bit)>(SD)>(Control).

These results may be due to one or all of the following possibilities:

1. The nutrients content in chicken manure (CM) was relatively higher if compared to the other organic residues under study (Table 2), these results are in agreement with those obtained by **El-Kholy *et al.* (2000), Basyouny (2002), Merwad (2009), Awad *et al.* (2013), El-Sayed (2017) and El-Tahawey *et al.* (2017)**.
2. The variation in C/N ratio, the chemical composition (Table 2) and decay rate of the organic manures under study. These findings are in accordance with those obtained by **Merwad (2009), Awad *et al.* (2013), El-Tahawy *et al.* (2017) and El-Sayed (2017)**.

Table 3. Effect of organic soil amendments on wheat and faba bean dry matter yield (g pot^{-1}) grown on two different soils

Treatment	Sandy clay loam soil			Sandy soil		
	Straw	Grains	Roots	Straw	Grains	Roots
			Wheat			
Control	6.23	5.87	4.55	5.24	5.43	3.49
Bit	7.28	7.14	5.11	5.49	6.22	3.84
SD	7.17	7.05	5.09	5.35	5.68	3.69
FYM	8.88	7.50	5.87	6.52	7.23	4.75
CM	13.5	11.3	6.03	8.93	9.56	4.84
Com	7.99	7.30	5.64	6.05	6.93	4.20
LSD 0.05	0.0971	0.1373	0.6330	0.0506	0.0404	0.1638
			Faba bean			
	Straw	Seeds	Roots	Straw	Seeds	Roots
Control	8.06	4.58	4.43	7.29	4.09	4.11
Bit	10.6	5.83	5.75	8.96	4.98	4.31
SD	8.84	5.16	4.80	7.60	4.80	4.25
FYM	12.8	6.50	5.93	11.9	5.46	4.85
CM	18.5	10.5	6.22	16.7	6.19	4.99
Com	12.5	6.39	5.42	11.3	5.01	4.63
LSD 0.05	0.5783	0.6371	0.1016	0.0967	0.1326	0.0967

Bit: Bitumen SD: Saw dust FYM :Farm yard manure CM: Chicken manure Com :Compost

3. The values of accumulated CO_2 gas due to decay of chicken manure were greater than those from decomposition of the other organic manures as well as the dissolving ability of some organic acids, especially amino acids as a result of decay of chicken manure lead to solubilizing of insoluble nutrients compounds in soils As reported by **Salem *et al*. (2004), Hassan *et al*. (2002), Merwad (2009), Awad *et al*. (2013) and El-Tahawy *et al*. (2017)**.

4. Chicken manure may increase the ability of cellular membrane of plant roots to absorb nutrients compared to the other organic residues as a result of the reduction in ratios of Na/Ca and Na/K in soil solution and improve water -soil-plant relationship.

In general, the favorable effect of various organic soil amendments on straw, seeds and roots yield of wheat and faba bean plants was more pronounced in the sandy clay loam than in the sandy soil, which may be related to the high ammonia loss by volatilization. Those findings as in accordance with those obtained by **Ali (2017) and El-Sayed (2017)**.

Effect of Tested Organic Amendments on Biological Yield and the Wheat 1000-grains and Faba bean 1000-seeds Dry Weight Grown on the Investigated Soils

The results given in Table 4 show the effect of organic soil amendments on the wheat 1000-grain weight and faba bean 1000-seed weight and biological yield (g pot^{-1}) grown on sandy clay loam soil and sandy soil.

Table 4. Effect of organic soil amendments on wheat 1000-grain weight and faba bean 1000-seed weight as well as biological yield (g pot^{-1}).

Treatment	Sandy clay loam soil		Sandy soil	
	1000-Grain weight	**Biological yield**	**1000-Grain weight**	**Biological yield**
		Wheat		
Control	101	16.7	48.0	14.2
Bit	349	19.5	75.8	15.6
SD	320	19.3	74.3	14.7
FYM	433	22.3	98.0	18.5
CM	481	30.8	116	23.3
Com	361	20.9	77.5	17.2
LSD 0.05	2.1575	0.0623	2.7853	0.0917
		Faba bean		
	1000-Seed weight	**Biological yield**	**1000-Seed weight**	**Biological yield**
Control	436	17.1	306	15.5
Bit	737	22.2	433	18.3
SD	725	18.8	420	16.7
FYM	870	25.2	476	22.2
CM	970	35.2	480	27.9
Com	819	24.3	450	20.9
LSD 0.05	6.8040	6.2281	6.5318	6.1359

See footnote of Table 3.

Results in Table 4 show that all the treatments in both soils significantly increased the 1000-grain and 1000-seed dry weight compared to the control treatment. These findings are in agreement with those obtained by **Basyouny (2001), El-Zahar *et al*. (2007) and Abdel All *et al*. (2003)**.

Irrespective of the control treatment, the 1000-grain and 1000-seed dry weight values ranged between 320 and 481 (g pot^{-1}) for wheat and between 725 and 970 (g pot^{-1}) for faba bean, in sandy clay loam soil and between 74.3 and 116 (g pot^{-1}) for wheat and between 420 and 480 (g pot^{-1}) for faba bean, in sandy soil. The lowest 1000-grain and seed dry weight values were observed with the treatment of saw dust (SD), while the greatest ones was obtained due to the application treatment of chicken manure (CM) for both tested soils under study. The values of biological yield ranged between 19.3 and 30.8, g pot^{-1} for wheat and between 18.8 and 35.2, g pot^{-1} for faba bean in sandy clay loam soil while, in sandy soil it varied between 14.7 and 23.3 g pot^{-1} for wheat and between 16.7 and 27.9 g pot^{-1} for faba bean. The lowest 1000-grain weight and 1000-seed weight were obtained owing to the (SD) treatment, while the highest ones were recorded with the treatment of (CM) and that found true in both soils under study.

In general, the effect of organic amendments on the wheat 1000-grain weight, faba bean 1000-seed weight and biological yield in both soils can be arranged for different treatments in the following descending order: (CM) > (FYM) > (Com) > (Bit) > (SD) > (Control).

Effect of Tested Organic Amendments on Nitrogen Uptake of Wheat and Faba Bean Plants Grown on the Investigated Soils

The results presented in Table 5 show the effect of organic amendments on straw, grains, seeds and roots nitrogen uptake of wheat and faba bean plants grown on sandy clay loam soil and sandy soil.

Results in Table 5 show that all the treatments in both soils significantly increased the straw, grains, seeds and roots nitrogen uptake

Table 5. Effect of organic soil amendments on nitrogen uptake (mg pot^{-1}) by wheat and faba bean plants grown on two different soils

Treatment	Sandy clay loam soil			Sandy soil		
	Straw	Grains	Roots	Straw	Grains	Roots
			Wheat			
Control	32	73	25	18	35	15
Bit	38	79	35	29	62	26
SD	37	77	31	26	58	25
Fym	45	83	40	33	72	31
CM	47	88	43	35	75	33
Com	42	80	39	31	68	29
LSD 0.05	0.6125	0.6847	0.6228	0.6354	0.6258	0.6254
			Faba bean			
	Straw	Seeds	Roots	Straw	Seeds	Roots
Control	45	65	44	32	41	40
Bit	51	78	53	41	65	49
SD	50	75	51	39	62	45
Fym	55	84	58	46	71	52
CM	59	88	60	50	80	54
Com	53	80	55	43	69	50
LSD 0.05	0.6847	0.6854	0.6328	0.6985	0.6475	0.6217

See footnote of Table 3.

compared to the control treatment. These findings are in agreement with those obtained by **Taha (2000), Rochette *et al.* (2006) and Shnsuke (2004)**.

Irrespective of the control treatment, the straw nitrogen uptake values ranged between 37 and 47 mg pot^{-1} for wheat plants and varied between 50 and 59 mg pot^{-1} for faba bean plants in sandy clay loam soil while in sandy soil varied between 26 and 35 mg pot^{-1} for wheat plants and between 39 and 50 mg pot^{-1} for faba bean. The lowest straw nitrogen uptake value was observed with the treatment of saw dust (SD), while the greatest one was obtained under the application treatment of chicken manure (CM) for the two tested soils under study. The values of wheat grains nitrogen uptake ranged between 77 and 88 mg pot^{-1} and between 75 and 88 mg pot^{-1} for faba bean seeds in sandy clay loam soil while in sandy soil it varied between, 58 and 75 mg pot^{-1}for wheat grains and between 62 and 80 mg pot^{-1} for faba bean seeds. For the two tested plants grown in both soils, the lowest grains and seeds nitrogen uptake values were found when plants treated with saw dust (SD), while the highest ones were recorded with the treatment of chicken manure (CM). The roots nitrogen uptake values ranged between 31 and 43 mg pot^{-1} for wheat and between 51 and 60 mg pot^{-1} for faba bean in a sandy clay loam soil and between 25 and 33 mg pot^{-1}for wheat and between 45 and 54 mg pot^{-1} for faba bean in the sandy soil. The lowest roots nitrogen uptake value was obtained under addition treatment of saw dust (SD) for the two tested plants in both soils, while the greatest ones were observed with the treatment of chicken manure (CM) and found true for the two soils under study.

In general, the effect of organic soil amendments on the nitrogen uptake of straw, grains and roots of wheat and straw, seeds and roots faba bean plants grown in both soils can be arranged for different treatments in the following descending order: (CM)> (FYM)> (Com)> (Bit)>(SD)>(Control).

Effect of Tested Organic Amendments on Phosphorus Uptake of Wheat and Faba Bean Plants Grown on the Investigated Soils

The results given in Table 6 show the effect of organic amendments on straw, grains of wheat, seeds of faba bean and roots phosphorus uptake grown on sandy clay loam soil and sandy soil.

Table 6. Effect of organic soil amendments on phosphorus uptake (mg pot^{-1}) by wheat and faba bean plants grown on two different soils

Treatment	Sandy clay loam soil			Sandy soil		
	Straw	**Grains**	**Roots**	**Straw**	**Grains**	**Roots**
			Wheat			
Control	0.46	4.70	1.23	0.24	1.40	0.08
Bit	0.64	7.10	1.34	0.34	4.30	0.50
SD	0.58	7.40	1.31	0.31	3.50	0.43
FYM	1.17	9.80	1.38	0.45	5.40	0.91
CM	1.50	9.92	2.16	0.49	5.70	1.04
Com	0.79	8.50	1.36	0.40	5.20	0.86
LSD 0.05	0.3254	0.3958	0.3547	0.3854	0.3278	0.3652
			Faba bean			
	Straw	**Seeds**	**Roots**	**Straw**	**Seeds**	**Roots**
Control	1.47	8.99	1.21	1.16	5.40	0.20
Bit	2.73	10.7	1.68	1.67	7.30	0.90
SD	2.58	11.0	1.75	1.61	6.90	0.80
FYM	2.87	12.9	2.20	1.96	8.40	1.40
CM	3.75	13.0	3.50	2.20	8.50	1.60
Com	2.85	11.4	1.81	1.84	7.50	1.30
LSD 0.05	0.3254	0.3637	0.3054	0.3874	0.3857	0.3254

See footnote of Table 3.

Results in Table 6 show that all the treatments in both soils significantly increased the straw, seeds and roots phosphorus uptake compared to the control treatment. These findings are in well agreement with those obtained by **Cooperband *et al.* (2002), Bar-Tal *et al.* (2004), Courtney and Mullen (2007), Gil *et al.* (2007), Zhang *et al.* (2009) and Zhuo *et al.* (2009).**

Irrespective of the control treatments, the straw phosphorus uptake values ranged between 0.58 and 1.5 mg pot^{-1} for wheat and between 2.58 and 3.75 mg pot^{-1} for faba bean in sandy clay loam soil and between 0.31 and 0.49 mg pot^{-1} for wheat and between 1.61 and 2.20 mg pot^{-1} for faba bean in sandy soil. The lowest Phosphorus uptake values were observed with the treatment of saw dust (SD), while the greatest ones were obtained under the application of the treatment of chicken manure (CM) to the two investigated soils.

The values of grains of wheat and seeds of faba bean phosphorus uptake ranged between 7.10 and 9.92 mg pot^{-1} for wheat grains and between 10.7 and 13 mg pot^{-1} or faba bean seeds in sandy clay loam soil and between 3.5 and 5.70 mg pot^{-1} for wheat grains and between 6.90 and 8.50 mg pot^{-1} for faba bean seeds in sandy soil. For the two tested plants grown in both soils, the lowest phosphorus uptake values of grains and seeds were found with the treatment of saw dust (SD), while the highest one was recorded with the treatments of chicken manure (CM). The roots phosphorus uptake values ranged between 1.31 and 2.16 mg pot^{-1}for wheat grains and between 1.68 and 3.5 mg pot^{-1} for faba bean seeds in a sandy clay loam soil and between 0.43 and 1.04 mg pot^{-1} for wheat grains and between 0.80 and 1.60 mg pot^{-1} for faba bean seeds in the sandy soil. The lowest roots phosphorus uptake values were obtained under addition of the treatment of saw dust (SD) to the two tested plants in both soils, while the greatest ones were observed with the treatment of chicken manure (CM) when applied to the two cultivated soils with both plants under study.

In general, the effect of organic soil amendments on the phosphorus uptake of straw, grains of wheat, seeds of faba bean and roots grown in both soils can be arranged for different treatments in the following descending order : (CM)>(FYM)>(Com)>(Bit)>(SD)>(Control).

Effect of Tested Organic Amendments on Potassium Uptake of Wheat and Faba Bean Plants Grown on the Investigated Soils

The results given in Table 7 show the effect of organic amendments on straw, grains of wheat, seeds of faba bean and roots potassium uptake grown on sandy clay loam soil and sandy soil.

The results indicated that all the treatments in both soils, significantly increased the straw, seeds and roots potassium uptake compared to the control treatments. These findings are in harmony with those obtained by **Kleinman *et al*. (2000), Bar-Tal *et al*. (2004), Jedidi *et al*. (2004) and Gil *et al*. (2007)**.

Irrespective of the control treatments, the straw potassium uptake values ranged between 12.6 and 20.7 mg pot^{-1} for wheat and between 9.4 and 16.4 mg pot^{-1} for faba bean in sandy clay loam soil and between 10.5 and 14.5 mg pot^{-1} for wheat and between 7.2 and 13.9 mg pot^{-1} for faba bean in sandy soil. The lowest straw potassium uptake values were observed with the treatment of saw dust (SD), while the greatest ones were obtained under the application of the treatment of chicken manure (CM) to the two tested soils under study. The values of grains and seeds potassium uptake ranged between 5.9 and 9.1 mg $pot^{-1}$for wheat grains and between 13.3 and 19.8 mg pot^{-1} for faba bean seeds in sandy clay loam soil and between 4.3 and 8.5 mg pot^{-1} for wheat grains and between 13.5 and 16.2 mg $pot^{-1}$for faba bean seeds in sandy soil, for the two tested plants grown in both soils. The lowest potassium uptake values were found with the treatment of saw dust (SD), while the highest ones were recorded with the treatment of chicken manure (CM).

The roots potassium uptake values ranged between 5.6 and 9.76 mg pot^{-1} for wheat and between 3.7 and 8.8 mg pot^{-1} for faba bean in a sandy clay loam soil and between 3.3 and 6.9 mg pot^{-1} for wheat and between 3.4 and 7.3 mg $pot^{-1}$for faba bean in a sandy soil The lowest potassium uptake weight values were obtained under addition of the treatment of saw dust (SD) to the two tested plants in both soils, while the greatest ones were observed with the treatment of chicken manure (CM) when applied to the two cultivated soils with both plants under study.

In general, the effect of soil organic amendments on the potassium uptake of straw, grains of wheat and seeds of faba bean, and roots grown in both soils can be arranged for different treatments in the following descending order: (CM)>(FYM)>(Com)>(Bit)>(SD)> (Control).

Effect of Tested Organic Amendments on Protein content (g kg^{-1}) and Harvest Index (%) of Wheat and Faba Bean Plants Grown on the Investigated Soils

The results given in Table 8 show the effect of organic amendments on protein content in grains and seeds as well as harvest index of wheat and faba bean plants grown on sandy clay loam soil and sandy soil.

The results showed that all the treatments in both soils significantly increased the protein content in grains and seeds and harvest index compared to the control treatments. These findings are similar to those obtained by **Sinjobi *et al*. (2010), Abd El-Rheem (2003) and Abdel All *et al*. (2003)**.

Irrespective of the control treatment, the protein content (g kg^{-1}) in grains of wheat and seeds of faba bean values ranged between 60.4 and 70.9 for wheat and between 80.6 and 90.6 for faba bean in sandy clay loam soil and between 45.0 and 58.0 for wheat and between 78.1 and 86.3 for faba bean in sandy soil. The values of harvest index ranged between 50.8 and 57.4 for wheat and between 35.7 and 43.7 for faba bean in sandy clay loam soil and between

Table 7. Effect of organic soil amendments on potassium uptake (mg pot^{-1}) by wheat and faba bean plants grown on two different soils

Treatment	Sandy clay loam soil			Sandy soil		
	Straw	Grains	Roots	Straw	Grains	Roots
			Wheat			
Control	9.60	3.60	1.90	5.80	2.90	1.50
Bit	15.2	6.30	5.90	12.2	4.80	3.60
SD	12.6	5.90	5.60	10.5	4.30	3.30
FYM	16.7	7.20	7.90	14.0	5.80	4.20
CM	20.7	9.10	9.76	14.5	8.50	6.90
Com	16.0	6.20	5.00	13.7	4.70	3.90
LSD 0.05	0.2581	0.2315	0.2143	0.2463	0.2395	0.2475
			Faba bean			
	Straw	**Seeds**	**Roots**	**Straw**	**Seeds**	**Roots**
Control	6.30	11.4	2.200	4.70	10.7	1.70
Bit	10.8	13.8	4.10	9.70	13.5	3.90
SD	9.4	13.3	3.70	7.20	13.7	3.40
FYM	15.2	19.2	6.90	11.0	14.0	6.20
CM	16.4	19.8	8.80	13.9	16.2	7.30
Com	12.8	15.1	6.50	9.37	13.6	5.40
LSD 0.05	0.2754	0.2155	0.2457	0.2149	0.2124	0.2658

See footnote of Table 3.

Table 8. Effect of organic soil amendments on protein content (g kg^{-1}) and harvest index (%) of wheat and faba bean plants grown on two different soils

Treatment	Sandy clay loam soil		Sandy soil	
	Harvest index (%)	Protein (g kg^{-1})	Harvest index (%)	Protein (g kg^{-1})
		Wheat plant		
Control	48.9	44.4	44.2	37.1
Bit	51.4	60.8	48.7	55.9
SD	50.8	60.4	47.1	45.0
FYM	56.4	63.1	50.2	57.0
CM	57.4	70.9	51.7	58.1
Com	53.4	62.2	50.1	57.0
LSD 0.05	2.1352	0.4125	2.1542	0.2127
		Faba bean plant		
	Harvest index (%)	**Protein (g kg^{-1})**	**Harvest index (%)**	**Protein (g kg^{-1})**
Control	28.4	62.5	18.9	52.5
Bit	37.9	80.6	32.1	80.6
SD	35.7	80.6	31.1	78.1
FYM	43.4	88.6	34.7	81.3
CM	43.7	90.6	40.6	86.3
Com	42.9	83.8	33.6	81.9
LSD 0.05	2.2183	0.7534	2.2093	0.5345

See footnote of Table 3.

In general, the effect of organic amendments on the protein content and Harvest Index (%) can be arranged for different treatments in the following descending order: (CM)> (FYM)> (Com)> (Bit)>(SD)>(Control)

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تأثير بعض المواد العضوية على إنتاجية محصولي القمح والفول البلدي المزروعة في ارضين مختلفتين

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اقيمت تجربتي اصص تحت ظروف الصوبة الزراعية لدراسة تأثير خمسة مصادر من المصلحات العضوية للتربة وهي البيتومين ونشارة الخشب والسماد البلدي وسماد الدواجن والكمبوست بمعدل ٢٠ميجاجرام الفدان$^{-١}$ على انتاجية نباتي القمح والفول البلدي المزروعة في التربة رملية طينية طميية والتربة الرملية، أضيف في التجربة الاولي (نبات القمح) والثانية (نبات الفول) سماد السوبر فوسفات العادي بمعدل ١٣,١ كيلو جرام فو للفدان$^{-١}$ وسماد سلفات البوتاسيوم بمعدل ٤١,٥ كيلو جرام بو للفدان$^{-١}$ للتربتين قبل الزراعة بينما أضيف سماد سلفات الامونيوم بمعدل ٧٥ و ٣٠ كيلو جرام ن للفدان$^{-١}$ لنباتي القمح و الفول البلدي على التوالي، في تجربة نبات القمح قسمت جرعة السماد النيتروجيني المضافة على ثلاث جرعات الاولي اضيفت بعد خمسة عشر يوم من الزراعة والثانية والثالثة عند مراحل التفريع القاعدي و طرد السنابل (بعد ٤٥ و ٧٠ يوم على التوالي) بينما في تجربة نبات الفول البلدي قسمت جرعة السماد النيتروجيني الى جرعتين الاولي بعد خمسة عشر يوما من الزراعة والثانية عند التفريع القاعدي (بعد ٤٥ يوم من الزراعة)، من الصفات التي تم تسجيلها للنباتين تحت الدراسة الوزن الجاف للقش، الحبوب والجذور كذلك الوزن الجاف للالف حبة والمحصول البيولوجي وكفاءة المحصول ونسبة البروتين وأخيراً المحتوي الكلي الممتص من النيتروجين والفوسفور والبوتاسيوم بواسطة النباتات، لقد تبين من النتائج ان سماد الدواجن اعطي أعلى قيم من الوزن الجاف للقش والحبوب والجذور وكذا الوزن الجاف للالف حبة والمحصول البيولوجي وكفاءة المحصول والمحتوى الكلي للنيتروجين والفوسفور والبوتاسيوم الممتص بواسطة نباتي القمح والفول البلدي المزروعة في التربتين محل الدراسة مقارنة بباقي معاملات المواد العضوية الاخري وكان ترتيب أفضل تأثير معاملات المواد العضوية على الصفات سالفة الذكر كالتالي: سماد الدواجن>السماد البلدي> الكمبوست>البيتومين>نشارة الخشب>التربة غير المعاملة.

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