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COOKING QUALITY AND NUTRIONAL VALUE OF FABA BEAN GROWN IN SANDY SOIL UNDER ORGANIC FERTILIZATION

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ABSTRACT: *A field experiment was carried out on a sandy soil cultivated with faba bean seeds at Ismalia Agricultural Research Station through the 2008/2009 winter season to assess cooking quality and nutritional value of the produced faba bean under organic fertilization as well as some physical properties and the content of available N, P and K of the studied sandy soil. The obtained results indicated that applying 5 ton compost / fed to the studied sandy soil resulted in the maximum decrease in soil bulk density value and in turn the maximum increase in total porosity. In addition, the greatest values of organic matter and available N,P and K as well as the significant increment of faba bean seed yield were also associated with applying 5 ton compost / fed.The maximum values of crude protein, ash and relatively low values of carbohydrates and fibers contents were achieved by applying 10 ton farmyard manure / fed. On the other hand, the cooked faba bean receiving 5 ton compost /fed gave the maximum values of ash, oil, fibers and protein. In addition, the moderate value of hydration coefficient of the stewed faba bean seeds and the highest value of cotyledon / hull. (C/H) ratio were resulted in applying 5.0 ton compost / fed. The soluble protein fractions gradually declined as a result of applied rats of farmyard manure or compost increased. Furthermore, ethanol soluble protein was approximately the predominant protein fraction in all treatments. Cooking process of faba bean showed more pronounced values of protein digestibility than those uncooked ones.*

Finally, while the applied rate of farmyard manure or compost increased, Ca, Mg, K, Na, Fe, Zn, Mn and Cu concentrations of crude faba bean markedly intensified.

Key words: *Organic fertilization, Sandy soil, Faba bean, Physical and chemical properties, Cooking quality and Nutritional value.*

INTRODUCTION

Most of newly reclaimed lands in Egypt are sandy or calcareous soils. Sandy soils are very poor in organic matter and plant nutrients.

Organic materials can increase soil productivity by providing essential plant nutrients (Farth *et al.*, 1997) and improving physical properties (EL-Sedfy, 2002). The improvement of some soil physical parameters were ameliorated as a result of organic manuring (EL-Sersawy *et al.*, 1997 and El-Sedfy, 2008).

In addition, the greatest values of organic matter and available N, P and K were also associated with applying 6 ton biocomposite / fed (El-sedfy *et al.*, 2005 and Hala and Osama, 2006). The soil improvement reflected on the weight of faba bean seed yield (Awad *et al.*, 2003).

Faiyad *et al.* (1991) revealed that the application of poultry and farmyard manure significantly augmented the dry weight of faba bean grown on sandy soil.

The proximate composition of common beans was 23.8% protein, 1.2% fat, 4.2% fiber, 5.0% ash and 66.3% carbohydrates on dry weight basis (Paredes-Lopez and Harry, 1989). In addition, Kutos *et al.* (2003) found that common beans are important sources of protein (16-33%), vitamins (thiamin, riboflavin, niacin, vitamin B6, folic acid), dietary fiber (14 -19%) especially soluble dietary fiber, minerals (Ca,

Fe, Cu, Zn, P, K, Mg) and free unsaturated fatty acids. The proximate composi-tion and mineral as well as phytate contents of legumes affected by soaking and cooking as determined by El-Tinay *et al.* (1989). Soaking and cooking treatment decreased mineral contents and reduced phytate of the most legume cultivars.

Food legumes are consider-ed to be an excellent source of dietary protein and are used as a substitute for expensive animal protein in human diets. Food legumes have also been used as part of the dietary treatment of diabetes (Jenkins *et al.*, 1981). Singh and Fraser (1998) noted that individuals consuming legumes more than 2 times per week were 47% less. Likely to develop colon cancer than individuals that consumed less than once per week.

The present study aimed to assess cooking quality and nutritional value of faba bean as affected by both source and application rate of organic fertilization in sandy soil.

MATERIALS AND METHODS

A field experiment was carried out on a sandy soil cultivated with faba bean seeds at Ismalia Agricultural Research station during the 2008/2009 winter season. The experiment was aimed to study the impact of organic materials on some physical and chemical characteristics of sandy soil as well as cook ability properties, protein fractions and protein digestibility of faba bean. A complete randomized blocks design was used with three replicates for each treatment. The treatments included the application of organic fertilizers before cultivation at the following rates:

1- Without organic manure.
2- 5.0 ton farmyard manure / fed.
3- 10.0 ton farmyard manure / fed.
4- 2.5 ton compost / fed.
5- 5.0 ton compost / fed.

Some physical and chemical characteristics of the experimental soil as well as the used organic materials were determined according to Jackson (1967) and shown in Tables (1 and 2). Compost was supplied from Soil conditioners project, Soil, Water and Environment Research Institute, ARC.

Table 1. Some physical and chemical properties of the experimental Soil.

Soil properties and units Particle size distribution	Value
Coarse sand	86.55 %
Fine sand	5.80 %
Silt	3.02 %
Clay	4.63 %
Texture class	Sandy
CaCO3%	0.92 %
Organic matter	0.44 %
pH (1;2.5 Soil Suspension)	7.80
ECe dS/m in(soil water extract 1:5)	0.20
Soluble ions (meq/100 g.Soil)	
Ca^{++}	0.80
Mg^{++}	0.17
Na^{+}	0.12
K^{+}	0.05
$CO3^{-}$	-----
$HCO3^{-}$	0.34
CL^{-}	0.55
$SO4^{--}$	0.25

Table 2. Chemical analysis of organic fertilizers.

Analysis	Compost	Farmyard manure
Moisture content %	33.51	51.30
pH (1:10)	6.51	9.03
EC (1:10) dS/m	4.58	2.06
N -NH4 (mg/kg)	100.00	51.00
N-NO3 (mg/kg)	20.00	191.00
Total N %	1.37	0.74
O.M %	37.56	25.30
O.C %	21.79	14.70
Ash %	62.40	74.70
C/N ratio	15.9:1	20:1
Total P (%)	0.24	0.26
Total K (%)	0.61	0.58

EC= electric conductivity of soil ds/m
O.M % = Organic matter of soil
O.C% = Organic carbon of soil

The previous treatments were mixed with the soil surface layer by hatchet. Then, the area was planted by seeds of faba bean (Vicia Faba). C.V. Giza 3 for one winter growth season (2008 -2009) under sprinkler irrigation system. The area of each experimental plots were 14m^2. The recommended dose of macro and micro nutrients were added according to Ministry of Agriculture and Soil Reclamation Recommendation (20 kg N, 31 kg P_2O_5 , 24 kg K_2O). Sulphate ammonium, Calcium super phosphate and potassium sulphate were applied as a sources of nitrogen, phosphate and potassium fertilizers respectively. Wheres nitrogen and potassium were added after one month from planting. When phosphate fertilizer with applied through soil perparition.

After harvesting, soil samples were taken at constant depth of 0–30cm for chemical analysis included the content of organic matter and available N, P and K. Organic carbon was determined by modified Walkely-Black method (Jackson, 1967). Available N, P and K were extracted and determined according to the methods described by Black *et al.* (1982). Bulk density was determined using undisturbed soil cores (Black *et al.*, 1965).

At harvesting stage plant samples of each experimental plot were taken and air-dried. The seeds were separated from straw and weighted. Some, chemical composition of faba bean seeds, i.e., moisture, crude protein, fiber, oil and ash contents of faba bean seeds were determined according to the methods out lined in A.O.A.C. (1990). Also, the concentrations of N, K, Ca, Mg, Na, Fe, Zn, Mn and Cu in faba bean seeds were determined according to chapman and Pratt (1961). The digestibility of protein was determined according to the method described by Santosh and Chauchan (1986). Protein fractions were determined according to the method described by Bhatty *et al.* (1976). Physical characteristics such as 100-seed weight, density, germination percentage, hull percentage and cotyledon- to- hull ratio were determined according to the methods described by Mahmoud *et al.* (1998). Cooking qualities, e.g., stewed percent using an autoclave for 30 min at 121°C and 1 lb/in^2, total solids and hydration coefficient of stewed seeds were determined also according to the methods described by Mahmoud *et al.* (1998).

The organoleptic characteristics of cooking treated faba bean were determined according to Larmond (1970). Ten panelists were asked to evaluate appearance, texture, odour, taste and colour using score of 10 for each character. The average score for each character was calculated.

Analysis of variance was statistically analyzed according to Snedecor and Cochran (1976) using SAS program (SAS Institute, 1982).

RESULTS AND DISCUSSION

1– Effect of applied organic materials on some soil physical properties of studied sandy soil:

Data in Table (3) displayed the influence of applied organic materials on soil bulk density and total porosity for the studied sandy soil. Increasing the rate of applied farmyard manure or compost declined soil bulk density values. The greatest decrease of bulk density values occurred as a result of applying 5.0 ton compost / fed, (1.42 vis 1.71g/cm^3). This decrement may be rendered to the increase of the apparent volume of soil which resulted from mixing organic materials during soil preparation. However, applying 5 ton farmyard manure / fed gave the highest value of bulk density (1.53 g/cm^3), comparing with other organic materials treatments.

Data in Table (3) appeared that the trend of total porosity values % were contrary to the values of bulk density, in view of the fact, the decrease of bulk density led to increase of total porosity. Hence, the maximum increment of total porosity was achieved through adding 5 ton compost / fed (46.42%). Whenever, applied 5 ton farmyard manure / fed realized the minimum value of total porosity (42.26%). These results are in accordance with the findings of Hala and Osama, (2006) and El-Sedfy, (2008).

2– Effect of applied organic materials on soil content of organic matter and available N, P and K:

2.1. Organic matter content:

Data in Table (4) revealed that higher content (%) of organic matter resulted in soils treated by compost than farmyard manure addition. This increase is due to the high organic matter content of the applied compost (37.56%) compared with farmyard manure (25.30%).

Table 3. Effect of applied organic fertilizers on some physical properties of the studied sandy soil.

Treatments	Bulk density (g/cm3)	Total porosity %
Control	1.71	35.47
5ton farmyard manure / fed	1.53	42.26
10Ton farmyard manure / fed	1.51	43.02
2.5 ton compost /fed	1.48	44.15
5 ton compost /fed	1.42	46.42

Table 4. Effect of applied organic materials on the soil content of organic matter and available N, P and K contents of the studied sandy soil.

Treatments	Organic matter%	N (mg/kg)	P (mg/kg)	K (mg/kg)
Control	0.44	27.0	8.13	40.8
5ton farmyard manure / fed	0.47	33.1	12.2	57.5
10Ton farmyard manure / fed	0.52	34.7	13.1	57.5
2.5 ton compost /fed	0.47	34.7	8.83	42.9
5 ton compost /fed	0.59	36.5	9.95	47.8

Thus, the high content of organic matter (0.60%) was achieved by applying 5 ton compost / fed, (Table 4). But, the lowest one was obtained through adding 5 ton farmyard manure / fed except the control treatment.

2.2. Available N, P and K contents:

The result in Table (4) depicted that more increment of available N content (mg/kg) was realized by addition of 5 ton compost/fed than adding of 10 ton farmyard manure/fed. This increment is due to compost contained more pronounced value of total N compared with farmyard manure, (Table 2).

Consequently, more release of nutrients in the available from was resulted from the decomposition of organic matter of applied compost than applied farmyard manure. Hence, the minimum value of available N was achieved by adding 5 ton farmyard manure/fed (Table 4). Available P and K concentration in soil showed similar trend of available N. The maximum contents of available P and K were 13.1 and 57.5 mg/kg, respectively which resulted from treatments 10 ton farmyard/fed. However, the relatively low content of available P (8.83 mg/kg) and K (42.9 mg/kg) were associated with adding 2.5 ton compost / fed. These results are in conformity with El-Sedfy, (2008).

3-Effect of applied organic materials on faba bean seeds yield (kg/ fed) and 100 seed weight:

Results presented in Table (5) revealed that highly significant increment of faba bean seed yield was obtained with the treatment of 5 ton compost/fed followed by adding 2.5 ton compost/fed. This increment may be ascribed to the relatively high content of soil organic matter, available N, P and K as well as reducing soil bulk density values (Table 3 and 4). On the other hand, the lowest yield of faba bean seeds (2378.03 kg/fed) was occurred with applying 5 ton farmyard manure/fed. Data in Table (5) appeared that 100 seed weight of faba bean took the same trend of faba bean seed yield.

These results are in accordance with those obtained by El-Sedfy (2002) and Awad *et al.* (2003).

4- Chemical composition of crude and cooked faba bean as affected by organic fertilization:

It could be noticed from the results presented in Table (6) that applied 10 ton farmyard manure/fed gave relatively low values of carbohydrate and fibers contents in crude faba bean. On contrary, the maximum value of ash resulted from the same treatment. However, the crude protein content gradually increased as a result of increasing levels of either compost or farmyard manure. Hence, the greatest value of crude protein was achieved with the treatment of 10 ton farmyard manure/fed, (Table 6). On the other hand, all treatments minished oil content of crude faba bean except application rate of 10 ton farm-yard manure which increased it, (Table 6). These results are in conformity with those obtained by Hala and Osama (2006).

Table 5. Faba bean seeds yield (Kg/fed) and 100 Seed weigh (g) as affected by organic fertilizer.

Treatments	Seeds yield (Kg/fed)	100 Seed weight (g)
Control	2140.23	39.71
5ton farmyard manure / fed	2378.03	41.80
10Ton farmyard manure / fed	2795.21	42.70
2.5 ton compost /fed	3424.96	45.40
5 ton compost /fed	3647.52	47.30
L.S.D.0.05	24.6	0.41

Table 6. Chemical composition of crude and cooked Faba bean as affected by organic fertilization.

Treatments	Moisture %	Fat %	Fiber %	Protein %	Carbohydrates %	Ash %
Control	67.20	1.16	9.76	18.29	62.53	8.26
Crude faba bean receing 5ton farmyard manure/fed	11.6	1.45	7.62	25.68	61.10	4.14
10 ton Farmyard Manure/fed	8.5	1.70	6.75	27.32	57.90	6.30
2.5 ton compost /fed	11.47	1.48	8.22	25.87	58.74	5.69
5 ton compost/fed	10.32	1.27	8.10	25.98	60.21	4.44
Control	11.26	1.74	8.02	22.99	61.98	5.27
Cooking faba bean receiving 5 ton farmyard manure /fed	65.32	1.67	7.35	17.91	64.59	8.48
10ton Farmyard Manure/fed	66.6	2.37	9.37	21.56	57.87	8.83
2.5 ton compost /fed	68.11	2.48	8.97	21.95	57.38	9.22
5 ton compost/fed	65.00	2.51	10.20	22.46	55.80	9.03

Regarding the influence of cooking practice on chemical composition of faba bean, Data in Table (6) depicted that the values of ash, oil and fibers were higher than those obtained in crude faba bean.

In additions, cooked faba bean receiving 5 ton compost/fed gave the best values of oil, fibers and protein, while adding 2.5 ton compost realized the highest value of ash, (Table 6).

5- Cookability properties of faba bean as affected by organic materials:

The results in Table (7) revealed that germination percentage ranged from 90 to 100%. The percentage of stewed faba bean seeds ranged from 60 to 100 when the autoclaving method was used. Meanwhile, the percentage of total soluble solids (T.S.S%) increased as the applied rate of farmyard manure or compost increased. Therefor, T.S.S can be arranged in the following descending order 5.0 ton compost (31.86) > 10 ton farmyard manure (29.88) > 2.5 compost (25.38) > 5 ton farmyard manure (17.63) > control (10.66) (Table 7). Hull percentage ranged from 5.53 to 12.42%. The ratio between cotyledon and hull (C/H) demonstrated an opposite trend to hull percentage. Consequently, faba bean seeds receiving 5.0 ton compost/fed realized the highest value of C/H and followed by those receiving 10 ton farmyard manure/fed, (Table 7). In addition, the maximum value of hydration coefficient of the stewed faba bean seeds resulted from the treatment of applying 5.0 ton compost/fed followed by the treatment of 2.5 ton compost/fed, (Table 7). In spite of, the relatively lowest value of hydration coefficient was achieved by adding 5 ton farmyard manure/fed, which was slightly increased almost the same as that of control.

6 – Protein fractions of crude and cooked faba bean (gm/100gm) as affected by organic fertilizer:

The obtained results in Table (8) declared that crude faba bean and / or cooked ones received 5.0 ton compost/fed achieved the maximum values of water soluble protein. While the lowest values resulted in control treatment.

Table 7. Cookability properties of faba bean as affected by organic fertilizers.

Treatments	Germination %	Stewing %	Density g/cm	T.S.S %	Cotyledons %	Hulls %	C/H	Hydration coefficient
Control	90	60	1.01	10.66	87.58	12.42	7.05	107.71
5 ton farmyard manure / fed	100	100	1.31	17.63	88.75	11.25	7.89	113.38
10Ton farmyard manure / fed	90	90	1.08	29.88	93.72	6.28	14.92	119.72
2.5 ton compost /fed	100	100	1.13	25.38	86.94	13.06	6.66	120.54
5 ton compost /fed	100	100	0.97	31.86	94.47	5.53	17.08	135.62

Table 8. Protein fractions (gm / 100 gm seeds) and protein digestibility (P.D%) of Faba bean as affected by organic fertilizers.

Treatments	Water soluble protein	Salt soluble protein	Ethanol soluble protein	Alkali soluble protein	Insoluble protein	Protein digestibility (P.D%)
Crude faba bean receiving						
Control	1.12	1.75	10.00	2.48	5.05	36.33
5 ton farmyard manure / fed	1.25	1.95	11.10	2.75	5.65	38.37
10 Ton farmyard manure / fed	1.89	8.27	12.80	0.95	1.09	36.78
2.5 ton compost /fed	2.25	10.0	7.63	1.19	1.83	39.41
5 ton compost /fed	2.88	6.29	10.86	2.00	1.27	30.34
Cook faba bean receiving						
Control	0.17	0.29	3.33	0.64	1.57	75.49
5 ton farmyard manure / fed	0.18	0.31	3.51	0.67	1.54	65.20
10Ton farmyard manure / fed	0.26	1.52	4.25	0.67	0.50	73.39
2.5 ton compost /fed	0.39	0.98	2.64	1.09	1.90	41.18
5 ton compost /fed	0.53	0.51	4.39	2.00	0.43	31.43

The highest values of salt soluble protein were realized through crud faba bean fertilized by 2.5 ton compost/fed. But, cooked faba bean manured by 10 ton farmyard manure/fed achiev-ed the greatest value of salt soluble protein, (Table 8).

Data presented in Table (8) cleared that crude faba bean fertilized by 10 ton farmyard manure/fed occurred the highest content of ethanol soluble protein followed by 5 ton farmyard manure / fed. While, cooked faba bean manured by 5 ton compost /fed gave the

highest content was followed by 10 ton farmyard manure / fed. Although, the lowest content was obtained through crude or cooked faba bean manured by 2.5 ton compost / fed. The greatest values of alkali soluble protein resulted in both crud faba bean fertilized by 5.0 ton farmyard manure / fed and cooked faba bean manured by 5.0 ton compost / fed. However, the minimum values of alkali soluble protein obtained through crude or cooked faba bean manured by 10.0 ton farmyard manure /fed (Table 8).

From aforementioned results, it's worthy to notice that ethanol soluble protein was approximately the predominant protein fraction in most treatments.

It's worth to mention that cooked faba bean resulted in decreasing amounts of all protein fractions compared with crude faba bean but increasing than that of control. This means, that the proteins may be released to the cooked water. In this respect, it could be advised to mix the seeds with water and not drained it to obtain the maximum nutritional value.

7 – Protein digestability (P.D%) of faba bean as affected by organic fertilization:

Data in Table (8) illustrated that protein digestibility of crude faba bean declined whereas the applied rate of farmyard manure or compost increased. Therefore, the greatest value of protein digestibility was achieved by crude faba bean fertilized by 2.5 ton compost / fed. On contrary the lowest one was obtained in the treatment of 5.0 ton compost / fed, (Table 8). It's worthy to mention that, the results indicated that cooking process of faba bean gave more pronounced values of protein digestibility than those obtained by crude faba bean, (Table8). The observed increase in digestibility of the cooked samples could be attributed to the denaturation protein by heat, so it's become more susceptible to the enzyme attack and hydrolysis (Abed-El Aal et al.,1986).While, the maximum value of protein digestibility was realized by cooked faba bean in the control treatment and followed by those receiving 10 ton farmyard manure. Although, the lowest one was achieved by cooked faba bean manured by 5.0 ton compost / fed. These results are accordance with those obtained by Santosh and Chauchan (1986).

8- Some elements of faba bean (mg /100g) as affected by organic fertilizers:

The results in Table (9) declared that Ca, Mg, K, Na, Fe, Zn, Mn and Cu concentrations of crude faba bean markedly intensified as the applied rate of farmyard manure or compost increased. This enhancement may be attributed to more release of nutrients in the available form which resulted in the decomposition of applied farmyard manure or compost. Consequently, this increment of soil nutrient availability heightened Ca, Mg, K, Na, Fe, Zn, Mn and Cu concentrations of crude faba bean. On the other hand, it could be observed that the studied nutrients concentration of cooked faba bean gave the same trend with those obtained in crude faba bean. But, the nutrients concentrations were less pronounced in cooked faba bean than that of crude faba bean.

9- Organoleptic scores of faba bean received organic fertilizer:

Appearance, texture, odour, taste, color and volume of faba bean received organic materials were evaluated organoleptically (Table, 10). It could be noticed that faba bean received 2.5 ton compost / fed showed non-significant differences for appearance and followed by those fertilized by 5.0 ton compost / fed. But, the lowest score was found for faba bean receiving 5.0 ton farmyard manure / fed (Table 10). While, the most in significant score for texture was achieved by faba bean fertilized by 5.0 ton compost / fed, followed by other manured by 5.0 ton farmyard manure / fed, although, the lowest one was

obtained by adding 10 ton farmyard manure / fed, (Table 10). On the other hand, faba bean manured by 5.0 ton compost / fed gave the maximum insignificant score for odour, followed by that received 10.0 ton farmyard manure / fed, (Table 10). In this respect, the last treatment realized the highly insignificant score for taste and followed by those fertilized by either 5.0 ton farmyard manure / fed or 5.0 ton compost / fed. On the other side, the most insignificant score for color was occurred by faba bean manured by 2.5 ton compost / fed and followed by those fertilized by 5.0 ton compost / fed. However, the last treatment realized the highest insignificant score for volume (Table 10). From the above mentioned data, it could be concluded that all treatments under study resulted in non- significant differences for all organoleptic characteristics.

Table 9. The content of some elements of faba bean (mg / 100 seeds) as affected by organic fertilizers.

Treatments	Ca	Mg	Fe	Zn	Mn	Cu	Na	K
Crude faba bean receiving								
Control	98.8	180.64	6.47	3.12	2.48	0.77	127.55	1015.03
5ton farmyard manure / fed	102.86	190.15	6.81	3.47	2.61	0.81	134.26	1068.45
10Ton farmyard manure / fed	113.15	209.17	7.35	3.64	2.74	0.83	139.93	1121.87
2.5 ton compost /fed	102.71	192.0	7.07	3.54	3.02	0.82	136.85	1089.82
5 ton compost /fed	112.98	211.2	7.24	3.87	3.14	0.84	143.21	1144.31
Cooked faba bean receiving								
Control	31.82	38.12	1.34	0.93	0.89	0.25	223.73	248.62
5ton farmyard manure / fed	33.98	41.00	1.41	0.98	0.94	0.26	235.50	261.71
10Ton farmyard manure / fed	35.28	48.10	1.48	1.00	1.07	0.27	246.27	267.48
2.5 ton compost /fed	32.27	42.78	1.54	1.08	1.04	0.26	242.00	273.24
5 ton compost /fed	34.04	47.06	1.62	1.24	1.06	0.28	254.10	286.91

Table 10. Organoleptic scores of faba bean received organic fertilizer.

Treatment	Appearance	Texture	Odour	Taste	Color	Volume
Control	18.14	17.07	9.14	24.93	8.79	9.29
5ton farmyard manure / fed	16.50	18.43	9.14	25.57	8.50	8.79
10Ton farmyard manure / fed	16.93	17.00	9.21	27.29	8.93	8.36
2.5 ton compost /fed	18.14	18.14	9.00	23.64	9.36	8.86
5 ton compost /fed	17.93	19.14	9.43	25.36	9.07	9.00
L.S.D.0.05	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

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دراسة جودة الطبخ والقيمة الغذائية للفول البلدى النامي فى الأرض الرملية المعاملة بالأسمدة العضوية

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الملخص العربي

أقيمت تجربة حقلية فى أرض رملية زرعت بالفول البلدى فى محطة البحوث الزراعية بالإسماعلية خلال الموسم الشتوى 2009/2008 لدراسة أثر جودة الطبخ والقيمة الغذائية للفول البلدى النامى على الرض رملية العضوية المعامل بالأسمدة وكذلك لدراسة أثر هذه الاضافات العضوية على بعض الخواص الطبيعية المحتوى من المغذيات الكبرى الميسرة فى الأرض الرملية.

وقد أوضحت النتائج أن أضافة خمسة طن كمبوست / فدان إلى الأرض الرملية أعطت أكثر نقصا فى قيمة الكثافة الظاهرية للتربة والذى أدى بدوره إلى أقصى زيادة فى قيمة المسامية الكلية للتربة– بالإضافة إلى ذلك فإن أعلى محتوى للمادة العضوية والميسر من عناصر النتروجين ، الفوسفور ، البوتاسيوم نتجت أيضا عن إضافة خمسة طن كمبوست / فدان والتى أدت بدورها إلى أعلى زيادة معنوية فى محصول بذور الفول البلدى وإضافة عشرة طن سماد بلدى / فدان أعطت أقصى قيم البروتين الفول الخام والرماد وأقل قيم لمحتوى الكربوهيدرات ، ومن ناحية أخرى فإن أضافة خمسة طن كمبوست / فدان أعطت اعلى قيم لمحتوى الفول البلدى المطبوخ من الزيت والألياف والبروتين. وعلاوة على ذلك فإن هذه الأضافة أعطت أقصى قيمة لنسبة الأملاح الكلية الذائبة بينما أدت إضافة خمسة طن سماد بلدى / فدان للحصول على أقل قيمة لنسبة الأملاح الكلية الذائبة. بالأضافة إلى ذلك فإن أعلى قيمة لمعامل التشرب لبذور الفول البلدى المدمس وأعلى قيمة للنسبة بين محتوى الفلفتين إلى القشرة (C / H) نتجت عن إضافة خمسة طن كمبوست / فدان.

كما وجد أنه بزيادة معدل إضافة الكمبوست أو السماد البلدى يقل جزء البروتين غير الذائب بينما كان جزء البروتين الذائب فى الكحول هو الجزء السائد فى كافة المعاملات.

ووجد أن قيم البروتين المهضوم تكون أعلى بوضوح فى الفول لبلدى المطبوخ عنه فى الفول البلدى الخام.

وأخيرا فقد وجد أنه بزيادة معدل إضافة السماد العضوى سواء كان كمبوست أو سماد بلدى تزداد محتوى بذور الفول البلدى الخام من عناصر الكالسيوم والمغنسيوم والصوديوم والبوتاسيوم والحديد والزنك والمنجنيز والنحاس زيادة واضحة.