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RESIDUAL EFFECT OF DIFFERENT ORGANIC MATERIALS ON SOME PHYSICAL PROPERTIES OF SANDY SOIL PRODUCTION AND NUTRIENT CONTENT OF EGYPTIAN CLOVER.

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ABSTRACT

A field experiment was conducted at Ismailia Experimental Research Station to study the residual effect of compost and bio-composite manures application on sandy soil properties and Egyptian clover yield, whereas the previous yield was soybean. The experiment design was randomized complete block with four replicates. The sandy soil was treated at the previous summer season with the following treatments: control, 4, 6, 8 ton compost /fed., 4 and 6 ton bio-composite /fed. Egyptian clover seeds were sowing with two agriculture method., arrange row and dispersal.

The obtained results revealed that the high effluence on sandy soil physical properties rendered to the residual effect of 6 ton bio-composite/fed. application where hydraulic conductivity and bulk density decreased and total porosity increased.

In proportion to the effect on fresh and dry clover yield, this study proved that the highest rate of bio-composite (6 ton/fed.) led to the maximum increase for cuts as well as total yield. Moreover, the residual effect at bio-composite addition gave the best results for N, P and K clover plant uptake.

Eventually, the arrange row agriculture method led to an increase for total clover yield with 12.9 % for fresh weight and 24.6% for dry weight, compared with dispersal agriculture methods.

INTRODUCTION

The newly cultivated lands in Egypt, are mainly sand and sandy calcareous soils, which are very poor in organic matter and plant nutrients. Different organic materials are established to be involved in the crops fertilization in almost all the world due to their effect on the physical, chemical and biological characteristics of soils (Faiyad *et al.*, 1991).

The concept of organic agriculture technique (clean agriculture) means using organic manures and bio-fertilizers rather than mineral fertilizers in different plant nutrition. Egyptian clover as a legume forage crops, is considered an important source of protein and energy for animal nutrition as well as a good source of fixed nitrogen in soil. El-Akabawy, 2000 proved that, the addition of FYM enhanced the bio-fertilizers effectiveness sowing N and P mineral fertilizer rates for Egyptian clover with respect to the effect of organic manure on plant growth and yield. Awad *et al.*, 1999 found that application of farmyard manure or town refuse had a beneficial effect on plant characteristics and yield (seed and straw) of Faba bean. On the other hand, Khater *et al.*, 2002 proved that nutrient uptake by plants increased with organic amendments application rates increasing. This work aimed to study the residual effect of compost and bio-composite manures on Egyptian clover production and some sandy soil properties.

MATERIAL AND METHODS

A field experiment was conducted at Ismailia Experimental Research Station. The study tested the residual effect of two organic amendments, compost and bio- fertilizer using different addition rates on some soil physical properties and Egyptian clover where as the above yield in summer was Soybean yield as well as N, P and K content, the experimental soil is characterized by sandy texture. Some physical and chemical properties of the surface layer were analyzed according to Black *et al.*, 1982. Data of soil and organic manure analyses are presented in Tables 1 (a,b) and (2). The experiment design was a randomized complete block with four replicates. The plot area was 15 m2 (3 x 5 m).

Table (1a): Some physical properties of the investigated soil .

Particle size distribution %				O.M	$CaCO_3$	K	B.D	T.P
C. sand	F. sand	Silt	Clay	%	%	m/day	g/cm^3	%
86.55	5.80	3.02	4.63	0.55	0.92	4.28	1.78	32.83

Table (1b): Some chemical characteristics of experimental soil .

E.C	PH	Water soluble salts (1:5) soil : water extract							
dS/m	(1:2.5)	Cations (meq/100g soil)				Anions (meq/100g soil)			
	Susp.	Ca^{+2}	Mg^{+2}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl^{-}	$SO_4^{=}$
0.20	7.8	0.80	0.17	0.12	0.05	-	0.30	0.55	0.25

Table (2): Compost manure and bio-composite analyses

Analysis	Compost manure	Bio-composite
Moisture content %	20.53	18.65
PH	7.97	6.47
E.C (dS/m)	2.60	10.19
Density (g/cm3)	0.45	0.80
Organic matter %	37.62	41.52
Organic carbon %	21.15	27.77
Total N %	1.12	1.31
Total P %	0.27	0.36
Total K %	0.36	0.40
C / N ratio	18.9	21.2
DTPA- extractable (µg/g)		
Fe	32.0	104.0
Mn	71.0	63.9
Zn	36.0	39.5
Cu	7.2	8.2
Total count of Bacteria	–	14×10^{7}
Total count of Fungi	–	14×10^{5}
Total count of Actinomycetes	–	2.7×10^{5}

The tested organic manure were added in the summer season before soybean cultivation (Ismail et. al., 2003) as follows:

1- Control
2- 4 ton compost/fed.
3- 6 ton compost/fed.
4- 8 ton compost/fed.
5- 4 ton bio-composite/fed.
6- 6 ton bio-composite/fed.

The agriculture methods were: A, arrange rows (to line up) and B, dispersal (strewing). Egyptian clover seeds were sown. Cuts were performed as follows: after 55, 110 and 150 days from sowing. Both fresh and dry yield were recorded, then plant samples were ground and analyzed for N, P and K content (Black , 1982).

Compost is a microbiological, non polluting and safe method for disposal and recycling of organic wastes by bioconversion them to fertilizers.

Bio-composite commercial bio-organic amendment prepared from some plant residues, clay minerals, rock phosphate and some plant growth promoting rhizobacteria

Both compost and bio-composite were supplied from soil conditioners project in Soil, Water & Environment Research Institute, Agric., Res. Center, Giza, Egypt.

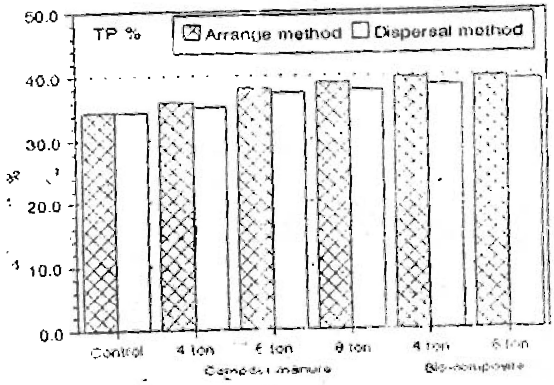
RESULTS AND DISCUSSION

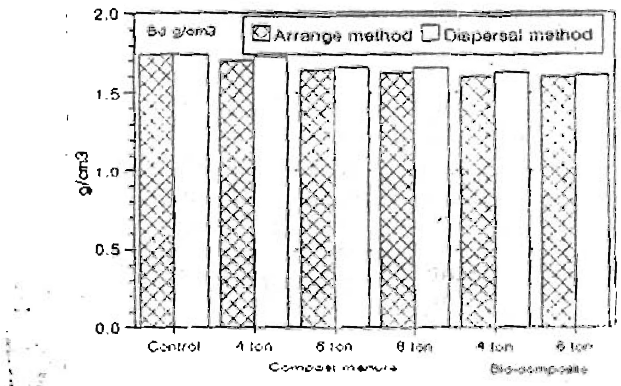
A. Residual effect of the different organic amendments on some soil physical properties.

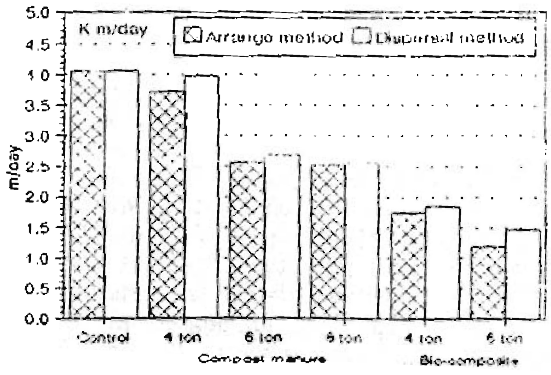
Data presented in Table (3) & Fig.1 show the changes in soil hydraulic conductivity (K), bulk density (B.D) and total porosity (TP) as response of organic additions (compost and bio-composite) at the end of experiment.

Concerning the effect on soil hydraulic conductivity, data in Table (3) indicated that the maximum decrease on hydraulic coefficient (K) values was obtained by addition of 6 ton bio-composite/fed. (60 N unite). On the other hand the K values under arrange agriculture method were less than the values under dispersal agriculture method, where the values decreased with 5.1, 13.1, 39.9, 40.9, 59.3 and 72.2 % under arrange agriculture method while decreased with 5.1, 7.0, 37.1, 40.4, 56.8 and 65.7 percent with using dispersal agriculture method for control treatment, 4 ton, 6 ton, 8 ton compost, 4 ton, 6 ton bio-composite/fed. treatments respectively. The decrease of hydraulic conductivity (K) values of the investigated soil after organic amendments application could be attributed to the creation of micro pores between sand particles as a results of aggregates formation.

In connection with effect on studied soil bulk density (B.D), data presented in Table (3) & Fig.1 show that the values of bulk density were decreased after soil conditioning with all organic addition. Data obtained indicated that 6 ton bio-composite/fed. led to the lowest values of B.D under both two sowing methods (arranged and dispersal). The values decreased from 1.78 (initial value) to 1.74, 1.70, 1.64, 1.62, 1.60 and 1.60 gm/cm3 for 1,2,3,4,5 and 6 treatments respectively with arranged agriculture method, whereas, under the dispersal method the values were 1.74, 1.72, 1.66, 1.65, 1.63 and 1.61 for the same treatments. The improving effect of added organic materials (compost and bio-composite), for decrease the soil bulk density can be explanation to the cementing effect on soil particles by organic materials, this cementing effect creat more aggregates leading to increase of soil apparent volume and consequently the bulk density decrease.


TP %
Arrange method
Dispersal method
50.0
40.0
30.0
20.0
10.0
0.0
%
Control
4 ton
6 ton
8 ton
4 ton
6 ton
Compost manure
Bio-composite


Bd g/cm3
Arrange method
Dispersal method
2.0
1.5
1.0
0.5
0.0
g/cm3
Control
4 ton
6 ton
8 ton
4 ton
6 ton
Compost manure
Bio-composite


K m/day
Arrange method
Dispersal method
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
m/day
Control
4 ton
6 ton
8 ton
4 ton
6 ton
Compost manure
Bio-composite

Also the maximum effect of bio-composite more than compost can be rendered to the high saturation capacity which caused to swelling and consequently lead to an increase in the apparent volume and decrease in soil bulk density more than compost.

With relation to the effect on total porosity, the obtained results cleared that the trend of total porosity values was contrary to the values of bulk density, in view of the fact , the decreasing of bulk density led to increase of total porosity values. The general trend of pervious results locates in an agreement with the findings of Fahim, 1986, Awad, 1989 and Ismail et. Al., 2003.

Table (3): **Effect of compost manure and bio-composite on soil hydraulic conductivity (K), bulk density (B.D) and total porosity (T.P) of studied soil.**

Treatment No.	Arrange agriculture method			Dispersal agriculture method		
	K. m/day	B.d g/cm^3	T.P %	K .m/day	B.dg/cm^3	T.P%
1	4.06	1.74	34.34	4.06	1.74	34.34
2	3.72	1.70	35.85	3.98	1.72	35.09
3	2.57	1.64	38.11	2.69	1.66	37.36
4	2.53	1.62	38.87	2.55	1.65	37.74
5	1.74	1.60	39.62	1.85	1.63	38.49
6	1.19	1.60	39.62	1.47	1.61	39.25

Where treatment were:

1 : Control treatment
2 : 4 ton compost/fed.
3 : 6 ton compost/fed.
4 : 8 ton compost/fed.
5 : 4 ton bio-composite/fed.
6 : 6 ton bio-composite/fed.

B. Residual effect of the different organic amendments and agriculture methods on fresh and dry yield of plant clover.

Data presented in Table (4) & Fig. 2 show that both fresh and dry yield of clover increased with addition of compost and bio-composite, furthermore, yield of each cut as well as the total yield were significantly increased with addition rate of organic materials increased. The highest total yield was achieved by bio-composite treatment (6 and 4 ton/fed.) followed by compost treatment (8, 6 and 4 ton/fed.) and control treatment. Moreover, the obtained results indicated that the agriculture with arranged row led to an increase for the total fresh and dry yield more than using of dispersal agriculture method. The maximum values for fresh and dry clover yield of each cut (1st, 2nd and 3rd) and total yield, were obtained with addition of 6 ton bio-composite/fed. under arrange row sowing method, whereas the values of clover fresh yield were 32.87, 41.74, 48.3, 52.73, 57.00 and 60.10 ton/fed. , while the dry yield were 6.89, 8.78, 10.44, 11.41, 13.20 and 13.87 ton/fed. for the dispersal agriculture method using control treatment, 4, 6, 8 ton compost, 4 and 6 ton bio-

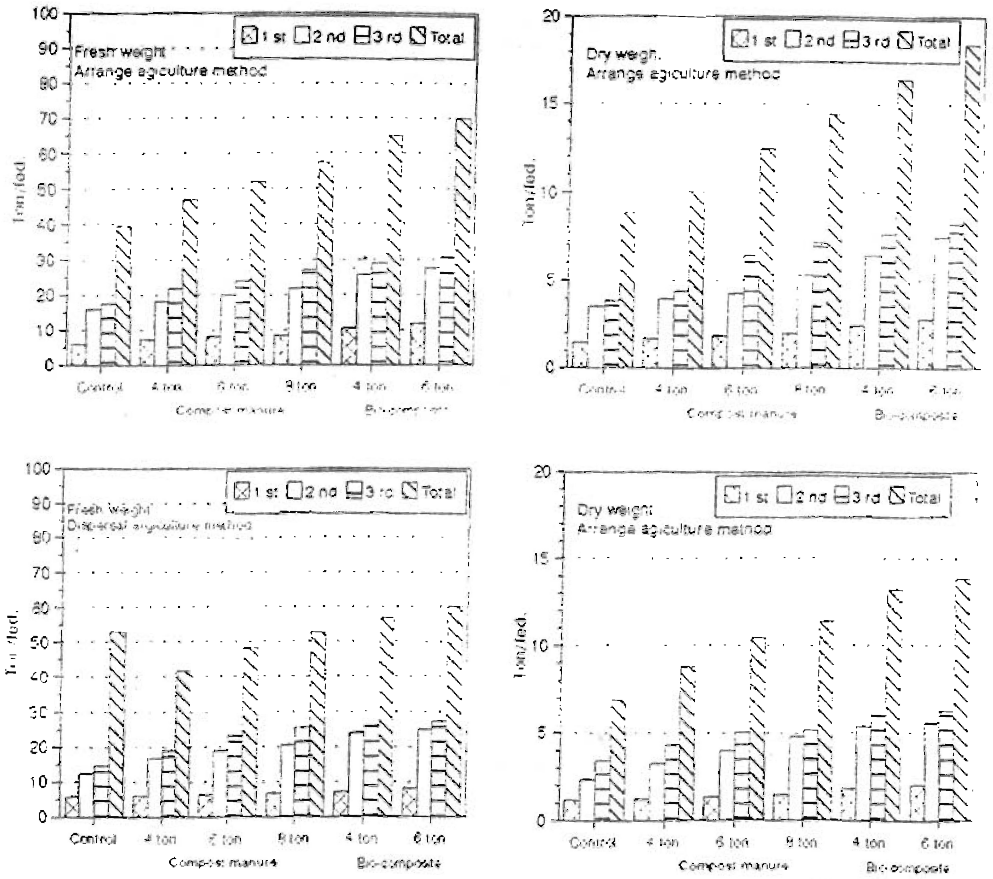


Fig. (2): Effect of different organic amendements on Egytian clover yield (fresh and dry) ton/fed. using different agriculture methods (Arrange and Dispersal).

Table (4): Effect of compost manure and bio-composite on Egyptian clover yield (fresh and dry) ton/fed. Using different methods agriculture (Arrange and Dispersal).

Treatment	Cuts	Arrange agriculture Method		Dispersal agriculture method	
No.	No.	Fresh weight	Dry weight	Fresh weight	Dry weight
1	1st	6.05	1.47	5.78	1.17
2		7.28	1.69	6.12	1.22
3		7.99	1.81	6.35	1.39
4		8.46	1.99	6.68	1.46
5		10.50	2.42	7.20	1.82
6		11.72	2.79	7.99	2.04
1	2nd	15.88	3.52	12.39	2.33
2		17.97	3.94	16.79	3.24
3		20.01	4.23	18.80	3.99
4		21.83	5.28	20.50	4.79
5		25.56	6.39	23.72	5.34
6		27.49	7.46	24.93	5.58
1	3rd	17.56	3.83	14.70	3.39
2		21.65	4.37	18.83	4.32
3		23.91	6.39	23.15	5.06
4		27.03	7.15	25.55	5.16
5		28.94	7.60	26.08	6.04
6		30.70	8.18	27.18	6.25
1	Total	39.49	8.82	52.87	6.89
2		46.90	10.00	41.74	8.78
3		51.91	12.43	48.30	10.44
4		57.32	14.42	52.73	11.41
5		65.00	16.41	57.00	13.20
6		69.91	18.43	60.10	13.87

Composite /fed. respectively. With regard to the effect of arrange row method the values were 39.49, 46.90, 51.91, 57.32, 65.00 and 69.91 ton/fed. at the fresh weight, where from the dry weight the values were 8.82, 10.00, 12.43, 14.42, 16.41 and 18.43 ton/fed. for the dry weight with the percentage increase 12.9 % for fresh weight and 24.6% for dry weight compared with dispersal agriculture method.

The positive effect of bio-fertilizer manure on quantity of clover weight cuts can be rendered to the height content of organic matter. Total nitrogen and high content of micro-flora (bacteria, fungi and actinomycetes), similar trend was previously observed by Monged *et al.*, 1996 and El-Akabawy, 2000. On the other hand the increase of clover cuts and total for fresh and dry yield by using arrange row sowing method, can be attributed to comparatively small number of plants per unit of area, whereof plants enable to obtained perfect nutrition and consequently led to an increase of cuts and total plant yield.

From Statistical analysis, the obtained results indicated that there is a significant effect for both different treatments and agriculture methods on studied soil physical properties and clover yield, while the effect of agriculture method on N, K and K content was insignificant.

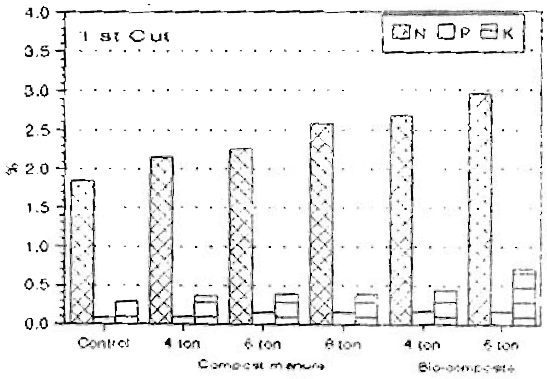
C. The effect on N, P and K content in clover plants.

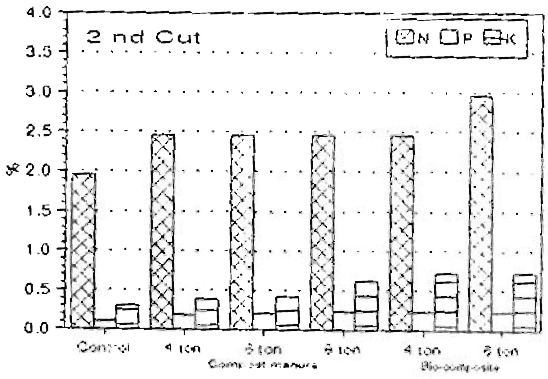
Data in Table (5) & Fig.3 show clarity that the application of organic materials led to increasing plant growth as well as N, P and K content at all addition rates. The maximum increase of N content was obtained by application of 6 ton bio-composite/fed., whereas the values were 2.09, 2.78, 2.78, 3.39, 3.39 and 3.70 % for treatments 1, 2, 3, 4, 5 and 6 respectively at the 3rd cut. Nitrogen content was increased about 60.0, 51.8 and 77.0 % after 1st, 2nd and 3rd cut respectively compared with control treatment. In respect to the effect on P content, the values gave the same trend with N, but the difference between residual effect of high addition rates for both compost and bio-composite were insignificant, where the values after cuts were 0.15, 0.23 and 0.31% with application of 8 ton compost/fed. for 1st, 2nd and 3rd cut respectively, in return for 0.17, 0.23 and 0.31% with application of 6 ton bio-composite/fed. after the same cuts. Furthermore, the K content pass through the same trend of N and P.

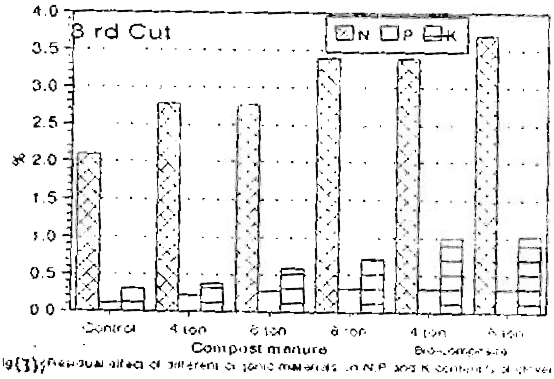
Table (5): Residual effect of compost manure and bio-composite on N, P and K content of clover plant.

Treatment	1st cut			2nd cut			3rd cut		
No.	N%	P%	K%	N%	P%	K%	N%	P%	K%
1	1.85	0.09	0.30	1.95	0.10	0.30	2.09	0.11	0.30
2	2.16	0.10	0.36	2.46	0.19	0.38	2.78	0.22	0.38
3	2.26	0.15	0.39	2.46	0.21	0.42	2.78	0.28	0.58
4	2.58	0.15	0.39	2.46	0.23	0.62	3.39	0.31	0.72
5	2.69	0.17	0.44	2.46	0.23	0.73	3.39	0.31	1.00
6	2.96	0.17	0.72	2.96	0.23	0.73	3.70	0.31	1.02

Finally, it can be concluded that the residual effect of 6 ton bio-composite manure/fed. with using arrange row sowing method are important to increase clover fresh and dry yield and complete improved some soil physical properties. This positive effect may be due to the simulative effect of bio-composite on soil microbial population, both N-fixation and P-dissolving ones as well as the fact that of organic manure are main source of the soil bacteria (El-Akabawy, 2000), These results added more support to the findings reported by Sharma and Namdeo, 1999.







Fig(3): Residual effect of different organic materials on N,P and K contents of (Italian ryegrass)

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دراسة الاثر المتبقى لاضافة المواد العضوية المختلفة على بعض الخواص الطبيعية للاراضى الرملية ومحصول البرسيم ومحتوى العناصر الغذائية

أسامه محمد فتحى الصدفى، على شحاته على عثمان، السيد مسعد جعفر،
ياسين حسين عوض
معهد بحوث الاراضى والمياة والبيئة – مركز البحوث الزراعية – جيزة – مصر

أقيمت تجربة حقلية بمحطة البحوث الزراعية بالاسماعيلية وذلك لدراسة الاثر المتبقى لكل من الكمبوست والبيوكمبوست على بعض الخواص الطبيعية للاراضى الرملية، وانتاجيتها من محصول البرسيم المصرى الاخضر والجاف وكذلك محتوى عناصر الازوت والفوسفور والبوتاسيوم ، حيث كان المحصول السابق فى فصل الصيف فول صويا .

نفذت التجربة فى اربع مكررات فى تصميم قطاعات كاملة العشوائية وكانت المعاملات : كنترول بدون معاملة ، ٤ ، ٦ ، ٨ طن كمبوست / فدان ، ٤ ، ٦ طن بيوكمبوست / فدان تم زراعة البرسيم بطريقتين: صفوف ، بدار.

أثبتت النتائج المتحصل عليها ان الجرعة الاعلى من البيوكمبوست (٦ طن / فدان) كان لها أعلى أثر متبقى على تحسين الخواص الطبيعية حيث سببت أعلى نقص فى كل من التوصيل الهيدروليكى والكثافة الظاهرية وكذلك أعلى زيادة فى المسامية الكلية للتربة تحت الدراسة.

نفس المعدل من سماد البيوكمبوست أعطى أعلى محصول من كل من البرسيم الاخضر والجاف سواء فى كل الحشات الثلاثة أو المحصول الكلى (طن / فدان) ، بالاضافة الى ذلك فان أعلى محتوى من النيروجين والفوسفور والبوتاسيوم فى نبات البرسيم كان بسبب أضافة نفس معدل الأضافة ، ٦ طن بيوكمبوست / فدان .

أخيرا ، فان طريقة الزراعة على سطور أعطت زيادة فى محصول البرسيم قدرها ١٢,٩ % للوزن الاخضر ، ٢٤,٦ % للون الجاف مقارنة بطريقة الزراعة بدار.