J. Agric. Sci. Mansoura Univ., 25 (4): 2005 - 2016, *2000.*

EFFECT OF SOME GREEN PLANT MATERIALS AS SOIL ADDITIVES ON SOIL NUTRIENT AVAILABILITY, GROWTH, YIELD AND YIELD COMPONENTS OF FABA BEAN PLANTS

Shaaban, M. M. and Zeinab M. Mobarak
Botany Dept., National Research Centre, Dokki, Cairo, Egypt

ABSTRACT

A pot experiment was conducted in the vegetation house of the programme "Micronutrients and Other Plant Nutrition Problems in Egypt" , National Research Centre with faba bean (*Vicia faba,* Giza 3) plants. The work aimed at studying the effect of different levels (in the rate of 100, 150 and 200 Kg/fed) of the different used dry plant materials (algae, water hyacinth and clover) as soil additives on plant nutrient uptake and their concentrations in the plant tissues as well as plant growth, yield and yield components. The obtained data showed that high positive correlations are found between increasing levels of the green materials and nutrients uptake, yield and 100 seed weight (gm). Nearly all additives of such materials increased macro- and micronutrients uptake and concentrations in the plant tissues. They consequently increased fresh weight, dry weight and plant height (cm) of the plants. Algae treatments were superior followed by water hyacinth, but clover treatments were less effective. Treatment of 200 Kg/fed gave the best results followed by the treatment 150 Kg/fed. Treatments with those materials led to average seed yield increases of 21 %, 23 % and 25 % over control with clover, water hyacinth and algae, respectively. The average weight (gm) of 100 seed increases over control reached 75.9 % with clover, 79 % with water hyacinth and 83 % with algae treatments. The study suggests that using of such available and cheap materials can partially substitute chemical fertilizers in order to increase yields and avoid more environmental pollution.

INTRODUCTION

Green manures are of great interest in improving both physical and chemical characteristics of the soil (De Boodt, 1975; Mengel and Kirkby, 1987). As soil conditioners, they increase soil moisture holding capacity and realize abundant growth of soil flora (Al-Gosaibi, 1994). Raising soil fertility, they encourage better growth of the plant roots (Boussiba, 1987; Marschner and Roemheld, 1996). Using of green manures was recently reported by many authors to increase shoot growth and crop yields (Mandimba *et al*., 1998; Paturde and Patankar, 1998; Buragohain and Medhi, 1999 and Vinod Kumar *et al*., 1999).

Green manures as biofertilizers can be partially used to substitute the chemical fertilizers, especially under intensive cultivation, solving the problem of chemical fertilizer environment pollution.

The present work aims at studying effects of some available plant materials as green manures on the nutrient availability and sequentially growth, yield and yield components of faba bean plants.

MATERIALS AND METHODS

A pot experiment was carried out in the vegetation house of the Programme "Micronutrients and Other Plant Nutrition Problems in Egypt", National Research Centre, Dokki, Cairo, Egypt with faba bean (*Vicia faba*, Giza 3) to study effects of different levels of different available green plant materials as green manures on the nutrient availability for the plants and consequently their nutrient concentrations, growth, yield and yield components.

Agricultural practices:

Seeds were sown in November in Mitscherlich pots containing 7.0 Kg soil. Before sowing, each pot received 1.0 g ammonium sulfate (20.6% N), 1.0 g superphosphate (15.5 % P_2O_5) and 0.5 g potassium sulphate (48 % K_2O). At seedling stage, the plants of each pot were thinned to 6 plants. Irrigation was applied to maintain the water level at 60 % of the field capacity. No pesticides were used during the course of the study.

Treatments:

Green manures:

clover (*Trifolium alexandrinum*) plants were brought from Delta (Monufia), water hyacinth (*Icornia crassipes*) from Nile river near Giza and alga (*Scenedesmus obliquus*) from the experimental pilot of the National Research Centre (Dokki). Clover and water hyacinth green materials were oven dried at 70° C and ground in a stainless steel mill. Algae were drum dried at 140° C. Chemical composition of the green materials is shown in Table (1).

Three replicates for every treatment were carried out and the treatments were conducted as follows:

Control:Only basic fertilization without any manure additives

Green manure treatments: three levels of 0.7, 1.05 and 1.4 g/pot (equal to 100, 150 and 200 Kg/fed., respectively) from clover, water hyacinth and algae were used.

Sampling and sample analysis

- **Soil**: after soil preparation and before fertilization, a representative soil sample was taken. The sample was air-dried and passed through a 2.0 mm sieve pores. Mechanical analysis of soil sample was carried out using hydrometer method (Bauyoucos, 1954); pH and E.C (electric conductivity) were determined in soil/water extract (1:2.5) (Jakson, 1973); Calcium carbonate ($CaCO_3$) content was determined using Calcimeter method (Black, 1965); Organic matter (O.M.) was determined using potassium dichromate method (Walkely and Black, 1934)

  Total nitrogen was determined using Bauschi digestion and distillation apparatus. Soil phosphorus was extracted using sodium bicarbonate

(Olsen *et al*., 1954). Potassium (K) and magnesium (Mg) were extracted using ammonium acetate (Chapman and Pratt, 1978)., while Fe, Mn, Zn and Cu were extracted using DTPA (Lindsay and Norvell, 1978). Physical characteristics and nutrient contents of soil are shown in Table (2).

Soil nutrient status was evaluated according to the sufficient concentrations of Ankerman and Large (1974) as follows:

Element	P	K	Mg	Fe	Mn	Zn	Cu
	-------- mg/100 g soil ----------			---------- ppm ----------			
Conc.	1.2-2.7	21-30	30-180	11-16	9.0-12	1.6-3.0	0.9-1.20

Table 1: chemical composition of plant materials used as green manures

Green material Composition	Clover	Water hyacinth	Algae
Moisture (%) in fresh matter	34.3	56.8	-
Moisture (%) in dry matter at 70°C	2.6	0.6	5.0
Protein (%)	18.75	10.0	46.9
N (%)	3.0	1.6	7.5
P (%)	0.32	0.16	0.44
K (%)	1.55	6.05	0.95
Mg (%)	0.25	0.35	0.21
Ca (%)	0.64	1.7	0.09
Na (%)	2.2	0.26	0.02
Fe (ppm)	559	298	1707
Mn (ppm)	28.8	224.5	18.6
Zn (ppm)	26.4	75.5	14.1
Cu (ppm)	2.8	3.9	1.6

Table 2: Mean values of physical and chemical soil characteristics

Physical characteristics		Nutrient concentrations	
		Exchangeable Macronutrients	
pH	8.4	**(mg/100g soil)**	
E.C. (dS/m)	0.7	P	9.8*
$CaCO_3$ (%)	2.0	K	28.4*
O.M. (%)	1.1	Mg	23.6*
Sand (%)	10.8	**Available Micronutrients**	
Silt (%)	24.0	**(mg/Kg soil)**	
Clay (%)	65.2	Fe	3.7***
Texture	Clay Loam	Mn	4.8**
		Zn	1.9*
		Cu	21.8*

*** Adequate ** Low *** Very low**

- **Plant materials**: At flowering stage (42 days after sowing) faba bean plant samples were taken to determine fresh and dry weights and to analyze for nutrient concentrations and calculations of nutrients uptake. Plants of every replicate were washed with tap water, 0.01 N HCl and bidistilled water. Samples of plant materials of faba bean as well as the green manures were oven dried at 70°C for 24 hours and ground. The samples

were dry-ashed in a muffle furnace at 550°C for 6 hours using 3.0 N HNO_3. The residue was, then, suspended in 0.3 N HCl.

Nitrogen was determined using Bauschi digestion and distillation apparatus. Phosphorus was photometrically determined using a Spectrophotometer. Na, K and Ca were measured using Dr. Lang Flamephotometer. Mg, Fe, Mn, Zn and Cu were determined using Atomic Absorption Spectrophotometer.

Fresh and dry weights determination:

Plant samples were taken 45 days after sowing. The plants were cleaned with tissue paper and weighed for fresh weight determination. Then, they were weighed again after drying at 70° C, and the dry weights were calculated.

Yield and yield components determinations:

At the ripening stage, faba bean plants were harvested and plant height (cm), seed yield/plant (gm) and 100 seed weight (gm) parameters were recorded.

Data analysis

Data were statistically analyzed using Costate Statistical Package (Anonymous, 1989).

RESULTS AND DISCUSSION

Nutrients uptake:

Data in Table 3 show macro- and micronutrients uptake as affected with different levels of different plant materials used as green manures. Highly positive correlations were found between green manure levels increment and all determined nutrients uptake except of sodium with water hyacinth treatments. It seems that this material is glutton to adsorb sodium from the root zone and thus has the advantage of lowering pH giving rise to more availability of micronutrients and phosphorus in the root medium (Schaller, 1987). Realizing most uptake increase, algae was the best material followed by water hyacinth and clover. As they act as soil conditioners, green manures improve water holding capacity, oxygen status, and organic carbon enabling abundant growth for root and soil microorganisms rendering higher availability of nutrients to be taken up by plant roots (Cooke, 1977; Boussiba, 1987; Mengel and Kirkby, 1987, Al-Gosaibi, 1994; Marschner and Roemheld, 1996; Vinod Kumar *et al*., 1999). In addition to its higher content of nitrogen, phosphorus and micronutrients, especially iron and manganese, algal material has a high content of protein. Amino acids derived from proteolysis in the soil can play a role in lowering of pH and act as phytosiderephores for micronutrients making them more available for the plant roots (Lindsay, 1974; Cakmak *et al*., 1994). This can be also true but to less extent for clover and water hyacinth. Water hyacinth material has also more potassium and micronutrients content especially Mn and Zn and, hence, it has the advantage of rendering them more available for the roots.

Nutrient concentrations in the plant tissues:

a) Macronutrients:

Fig. 1 shows macronutrient concentrations in the tissues of faba bean plants as affected by different levels of different plant materials. Algae plant material was superior in increasing macronutrient concentrations followed by water hyacinth but clover had the least effect. On the other hand, all determined macronutrients concentrations (except Na) were increased as algae dose increased, while with water hyacinth and clover, concentrations increment were more or less stable after the first dose (100 kg/fed) except potassium.

b) Micronutrients:

Micronutrient concentrations in the tissues of faba bean plants as affected by different levels of different green manures are shown in Fig. 2.

Table 3: Macro- and micronutrients uptake (mg/pot) by faba bean plants as affected by different levels of different green materials as soil additives

Element	Treatments Manures	Cont	100Kg /fed	Inc. %	150 Kg/fed	Inc. %	200Kg /fed	Inc. %	Mean	SD	r
N	Clover	251.9	339.1	34.6	363.4	44.2	370.5	47.0	331.2	54.5	0.96
	Water hyacinth		343.1	36.2	401.7	59.4	396.9	57.6	348.4	69.6	0.96
	Algae		405.7	61.0	463.1	83.8	479.5	90.3	400.5	103.1	0.98
P	Clover	68.8	80.1	16.9	82.8	20.3	85.5	24.3	79.3	7.3	0.98
	Water hyacinth		89.3	30.3	97.9	42.3	105.0	52.6	90.3	15.6	0.99
	Algae		95.0	38.0	115.5	67.7	126.5	83.8	101.5	25.4	0.99
K	Clover	18.4	231.4	6.0	249.3	14.1	272.6	24.8	242.9	23.5	0.95
	Water hyacinth		258.5	18.4	383.3	29.7	306.6	40.4	266.7	37.7	0.99
	Algae		274.4	26.5	319.0	46.0	242.7	56.9	288.6	85.3	0.99
Mg	Clover	25.8	34.7	34.5	37.7	44.5	39.0	51.2	34.3	5.9	0.98
	Water hyacinth		32.9	27.5	36.0	39.5	37.8	46.5	33.1	5.3	0.99
	Algae		44.1	70.9	52.8	105	37.5	123	45.0	14.0	0.99
Na	Clover	41.3	44.5	7.74	42.3	2.42	44.7	8.2	43.2	1.7	0.69
	Water hyacinth		32.0	-22.5	33.6	-18.6	31.5	-23.7	39.6	4.5	-0.88
	Algae		47.0	13.8	56.1	39.2	57.5	39.2	50.5	7.7	0.96
Ca	Clover	78.3	81.0	3.4	86.5	10.5	89.3	14.0	83.8	5.0	0.96
	Water hyacinth		87.4	11.6	96.0	22.6	99.8	27.5	90.4	9.6	0.99
	Algae		90.2	15.2	105.6	34.8	113.9	45.5	97.0	15.9	0.98
Fe	Clover	1.12	1.18	5.35	1.43	27.7	1.61	43.7	1.33	0.23	0.92
	Water hyacinth		1.22	8.92	1.44	28.6	1.68	50.0	1.36	0.25	0.94
	Algae		1.69	50.1	2.00	78.6	2.47	121	1.82	0.57	0.99
Mn	Clover	0.326	0.338	3.7	0.359	10.1	0.370	13.5	0.348	0.02	0.96
	Water hyacinth		0.357	9.5	0.402	23.3	0.420	28.8	0.376	0.04	0.97
	Algae		0.402	23.3	0.528	62.0	0.598	83.4	0.463	0.12	0.97
Zn	Clover	0.387	0.640	65.4	0.745	92.5	0.826	113	0.65	0.19	0.99
	Water hyacinth		0.611	57.9	0.814	110	0.840	117	0.66	0.21	0.98
	Algae		0.676	74.7	0.858	122	0.934	141	0.71	0.24	0.99
Cu	Clover	0.129	0.142	10.0	0.156	20.9	0.161	24.8	0.147	0.014	0.98
	Water hyacinth		0.150	16.3	0.164	27.1	0.168	30.2	0.152	0.017	0.99
	Algae		0.167	29.5	0.198	53.4	0.207	60.4	0.175	0.035	0.99

Cont. = Control Inc. % = Increase % over control SD = Standard deviation
r = Correlation coefficient

Fig. 1: Macronutrients concentrations in faba bean plant tissues at flowering stage as affected by different levels of different green manures added to soil

Fig. 2: Micronutrients concentrations in faba bean plant tissues at flowering stage as affected by different levels of different green manures added to soil

The same trend as that with macronutrients was found with algae treatments where they gave the best effect on micronutrient concentrations increases in the plant tissues. Iron, zinc and copper concentrations were increased with different degrees with all different green manures, while Mn concentrations appeared to be not affected by the additives of water hyacinth and clover.

Increase of macro- and micronutrients concentrations in the plant tissues due to different plant materials used as green manures reflects the improvement in their uptake as a result of their availability increment in the root zone. Similar results were obtained by Al-Gosaibi (1994) with algae as soil conditioners in Saudi Arabia. Elements concentration increase in the plant tissues means that addition of the green manures creates a nutrient balance in the rihzosphere enabling the absorption mechanism of the root to freely select the required nutrients and amounts (Shaaban and Abou El-Nour, 1996, El-Fouly and Shaaban, 1999).

Superiority of green algae material can be explained on the basis that it has higher content of nitrogen, protein and micronutrients. On the other hand, drum drying for algae cells enables the break down of the cellulose cell wall making its components readily available for the plant root. Despite of its less nitrogen and protein content, spongy cell contents of water hyacinth also appeared to be more available than the clover cell contents. In addition water hyacinth contains higher potassium percentage.

Fig. 3: Fresh weight, dry weight and plant height of faba bean plants as affected by different levels of different green manures

Plant growth parameters:

Fresh weight, dry weight (gm) and plant height (cm) of faba bean plants as affected by different levels of different plant materials used as green manures are shown in Fig. 3. The figure clearly illustrates that for all used materials, the 3rd treatment (200 kg/fed) was the best followed by the 2nd one (150 kg/fed). Algae treatments were the best in realizing the highest biomass formation as well as the highest plant elongation, followed by water hyacinth, but clover treatments were the lowest. As a single cell plant, algae have the higher nitrogen and protein content (Table 2). They also contain high nucleic acids, growth regulators and enzymes (El-Fouly *et al*., 1985) which directly involved in the physiological processes of faba bean plants, thus play a better role in biomass formation and plant cell elongation. Beside its containing plant growth enzymes, water hyacinth contained more calcium which plays an important role in plant cell elongation and more potassium which of great importance in plant cell turger and respiration process control (Mengel and Kirkby, 1987).

Yield:

Data in Table 4 show dry seed yield and 100 seed weight (gm) with different treatments. Both seed yield and 100 seed weight were highly positive correlated with increasing of green manure levels. Algae treatments gave the highest yield and the highest weight of 100 seed, followed by water hyacinth treatments while clover gave the lowest. It can be also recognized from the Table that the great part of the yield increases are due to seed weight increase not to the increase of seed number, where average of the seed weight increase reached 75.9, 79.0 and 83% over control with clover, water hyacinth and algae, respectively.

Table 4: Seed yield (g/pot) and 100 seed weight (g) of faba bean plants as affected by different levels of different green manures

Treatment	Clover	Effect (increase % over control)	Water Hyacinth	Effect (increase % over control)	Algae	Effect (increase % over control)
Dry seed yield (g/plant)						
Control	19.3	-	19.3	-	19.3	-
100 Kg/fed.	19.6	1.55	20.8	7.77	24.5	26.9
150 Kg/fed.	22.3	15.5	25.7	33.2	27.4	42.0
200 Kg/fed.	22.8	18.1	26.5	37.3	29.2	51.3
Mean ± SD	21.0 1.8	11.71	23.0 3.6	26.09	25.1 4.3	39.96
R	0.90		0.93		0.99	
100 seed weight (g)						

Control	69.0	-	69.0	-	69.0	-
100 Kg/fed.	70.5	2.17	80.0	15.5	83.0	20.3
150 Kg/fed.	80.2	16.2	82.0	18.8	89.0	29.0
200 Kg/fed.	84.0	21.7	85.0	23.2	91.0	31.9
Mean ± SD	75.9 7.3	13.35	79.0 6.9	19.16	83.0 9.9	27.06
R	0.91		0.98		0.98	

SD = standard deviation r = correlation coefficient

This can be attributed to the improvement in nutrient concentrations in the plant tissues which, in turn, improved formation of the photosynthesates in the leaves as well as their translocation to the storage organs (Mengel and Kirkby, 1987, Marschner, 1995).

CONCLUSIONS

Using algae, water hyacinth and clover green materials as soil additives before sowing could improve the nutrient uptake, concentrations in the plant tissues and consequently growth, yield quantity and quality of faba bean plants. Treatments in the rate of 150 and 200 Kg/fed were found to achieve the best uptake, concentrations of the nutrients as well as growth parameters, yield and yield components. Algae treatments were the best followed by water hyacinth. Such cheap and available materials can partially substitute the chemical fertilizers to avoid environmental pollution. More studies should be done to stabilize application of such green materials as soil additives for all crops.

ACKNOWLEDGMENT

This work was carried out as a part of the Egyptian-German programme “Micronutrients and Other Plant Nutrition Problems in Egypt” executed by the National Research Centre (Coordinator Prof. Dr. Mohamed M. El-Fouly) and Institute of Plant Nutrition, Technical University, Munich, FRG.

REFERENCES

Al-Gosaibi, A. M. (1994). Use of algae as a soil conditioner for improvement of sandy soils in Al-Ahasa, Saudi Arabia. J. Agric. Sci. Mansoura Univ., 19(5): 1877-1883.

Ankerman, D. and L. Large (1974). Soil and Plant Analysis. A&L Agric. Lab. Inc. New York, USA (1974).

Anonymous, A. (1989). Cohort Soft Ware Corp. Costate user manual version 3.03, Barkley Ca, USA.

Bauyoucos, H. H. (1954). A recalibration of the hydrometer for making mechanical analysis of soil. Agron. J. 43: 343-348.

Black, C.A. (1965). Methods of Soil Analysis. No.9, Part 2, Am. Soc. Agron. Inc., Madison, Wisconsin.

Boussiba, S. (1987). Anabaena azollae as nitrogen biofertilizer. In: S. T. Barking (ed.) "Algal Biotechnology, Elsevier App. Sci. Publ., pp. 169-178.

Buragohain, S.K. and D. N. Medhi (1999). Green manuring in combination with nitrogen on producing of sugarcane. Indian Sugar, 48(11): 923-926.

Cakmak, I.; K. Y. Gueluet, H. Marschner and R. D. Graham (1994). Effect of zinc and iron deficiency on phytosiderophore release in wheat genotypes differing in zinc efficiency. J. Plant Nutr., 17(1): 1-17.

Chapman, H. D. and P. F. Pratt (1978). Methods of Analysis for Soils, Plants and Waters. Division of Agric. Sci., Univ. California, Berkeley, USA. 309 p.

Cooke, G. W. (1977). The role of organic manures and organic matter in managing soils of higher crop yields. In: Proc. Int. Seminar on "Soil Environment and Fertility Management in Intensive Agriculture", Tokyo, Japan, 1977, pp. 53-64.

De Boodt, M. (1975). Use of soil conditioners around the world. Soil Sci. Soc.. Amer. Spec. Publ. 7:1-9.

El-Fouly, M. M. and M. M. Shaaban (1999). The nutritionl status of some horticultural crops in Salalah region, Sultanate of Oman. Agric. Sci., Sultan Qaboos Univ., 4(2): 47-52.

El-Fouly, M. M.; F. H. Mohn and C. J. Soeder (1985). Final report of the Egyptian-German project "Intensive protein production through microalgae".Bilateral Projects of the International Bureau Nr.34/85.1, KFA., Juelich, FRG, 177 p.

Jackson, M. L. (1973).Soil Chemical Analysis. Prentice-Hall of India Private Limited, New Delhi, India, 1973.

Lindsay, W. L. (1974). Role of chelation in micronutrient availability. In: E. W. Carson (Ed.) "The Plant Root and its Environment". University Press of Virginia, 1974,pp.507-524.

Lindsay, W.L. and W. A. Norvell (1978). Development of DTPA soil test for zinc, iron, manganese and copper. Soil Sci. Soc. Am. J. 42: 421-428.

Mandimba, G. R.; G. D. Okomba and J. Pandzou (1998). Nodulated legumes as green manure: an alternative source of nitrogen for non-fixing and poor fixing crops. Int. J. of Tropical Agric., 16(1/4): 131-145.

Marschner, H. (1995). Mineral Nutrition of Higher Plants. Academic Press, London, UK, pp.597-680.

Marschner, H. and V. Roemheld (1996). Root-induced changes in the availability of micronutrients in rhizosphere. In: Y. Waisel, A. Eshel and U. Kafkafi (Ed.) "Plant Roots the Hidden Half" Marcel Dekker, Inc. New York, Basel, Hong Kong 1996, pp. 557-579.

Mengel, K. and E. A. Kirkby (1987). Principles of Plant Nutrition, 4th Ed. Int. Potash Inst. Bern, Switzerland, 1987,687 p.

Olsen, S. R.; C. W. Cole, S. S. Watanabe and L. A. Dean (1954). Estimation of available phosphorus in soil by extraction by sodium bicarbonate. USDA Agric. Circ. 939, 19 p.

Paturde, J. T.; M. N. Patankar (1998). Effect of green manuring with *Sesbania rostrate* and *Sesbania aculeata* as well as levels of nitrogen

on yield of transplanted paddy variety SKL 7. Agric. Sci. Digest (Karnal), 18(3): 213-216.

Schaller, G. (1987). pH changes in the rhizosphere in relation to the pH-buffering of soils. Plant &Soil 97: 439-444.

Shaaban, M. M. and E. A. A. Abou El-Nour (1996). The nutrient balance in Egyptian clover (*Trifolium alexandrinum*) as affected the yield. J. Agric. Sci. Mansoura Univ., 21(6): 2293-2299.

Vinod Kumar; B. C. Ghosh and Ravi-Bhat (1999). Recycling of crop wastes and green manure as their impact on yield and nutrient uptake of wetland rice. J. Agric. Sci., 132(2): 149-154.

Walkley, A. and I. A. Black (1934). Examination of the Dejtjareff method for determining soil organic matter and a proposed modification of the chromic acid titration method. Soil Sci. 37: 29-38.

تأثير الاضافة الأرضية لبعض المواد النباتية الخضراء على صلاحية العناصر للامتصاص وكذلك النمو والمحصول ومكوناته لنبات الفول البلدى

محمود محمد شعبان - زينب محمود مبـــارك

قسم النبات-المركز القومى للبحوث-الدقى-القاهره-ج.م.ع

أجريت تجربة أصص بصوبة برنامج العناصر المغذية الصغرى ومشاكل تغذية النبات فى مصر على نبات الفول البلدى (جيزه ٣) بهدف دراسة تأثير اضافة مستويات مختلفة (معدل ١٠٠، ١٥٠، ٢٠٠ كج/فدان) من المواد النباتية الجافة (البرسيم-ورد النيل-الطحالب) على امتصاص النبات للعناصر المختلفة وتركيزاتها فى أنسجة النبات، وكذلك نمو النبات ومحصول الحبوب ومكوناته. أوضحت النتائج أن هناك ارتباطا موجبا بين زيادة مستويات المادة المضافة من كل المواد النباتية وامتصاص العناصر الغذائية بواسطة النبات ومحصول الحبوب وكذلك وزن ١٠٠ حبة. فلقد زاد امتصاص العناصر مع كل المعاملات تقريبا والذى استتبعه زيادة فى تركيز العناصر داخل أنسجة النبات وكذلك الوزن الأخضر والوزن الجاف وطول النباتات والمحصول من الحبوب. ولقد كانت المعاملة ٢٠٠ كج/فدان أفضل المعاملات تلتها المعاملة ١٥٠ كج/فدان ، كما أعطت معاملات الطحالب أحسن النتائج تلتها معاملات ورد النيل بينما أعطت معاملات البرسيم أقل النتائج ايجابية. ولقد كان متوسط الزيادات فى محصول الحبوب عن دليل التجربة ٢١%، ٢٣ % ، ٢٥% باستخدام البرسيم،ورد النيل والطحالب على التوالى ، كما كان متوسط زيادة وزن الـ١٠٠ حبه ٧٥,٩ % مع معاملات البرسيم ، ٧٩ % مع معاملات ورد النيل و ٨٣% مع معاملات الطحالب. وتوصى الدراسة بأن هذه المواد النباتية المتوفرة والرخيصة الثمن يمكن أن تحل جزئيا محل استخدام الأسمدة الكيماوية لزيادة الانتاج وتجنب المزيد من التلوث البيئى.