J. Agric. Sci. Mansoura Univ., 33(5): 3573 - 3595, 2008

EFFECT OF SOME DIFFERENT (ORGANIC AND BIO) FERTILIZERS AND FOLIAR APPLICATION TREATMENTS ON PEA CROP.

Dawa, Kawsar K.; E. A. A. Tartoura and M.A., Darweesh
Vegetables and Ornamentals Dept., Fac.of Agric., Mans. Univ., Egypt.
E-mail: sayedtartoura@yahoo.com

ABSTRACT

A two field experiments were carried out in a special farm at "Mitt Sharaf" Dekerniss distract, Dakahlia Governorate, Egypt during the two successive wintery seasons of 2003-2004 and 2004-2005 to study the effect of foliar spray with a biological promoters, fertilization with different nitrogen sources, with or without inoculation with biofertilizers and their interactions on growth, chemical contents and yield, as well as, yield components of pea plants (*Pisum sativum* L.) cv. Master-B.

The split-split plot system in a randomized complete block design with three replicates was used in both growing seasons. The chemical and organic fertilizers (farmyard manure, chicken manure and compost) were randomly located in the main plots, whereas, the sub-plots were devoted for the foliar treatments (yeast extract and biomagic). The biofertilizer treatments (with and without inoculation with Rhizobium + Mycorrhiza) were assigned to the sub-sub plot.

By comparing the N-sources (as a single factors), the best treatment is the control followed by chicken manure followed by F.Y.M and the compost came in the last. By comparing the foliar application treatments, there is no significant difference between the yeast extract and the biomagic, whereas, these two treatments (each of them) is better than without. As well as the inoculation with biofertilizer (Rhizobium + Mycorrhiza) is better than without.

The higher values of total green pod and dry seed were obtained from plants which received the chicken manure fertilizer, sprayed with yeast extract or biomagic and inoculated with biofertilizer comparing with other organic fertilizers sources. This treatment gave a total green and dry seed yield values more than that has the chemical fertilizer (control).

By conducting on economical estimation, it appears that the treatment of the triple interaction (chicken manure + yeast extract + biofertilizer) gave 2.19 fold as a net return comparing with control.

Keywords: *Pea, Pisum sativum, organic fertilizers, nitrogen sources, foliar application, biofertilizers, organic farming.*

INTRODUCTION

Pea (*Pisum sativum* L.) is one of the most important leguminous vegetables crop, grown during wintery, season in Egypt. It occupies a great figure in the local consumption and export.

Human health has received a great attention nowadays. It was documented that artificial fertilizers have a pollutant effect in the soil and plants, in turn, on the human health. Owing to that, the scientists are looking forward to substitute the artificial fertilizers (partially) with the natural ones like organic and biofertilizers.

Town refuse consider as a serious problem, if it left without safe expiring. Cairo city from about 10 years ago is suffering from the smoke that comes from firing rice straw and town refuse in the Cairo cordon. Composting

town refuse consider as a double weapon in this respect. It expire the refuse and turn it to organic fertilizer.

Recently, great attention has been focused on the possibility of using natural and safe substituents, i.e., organic fertilizers, yeasts, biomagic and biofertilizers in order to improve plant growth, flowering, fruit setting and total yield of horticultural plants.

Organic manures contain higher levels of relatively available nutrients elements, which are essentially required for plant growth. The addition of organic matter improves the physical, chemical and biological properties of soils and the natural organic material are broken down slowly by soil microorganisms (Shafeek *et al*., 2001; Rizk *et al.,* 2003) resulting more release of plant available nutrients.

Yeast extract is a natural bio-substance suggested to be of useful promotional and nutritional functions, due to their hormones, sugars, amino acids, nucleic acids, vitamins and minerals content. Thus, it can accelerate cell division and enlargement. Also, enhance synthesis of nucleic acid, protein and chlorophyll as well as, promote the formation of flower initiation.

Biomagic is a biological promoter of microbial origin (El-Sibaie 1995). It does not contain any of the synthetic phytohormones, but it contains many of the biological products, which affect the plant growth and productivity, and increase the plant immunity to microbial diseases.

Biofertilization became in the last few decades a positive alternative to chemical fertilizers, especially, nitrogen and phosphorus fertilizers. Biofertilizers are very safe for human, animal and environment. Using them reduce, at a lower extent, the great pollution occurred in our environment.

Rhizobium (*Rhizobium leguminosarum*) plays a principle role in N-fixation in the soil which increases the uptake of N through plant roots. These bacteria could be grown under laboratory conditions and then applied to seed, roots or directly to the soil. The aim of using N-biofertilizer is to increase soil content of symbiotic bacteria of genus *Rhizobium* which considered as a good way of N-fixation in legume crops.

Vesicular Arbuscular Mycorrhizal fungi (VAM) play a fundamental role in correcting the solubility problem of phosphorus element in many soils by transforming this insoluble part to be soluble.

Therefore, this study was conducted to evaluate the growth characteristics, chemical constituents, yield and quality of green and dry seeds of pea plants cv. Master-B in response to different nitrogen sources (chemical fertilizer, farmyard manure, chicken manure and compost) and organic foliar applications (yeast and biomagic) as well as inoculation with biofertilizer (Rhizobium and Mycorrhiza) and their interactions under El-Dakahlia growing conditions.

MATERIALS AND METHODS

The two field experiments were carried out in a special farm at "Mitt Sharaf" Dekerniss distract, Dakahlia Governorate, Egypt, during the two successive wintery seasons of 2003-2004 and 2004-2005 to study the possibility of reducing pollution hazard, chemicals fertilizers and enhance the

yield and its quality by using natural and safety compounds such as yeast, biomagic (added as foliar application), organic and biofertilizers **(**added as soil application) and their interactions on growth, chemical contents and yield as well as yield components of pea plant (*Pisum sativum* L.) cv. Master-B.

The physical and chemical properties of the experimental soil are shown in Table (1) according to Black (1965) and Page *et al.* (1982).

The experimental design and treatments:

Split-split plot system in a randomized complete block design with three replicates was used. The chemical and organic fertilizers were randomly located in the main plots, whereas, the sub-plots were devoted for the foliar treatments and the biofertilizer treatments were assigned to the sub-sub plot. The sub-sub plots area was 12.00 m^2, which consisted of 4 ridges, 3.00 m length and 1.00 m width.

Table (1): Physical and chemical analysis of experimental soil during 2004 and 2005 seasons.

Soil properties		**2004**	**2005**
Physical properties	Texture	Clayey	Clayey
	Clay %	61.63	60.25
	Silt %	17.85	18.26
	Fine sand %	19.65	20.54
	Coarse sand %	0.87	0.95
Chemical properties	pH (units)	7.6	7.7
	EC dSm^{-1}	0.9	0.9
	Organic matter %	1.81	1.98
	S.N (ppm)	76.6	65.8
	Available P (ppm)	15.4	16.8
	Available K(ppm)	542	539
	SO_4^{--} (ppm)	0.41	0.48
	Cl^- (ppm)	0.46	0.48
	Na^+ (ppm)	0.68	0.66
	Mg^{++} (ppm)	0.36	0.38
	Ca^{++} (ppm)	0.48	0.49

The experiment included 24 treatments, which were the combination between four sources of fertilizers, three treatments of foliar applications and two levels of biofertilizers as the following:

I-Nitrogen sources (main plots):

1-Ammonium nitrate (control).
2-Farmyard manure.
3-Compost.
4-Chicken manure

II- Foliar applications (sub plots):

1-Control (without foliar application).
2- Yeast extract.
3- Biomagic.

III- Biofertilizer treatments (sub-sub plots):

1-With biofertilizer (Mycorrhiza + Rhizobium).
2-Without biofertilizer.

Planting dates:

Seeds were sown on November 15th in 2003/2004, also 2004/2005 seasons, in hills 5 cm apart on 7 rows of each ridge.

Fertilizers applications:

The experimental plots were fertilized according to the recommendation of Egyptian Agric. Ministry for pea crop in Dakahlia Governorate. The nitrogen (studying factor) was added at 100 kg available N/fed. taken form of ammonium nitrate (33.5% N). Available-N is calculated directly in case of ammonium nitrate (control), but calculated indirectly in case of F.Y.M., chicken manure and town refuse compost. It takes the amount that give available-N equivalent to the recommendation.

Potassium was added in a basal amount for all the plots in the form of K-sulphate 50 % K_2O at a dose 50 Kg/ K_2O / fed. Phosphorous was added at a dose 30 kg P_2O_5 /fed. as a form of calcium superphosphate (15.5 % P_2O_5).

Time and addition method:

Nitrogen and Potassium doses were divided two equal parts, the first part (of each) was added before the first irrigation and the second part was added before the next irrigation. Phosphorous fertilizer was added in one addition during the experimental field preparation.

The application of organic manure took place four weeks before sowing. It mixed with the upper 15 cm of the soil during bed shaping. The three sources of organic fertilizers were as the following**:**

a- Farmyard manure: was taken from dairy farm near Mansoura.

b- Chicken manure: brought from private station near Mansoura, Dakahlia, Governorate, Egypt.

c- Compost (recycling the agricultural residues of El-Obour market): was taken from special Co. at El-Obour city near Cairo.

The organic fertilizers analysis of the samples are shown in Table (2) as following:

Table (2): Chemical analysis of the used organic manures (based on dry weight).

Organic Fertilizer	PH units	EC dS/m	O.C %	O.M %	Macro elements				Micro elements (ppm)				C:N ratio	Moisture %	Ash %
					N%	Available N ppm	P%	K%	Fe	Zn	Mn	Cu			
F.Y.M	7.5	14.03	12.7	19.7	0.72	420	0.56	0.98	1050	72	190	35	17.6:1	30.7	80.3
Chicken manure	6.2	5.70	35.0	64.3	2.97	500	1.45	1.90	1660	395	205	25	11.8:1	19.7	32.5
Compost	7.1	5.21	24.3	50.8	1.10	400	0.35	0.55	986	86	138	42	22.1:1	25.0	49.2

Foliar applications:

Yeast extract:

Baker's yeast (soft yeast) mixed with usual table sugar at a ratio of 1:1 and left for 3 hours at a room temperature. Then freezing for disruption of yeast tissue and releasing their content. Preparation of yeast solution was done according to El- Ghamriny *et al.* (1999). Composition of yeast extract (According to Mahmoud (2001) is shown in Table (3).

3

It was used at a concentration of 50 ml/ℓ. It applied 4 times, each one just to make complete witting to the arial part of the plant. The application was periodically every 10 days, starting from one month after planting.

Biomagic:

Biomagic is biological promoter of microbial origin (El-Sibaie 1995). It does not contain any of the synthetic phytohormones, but it contains many of the biological products, which affect the plant growth and productivity and increase the plant immunity to microbial diseases. It contains N.P.K and all the trace elements required by the major plants. Biomagic has a pH 5.5. It was added at a concentration of 15 g/ℓ. Its application was as the yeast application. The composition of Biomagic is shown in Table (4).

Table (4): The important chemical characters of the used Biomagic.

Amino acids (%)	Vitamins (%)	Macro elements (g/ℓ)			Microelements (mg/ℓ)								
		N	P_2O_5	K_2O	Fe	Zn	Mn	Mg	Cu	B	Mo	Cd	Ni
1.907	0.038	11.25	5.50	6.25	160	124	100	45	45	14	12	7	4

Biofertilizers addition:

The pea seeds were mixed with the solution of Rhizobium at 35 ml/kg dry seeds directly before sowing. Mycorrhizal inoculum was used at a rate of 75g inoculums /m^2. It added to root absorption zone of plants, 20 days after sowing before the first irrigation.

Measured parameters and sampling:

Five plants of each plot were randomly chosen at 50 days after sowing to obtain the following parameters:

1-**Vegetative parameters:**

a- Plant length. b- Number of branches/plant.
c- Number of leaves/plant. d- Fresh weight/plant.
e- Dry weight/plant.

f- Total chlorophyll: leaf chlorophyll content was determined with A-Minloti SPAD chlorophyll-meter (Yadava, 1986). The chlorophyll-meter readings were recorded on the plant standing in the field on 2nd leaf from the plant top.

2- Flowering time:

Ten plants per plot were labeled to determine the flowering date which defined as: the total number of days from sowing to opening of the first fully developed flower.

3-Yield and yield components:

A- Green yield

Green pods of two ridges of each plot were harvested three times at the proper maturity stage. The following parameters were recorded:

a- Average pod length (mean length of 20 pods).
b- Average pod weight (mean weight of 20 pods).
c- Number of green seeds/pod (mean number of seed per 20 pods).
d- Weight of 100- green seed.
e- Average number of green pods/plant.
f- Fresh pods yield/plant.

g- Total green pods yield (ton/fed.).

B- Seed chemical constituents

Representative samples of 100 g. of green seeds from each experimental plot were taken randomly and oven dried to determine the following characteristics:

1- Total nitrogen as described by A.O.A.C. (1975).
2- Phosphorous was determined colorimetrically according to the standard method of Jackson (1967) using 660 nm.
3- Potassium was determined using flame photometer as described by Jackson (1967).
4- Reducing, non- reducing and total sugars was determined according to the method of Forsee (1938).
5- Total carbohydrates content was determined colorimetrically according to the method described by Michel *et al*. (1956).
6- Total protein % was calculated by multiplying nitrogen content by 6.25.

C- Dry seed yield

Dry pods of the other two ridges were harvested at the end of experiment, threshed and the following characters were calculated:

1-Total dry seed yield (ton/fed.).
2-Seed index (1000-dry seed weight).

Statistical analysis:

The obtained data were subjected to statistical analysis as a Split-split plot system in a randomized complete block design with three replicates in the both growing seasons. All data were statistically analyzed according to the procedure outlined by Snedecor and Cochran (1967). The treatment means were compared using LSD according to Gomez and Gomez (1984).

RESULTS AND DISCUSSION

1.Vegetative Growth

1.1. Effect of N-fertilizer Sources:

It is clear from Table (5) that the pea plants which received chicken manure recorded the higher values of plant growth than FYM and compost, but, the chemical fertilizer gave the highest significantly values of plant growth characters compared with addition of nitrogen as an organic form in both seasons, except in plant length, fresh weight per plant in the second season and total chlorophyll content in both seasons as compared with chicken manure.

The poorest pea growth on such parameters were noticed when it received the N. fertilizer source as a compost form in both experimental seasons.

It was noticed that pea plants fertilized with organic fertilizers, i.e., chicken manure, FYM and compost recorded less values of plant growth parameters expressed as plant length, number of both branches and leaves, fresh and dry weight per plant and total chlorophyll compared with chemical fertilizer. This may be attributed to that organic forms of the natural nitrogen must be transferred into mineral forms through mineralization process before the plants can absorb it.

5

These chemical changes needs time, consequently this will refluxed on the growth of pea plants. The superiority in plant growth resulted from the plants which were supplied with chemical fertilizer. It may be attributed to solubility and availability of NPK in the chemical form.

Moreover, such positive response in the recorded vegetative growth characters under the addition of chicken manure may be due to its high contents of mineral nutrients, i.e., nitrogen, potassium, phosphorus, micro elements such as Fe, Zn and Mn and the organic matter percent, comparing with the other studied organic kinds of manure (farmyard manure and compost) as shown before in Table (2) and improved the soil texture which encourage the plant to gave a good roots by improving the aeration in the soil.

The findings which obtained by the previous investigators such as El-Gizy (1994) and Nour (2004) on pea; Kabeel *et al.* (2006) on snap bean.

1.2. Effect of foliar applications:

Both yeast extract and biomagic treatments significantly increased the previous measurements compared with untreated plants, but the differences between the two kinds of foliar applications were not enough to reach the 5% level of significance in the two seasons. The results showed also that there were no significant differences could be observed between the two foliar applications in both seasons (Table 5).

The enhancing effect of yeast extract (as a foliar spray) on the vegetative growth may be attributed to its composition, as shown in Table (3), which include majority of the macro and micro elements, in addition, it contains a natural growth regulators, especially, cytokinins which play an important role and had a simulative effect on cell division, enlargement, protein and nucleic acids synthesis. It has been reported that application of yeast extract increased chlorophyll content (Fathy and Farid, 1996), that increase the accumulation of carbohydrate, which in turn increase plant growth of common bean. The yeast also contains tryptofan (Abdel-Latif, 1987) which considered the precursor of IAA (Wareing and Phillips, 1973 and Moor, 1979). Consequently, the application of yeast produced more IAA which increased plant growth. In addition, Ahmed *et al.* (1998) suggested that yeast is probably responsible on facilitating the opening of stomata in the leaves which, in turn, stimulates photosynthesis and, consequently, plant growth.

Moreover, using the Biomagic compound caused also a significant simulative effect on the vegetative growth characters. These enhancing effect on the vegetative growth may be due to its compositions, i.e., macro element (N, P, K and Mg), microelements (Fe, Zn, Mn, Cu, Mo and B), amino acids and vitamins which play an essential roles in many important metabolic functions such as transport of carbohydrates, regulation of meristematic activity, photosynthesis, respiration, energy production and protein metabolism. Such functions would directly or indirectly contribute to plant growth (Srivastva and Gupta, 1996).

These results are in parallel with those reported by Ismail (2002), Dawa *et al*. (2003) on pea, Fathy and Farid (1996) and Amer (2004) on common bean; El-Ghamriny *et al.* (1999) on tomato; Alian (2005) on artichoke.

1.3. Effect of biofertilizer:

Data in Table (5) demonstrated that inoculation with biofertilizer caused a high significant effect on vegetative growth characters comparing with untreated plants. This trend was true in the two growing seasons.

The improving effect of Rhizobium bacteria on the plant growth may be due to that it plays an important role in atmospheric nitrogen fixation and improve the aeration of the soil as well as increasing soil fertility and plant growth (Pacovsky *et al.*, 1991). In addition, the nodules contain higher levels of IAA and growth hormones. These growth hormones may be the cause of increment in plant nodule growth and dry matter in different plant parts.

The effects of vesicular arbuscular mycorrhizal (VAM) in this respect, may be attributed to that such fungus plays an important role in releasing phosphorus in the soil and supplying the growing plants with available phosphorus needs, some micronutrients and phytohormones, such as gibberellins, auxins and cytokinins which promoted plant root development, thereby enhanced nutrient uptake (Marschner., 1995). Consequently, producing activation energy to utilization of metabolites and building the cells, as well as, development of the plant (Pacovsky and Fuller, 1986).

These results are in the same line with those reported by Ismail (2002), Sarg and Hassan (2003), Abou El-Salehein *et al*. (2005) on pea; El-Bassiony (2003), El-Shimi (2004) on bean.

1.4. Effect of interactions:

No significant effect was observed as results to the interaction among all the studied factors on both numbers of branches and leaves as well as total chlorophyll content in both seasons except total chlorophyll content which responded significantly to the interaction among the three factors in the first season only (Table 5). Meanwhile, all interactions factors gave a significant effect on dry weight in the two seasons. All the interactions had a significant effect on plant length in the first season only except the interaction between N. fertilizer sources and foliar applications. The interaction between N. fertilizer sources x foliar applications in the first season and N. fertilizer sources x biofertilizer in the two seasons caused a significant effect on fresh weight of plant.

2. Flowering Time

2.1. Effect of N- fertilizer Sources:

It is clear from Table (6) that the shortest period required to flowering was obtained when plants were fertilized with chemical fertilizer in both seasons comparing with the three organic fertilizer sources. Both of compost and chicken manure treatments recorded the longest period to flowering in the first and second seasons, respectively.

These results are in the same direction as those reported by Abdel-Hakeem (2003) on sweet pepper.

2.2. Effect of foliar applications:

Data in Table (6) showed also that the two foliar application treatments gave a significant effect on flowering date comparing with untreated plants. Its worth to mention that using yeast extract pushed the plants to flowering earlier comparing with biomagic in both seasons.

Table (6): Effect of nitrogen fertilizer sources, foliar applications, biofertilizer and their interactions on date of the first flower appearance during 2004 and 2005 seasons.

Parameters / Treatments	Date of first flower appearance (days from planting)		
	2004		2005
A- Nitrogen fertilizer sources:			
Chemical fertilizers	35.427		34.265
FYM	35.755		35.017
Chicken manure	36.383		35.208
Compost	36.579		35.018
L.S.D. 5 %	0.461		0.188
1 %	0.698		0.285
B- Foliar applications:			
Without	36.985		35.482
Yeast	35.184		34.090
Biomagic	35.940		35.059
L.S.D. 5 %	0.373		0.182
1 %	0.514		0.251
C- Biofertilizer:			
Without	36.192		34.992
With	35.880		34.762
F. Test	**		**
D- Interactions:			
A X B	N.S.		**
A X C	N.S.		N.S.
B X C	N.S.		N.S.
A X B X C	N.S.		*

These results are in agreement with those reported by Darweesh (2003) on pea; Abdel-Aziz (1997) on tomato.

2.3. Effect of biofertilizer:

Data in Table (6) clearly illustrated that inoculation with biofertilizer gave a high significant effect where inoculated plants with biofertilizer appeared earlier than those of the untreated plants. These results were repeated in the both seasons.

The obtained results are in parallel with those of Zahao and Li (1994) on sweet pepper

2.4. Effect of interactions:

Table (6) showed that the interaction among all the studied factors did not show any significant effect on such character in the two growing seasons, except the interaction between nitrogen fertilizer sources and foliar applications in the second season, and the interaction among the three factors in the second season.

3. Seed Chemical Constituents

3.1. Effect of N-fertilizer Sources:

It is concluded from Table (7) that there were insignificant differences among the different organic nitrogen sources in the most cases on green seeds chemical constituents,i.e., NPK, reducing sugars, non-reducing sugars, total sugars, carbohydrates % and protein %. Chicken manure gave the highest values on these parameters comparing with the other studied organic kinds of manure (FYM or compost) during both seasons of study.

7

It was noticed that chemical fertilizer recorded the highest values in this respect in both seasons.

These results agree with those reported by El-Gizy (1994) and Nour (2004) on pea; Kabeel *et al.* (2006) on snap bean.

3.2. Effect of foliar applications:

It is noticed from such data that chemical constituents of pea seeds were significantly increased as a result of application of yeast extract and biomagic treatments comparing with untreated plants. The statistical analysis between the two kinds of the foliar applications failed to reach the 5% level of significance in both seasons, except protein % in the first season, non-reducing and total sugars in the second one, also the nitrogen and potassium percentage in the first and second seasons, respectively.

As well as, to its favorable effect as reported by several investigators as Ismail (2002) and Dawa *et al.* (2003) on pea; Fathy *et al.* (2000); El-Ghamriny *et al.* (1999) on tomato; Alian (2005) on artichoke.

3.3. Effect of biofertilizer:

Data in Table (7) reveal also that inoculation with biofertilizers led to significant increases in the concentration of such chemical characteristics in green seeds of pea in both seasons of the study comparing with check plants.

Such obtained results are in agreement with those mentioned by El-Neklawy *et al*. (1995), Sarg and Hassan (2003), Abou El-Salehein *et al*. (2005) on pea; Hassan *et al.* (2005 a,b) on sweet potato

3.4. Effect of interactions:

No significant effects on potassium %, non-reducing and total sugars and carbohydrates % were detected as a result to interaction among all the studied factors in the two seasons, except the triple interaction among N-fertilizer sources x foliar applications x biofertilizer on non-reducing sugars in the second season and carbohydrate % in the first one.

Also, all the interactions did not show a significant effect in the two seasons, except the interaction between N. fertilizer sources x foliar applications on N % and protein % in the first season and P % in the two seasons. The interaction between N- fertilizer sources x biofertilizer significantly affected on N%, P% and protein % at one season and reducing sugars in both seasons. Both P% and reducing sugars responded significantly to the interaction effect between foliar applications x biofertilizer in the second season. The interaction among the three factors affected significantly on P % and carbohydrate % in the first season and N%, reducing and non reducing sugars and protein % in the second one.

4. Yield and its Components

4.1. Effect of N- fertilizer Sources:

The results in Table (8) revealed that chicken manure was the most reliable treatments among the three types of organic manures on physical pod characters, weight of 100 green and 1000 dry seed, No. pods per plant, average yield per plant, total green pod yield/fed., as well as, total dry seed yield per fed. Such data reveal that the highest values in all measured characters were obtained as a result of using mineral fertilizers followed by chicken manure.

T8

The favorable effect of chicken manure and chemical fertilizer on total green pod and dry seed yield/fed. comparing with FYM or compost may be due to the higher values obtained of vegetative growth parameters i.e. plant length, number of branches or leaves, fresh and dry weights, as well as total chlorophyll content as shown before in Table (5) and, also, to the increases in both number and weight of pods per plant and No. of seeds/pod, as well as, the average of green and dry seed weight.

The obtained results are in accordance with those reported by El-gizy (1994), Osman (1998), Kabeel *et al*. (2006) on snap bean; Fattah-Allah (1992 a,b) on tomato; Rizk *et al.* (2003) on potato; Rizk (2002) on eggplant.

4. 2 Effect of Foliar Applications:

The results in Table (8) showed that application of yeast extract or biomagic was generally more effective as comparing with control, where they significantly increased the previous measurements in the two growing seasons. Meanwhile, no significant differences were detected between the two foliar applications on both 100 green seed and 1000 dry seed, physical pod characters the number of pods/plant and dry yield/fed. in the two seasons and total pod yield in the first season of study.

The obtained results may be attributed to increases in the amount of metabolites synthesized by the plant, which in turn, accelerate different plant growth parameters and dry weight (Table 5) and finally, reflected on the total yield. It can be conclude that there is a clear relation between each of number of pods, pod weight, number of green seeds, yield per plant and the total yield per fed.

Yeast, via its cytokinins content (Nagodawthana, 1991) and its high content of vit. B_1 and mineral may play a role in orientation and translocation of metabolites from leaves into the production of organs (Saure-Sink relationship Savenkova, 1984). Also, it might play a role in the synthesis of chlorophyll content and increase the dry matter and the pod characters. All of these occurrences and attributes may lead to the improvement of the yield of pea plant.

The improvement effect of biomagic on yield and its components may be attribute to its positive role on enhancing photosynthesis and their effects on increasing vegetative growth of plant (Table 4), which subsequently replicate positively on the physical properties of pods and finally on total yield/fed. (Table 8).

These results are in coincidence with those reported by Ismail (2002), Darweesh (2003) on pea, Fathy and Farid (1996) and Amer (2004) on common bean; Abdel-Aziz (1997), Fathy *et al*. (2000), El-Ghamriny *et al.* (1999) on tomato; Alian (2005) on artichoke.

4. 3. Effect of biofertilizer:

It is clear from Table (8) that the inoculation of pea seeds with Rhizobium and VAM tend to a high significant increase in all formerly studied characters in the two growing seasons

The favorable effect of Rhizobium and Mycorrhiza on yield and its components of pea may be due to the increases in vegetative growth characters Table (5). Hence, such vigorous growth results in turn, in increasing the amount of metabolites synthesized and dry matter

accumulation by the plants. Moreover, the increase in total green pod yield owe directly to the increase in both number and weight of pods, as well as, green pod yield/plant as shown before in Table (8).

These results are in agreement with those of Ismail (2002), Sarg and Hassan (2003) Abou El-Salehein *et al*. (2005), on pea; El-Oksh *et al.* (1991), Abou El-Salehein and Ahmad (1998), El-Melegy (2001), El-Bassiony (2003) Shafeek *at al.* (2004) on bean; Hassan *et a l.* (2005 a, b) on sweet potato.

4. 4. Effect of interactions:

Insignificant increment was observed as a result to the interaction between N. fertilizer sources and foliar applications (Tables 8 and 9) in all characters except plant yield which responded significantly in both seasons and fresh and dry seed yield/fed. in the second one and the maximum values of these characters were observed with application of chemical fertilizer followed by chicken manure under biomagic application.

The interaction between N. fertilizer sources and biofertilizer had a significant effect on pod weight, pod length, weight of 1000 dry seed, number of pods/plant, plant yield, fresh yield/fed. in one season only and dry seed yield /fed. in the two seasons. The maximum values were obtained may be as a result of inoculation with biofertilizer, and fertilization with NPK followed by chicken manure treatments.

The interaction between foliar applications and biofertilizer significantly affected on the pod weight, weight of 100 fresh seed in both seasons where the same combination affected significantly on number of pods, total fresh pod yield/fed. and dry seed yield at one season only. Treated plants with yeast extract and inoculated with biofertilizer recorded the highest values in this respect.

The same Tables (8 and 9) showed that there were significant differences in most the previous characters i.e., pod length, weight of 100 fresh seed, No. of pods per plant, average yield per plant, total green pod yield/fed., as well as, total dry seed yield per fed were recorded as a result of the interaction among all the studied factors in the two growing seasons except, the pod length, weight of 100 fresh seed and No. of pods/plant significantly at one season only.

The higher values of total green pod and dry seed yield/fed. were obtained from plants which received the chicken manure fertilizer, sprayed with yeast extract or biomagic and inoculated with biofertilizer comparing with other organic fertilizers sources. The highest values of the two yield characters were detected at the chemical fertilizer and biofertilizer treatments with foliar applications with no differences between the two kinds of foliar application in the two seasons. Meanwhile, all the compost treatments yielded the lowest values on both seasons of experiment.

Also, it can be noticed that, chicken manure treatments and spraying with yeast extract or biomagic in the presence of inoculation with biofertilizer recorded a high total green and dry seed yield comparing with control plants (chemical fertilizer) in both seasons of experiments.

9

5. Economic Estimation

Presented data in Table (10) indicated that the highest value of net return (5620 L.E./fed.) was obtained from plants which received chicken manure and sprayed with yeast extract under biofertilizer comparing with the other fertilizer sources.

Although, organic fertilizer treatments gave lower total green pod yield and costed more than the control (chemical fertilizer alone), it recorded higher net return than the control because product of the organic fertilizer treatments is more expensive than the chemical product treatments.

CONCLUSION

From the above mentioned results it was noticed that, fertilization with chicken manure, biofertilizr and spraying with yeast extract gave total fresh and dry yield better than fertilization with chemical fertilizer alone.

From the economical and environmental point of view, it was noticed that, fertilization with chicken manure in combination with seed inoculation with Rhizobium and Mycorrhiza in presence of spraying with yeast extract recorded net return better than the chemical fertilizer treatments (control) and gave safety and clean products from the pollution, which could be occur by excessive chemical fertilizers application.

Therefore, it can be recommended by using chicken manure combined with seed inoculation with biofertilizer in presence of spraying with yeast extract.

REFERENCES

Abdel-Aziz, M. A. (1997). Response of tomato plants to nitrogen fertilizer levels and growth regulators. M. Sc. Thesis, Dept. Vegetable Crops. Fac. Agric., Cairo Univ., Egypt.

Abdel-Hakeem, A. E. S. (2003). Response of sweet pepper crop to organic and biofertilizer application. Ph. D.Thesis, Fac. Agric., Moshtohor, Zagazig Univ., Egypt.

Abdel-Latif, S.H. (1987). Study on utilization of some food industries wast in the production of single cell protein. M.Sc. Thesis, Fac. Agric. Moshtohor, Zagazig Univ. Egypt.

Abo El-Salehein, E. H.; Wahdan, H. I.; El-Hamady, M. M and Baddour, G. A.(2005). Effect of some biostimulants and NPK fertilizers levels on growth, green pod yield and its quality of peas. J. Agric. Sci. Mansoura Univ., 30 (2): 1055-1067.

Ahmed, S., K., El-Ghawas, E. O. and Aly, A. F. (1998). Effect of active dry yeast and organic manure on Roseelle plant. Egypt. J. Agric. Res., 76 (3): 1115-1143.

Alian, F. S. S. (2005). Response of globe artichoke to some organic manure and mineral nitrogen levels, and biostimulant treatments under sandy soil conditions. Ph. D. Thesis, Fac. Agric., Cairo Univ., Egypt.

Amer, S. S. A. (2004). Growth, green pods yield and seeds yield of common bean as affected by active dry yeast, salicylic acid and their interaction. J. Agric. Sci. Mansoura Univ., 29 (3): 1407-1422.

A.O.A.C. (1975). "Association of Official Agricultural chemists". Official Methods Analysis, 12th Ed., Published by A.O.A.C., Washington, D.C.

Black, C. A. (1965). "Methods of Soil Analysis". Part I- Physical and mineralogical properties. A. S. A. Madison Wisc., USA.

Darweesh, M. A. A. (2003). Effect of phosphorous fertilization and some growth promoters on growth and yield of pea (*Pisum sativum*, L.). M.sc. Thesis, Fac. Agric., Mansoura Univ., Mansoura, Egypt.

Dawa, K.; Tartoura, E. A. A. and Darweesh, M. A. (2003). Effect of phosphorous fertilization and some growth promoters on growth and yield of pea (*Pisum sativum*, L.). J. Agric. Sci. Mansoura Univ., 28 (2): 1327-1343.

Ebo El-Salehein, E.H. and Ahmed, M.A. (1998). Effect of some bio-and chemical fertilizers on growth, chemical composition and yield of snap bean (*Phaseolus vulgaris* L.) Egypt Appl., 13 (12): 228249.

El-Bassiony, A. M. (2003). Response of some Bean (*phaseolus vulgaris* L.) cultivars to organic and biofertilizer. Ph. D Thesis, Fac. Agric., Ain Shams Univ., Cairo, Egypt.

El-Ghamriny, E. A.; Arisha, H. M. E. and Nour, K. A. (1999). Studies in tomato flowering, fruit set, yield and quality in summer seasons. 1- Spraying with thiamine, ascorbic acid and yeast. Zagazig J. Agric. Res., 26 (5): 1345-1364.

El-Gizy, S. M. (1994). Comparative study for influence of some manure sources on growth, yield and pod quality of pea. Menofiya J. Agric. Res. Vol. 19No. 6(2): 3243-3257.

El-Melegy A.M. (2001). Effect of inoculation with mycorrhizal fungi and phosphorus fertilization on growth and production of some vegetable crops. M.Sci., Thesis, Dept. Vegetable crops, Fac.Agric. Kafer El-Sheikh, Tanta Univ. Egypt.

El-Neklawy, A.S.; Abd El-Maksoud, A.M.; Selim, A.M. (1985). Field response of pea (*Pisum sativum* L.) to NPK fertilization and to inoculation with Rhizobium in a sandy soil. Annals Agric. Sci. Moshtohor, 23 (3): 1365-1372.

El-Oksh, I.I.; Soliman, M.M.; El-Demerdash, M.H. and El-Gizy, S.M.H. (1991). Effect of rhizoidal inoculation and nitrogen supplementation on growth and yield of common bean (*Phaseolus vulgaris* L.). Annals of Agric. Sci., 36 (2): 599-507.

El-Shimi, N.M.M. (2004). Physiological studies on growth and productivity of common bean. Ph.D.Thesis, Fac. Agric., Moshtohor Zagazig Univ. Egypt, 133 pp.

El-Sibaie, M. (1995). Biomagic a biological promoter patent by Patent Office, Academy of Scientific Research and Technology. Egypt, 5/1995.

Fathy, E. S. L. and Farid, S. (1996). The possibility of using vitamin Bs and yeast to delay senescence and improve growth and yield of Common Beans (*Phaseolus vulgaris* L). J. Agric. Sci. Mansoura. Univ., 21 (4):1415-1423.

Fathy, El-S. L; Farid, El-S.S. and El-Desoaky, S.A. (2000). Induce cold tolerance of outdoor tomatoes during early summer season by using Adenosine-tri-phosphate (ATP), yeast, other natural and chemical treatments to improve their fruiting and yield. Veget. Dept., Hort. Inst. Agric. Res. Center, Cairo. Mansoura Univ. 25 (1): 377-401.

Fattah-Allah, M.A. (1992a). Response of tomato to various irrigation regimes in relation to farmyard manure fertilization. 1- Plant growth and some chemical contents. Menofiya J. Agric. Res. 17 (3): 1263-1283.

Fattah-Allah, M.A. (1992b). Response of tomato to various irrigation regimes in relation to farmyard manure fertilization. 2- yield and fruit quality. Menofiya J.Agric. Res. 17 (3): 1327-1351.

Forsee, W. T. (1938). Determination of sugar in plant materials a photoelectric method. Indus. Eng. Chem. Annal. Ed. 10: 411-418

Gomez, K. A. And Gomez, A. A. (1984). "Statistical Procedures for the Agricultural Researches". John Wiley and Son, Inc. New York.

Hassan, M.A.; El-Seifi, S.K.; Omar, F.A. and Saif El-Deen, U.M. (2005 a). Effect of mineral and bio-phosphate fertilization and foliar application micronutrients on growth, yield and quality of sweet potato. 1- Vegetative growth, yield and tuber root characteristics.1- J. Agric, Sci Mansoura Univ., 30 (10): 6149-6166.

Hassan, M.A.; El-Seifi, S.K.; Omar, F.A. and Saif El-Deen, U.M. (2005 b). Effect of mineral and bio-phosphate fertilization and foliar application micronutrients on growth, yield and quality of sweet potato. 2- Chemical composition of leaves and crud tuber roots. J. Agric, Sci Mansoura Univ., 30 (10): 6167-6182.

Ismail, R. H. A. (2002). Physiological studies on biofertilization in pea plants (*Pisum sativum*, L.) under calcareous soil conditions. Ph.D. Thesis, Fac. Agric., Cairo Univ., Egypt.

Jackson, M. L. (1967). "Soil Chemical Aanalysis". Prentic-Hall, India, pp. 144-197.

Kabeel, S. M. A.; Saleh, M. M. and Abdallah, M. E. (2006). Effect of organic and biofertilizers on growth and yield of snap bean grown under transparent polyethylene low tunnels in newly reclaimed land. J. Agric. Sci. Mansoura Univ., 31(2): 927-943.

Mahmoud, T. R. (2001). Botanical studies on growth and germination of Magnolia (*Magnolia grandiflora* L.). Ph. D.Thesis, Fac. Agric., Moshtohor, Zagazig Univ., Egypt.

Marschner, H. (1995). "Mineral Nutrition of Higher Plants." 2nd Ed. Academic Press, Harcourt Brace and Company, Publishers. London, San Diego, New York, Boston, Sydney, Tokyo, Toronto, 864 pp.

Michel, K. G.; Gilles, P. A., Hamilton, J. K. and smith, F. (1956). Colorimetric methods for determination of sugar and related substances. Analytic. Chemistry, 28: (3), 350.

Moor, T.C. (1979). Biochemistry and physiology of plant hormones. Pub. By Springer-Verlag, New York USA.

Nagodawithana, W.T. (1991). Yeast technology. Univ. Foods Corporation Milwaukee, Wisconsin. Published by Van Nostrand Reinhold New York. P. 273.

Nour, E. M. E. (2004). Physiological studies on pea crop under sandy soil conditions. Ph. D. Thesis, Fac. Agric., Zagazigs Univ., Egypt.

Osman, F.A.A. (1998). Effect of organic manure, phosphorus and magnesium application on yield components and nutrients uptake of magnesium application on yield components and nutrients uptake of peas. Zagazig J. Agric.Res.,25 (5):875-888.

Pacovsky, R.S. and Fuller, G. (1986). Development of two and mycorrhizal symbioses on soybean and comparison with phosphorus fertilization. Plant and Soil, 195:361-377.

Pacovsky, R.S.; Silva, P.D.; Carvaiho, M.T. and Tsai, S.M. (1991). Growth and nutrient allocation in (*Phaseolus vulgaris* L.) colonized with endomycorrhizae or Rhizobium. Plant and Soil, 132: 127-137

Page, A. L.; Miller, R. H. and Keeney, D. R. (1982). "Methods of Soil Analysis". Part II- Chemical and microbiological properties. A. S. A. Madison Wisc., USA.

Rizk, F.A. (2002). Boi-organic and chemical fertilizer as affected the productivity of eggplant (*Solanum melongena* L). J. Agric. Sci. Mansoura Univ., 27 (12): 8477-8491.

Rizk, F.A.; Foly, H.M.H. and Shafeek, M.R. (2003).The productivity of potato yield and its quality as influenced by the application of different nitrogen fertilizer sources. J.Agric. Sci. Mansoura Univ., 28 (2): 1281-1290.

Sarg, S.M.H. and Hassan, M.A. (2003). Effect of Rhizobium inoculation, nitrogen fertilization and plant density on growth, yield and mineral content of pea under sandy soil conditions. J.Agric.Sci. Mansoura Univ., 28 (11): 6857-6873.

Savenkova, L.M. (1984). Apossibility of regulating the seed of lupine with physiological active substances. Referativny Zhumal, 55 (6): 426 (C.A. Plant Growth Reg. Abstr., 12: 424).

Shafeek, M.R.; El-Desuki, M. And Shaheen, A.M. (2001). Growth and yield of some potato cultivars as affected by sources of fertilization. Egypt. J. Appl. Sc., 16 (4):. 701-716

Shafeek, M.R.; Faten, S.a. and Arisa, H.A. (2004). The productivity of broad bean plant as affected by chemical and / or natural phosphorus with different biofertilizer. J.Agric.Sci. Mansoura Univ., 29 (5): 2727-2740.

Snedecor, W.G. and Cochran, G.W. (1967). "Statistical Methods". Lowa State Univ. Press, Amer, USA. 6th Ed., PP. 393 .

Srivastva, P.C. and Gupta, U.C. (1996). Trace elements: A concern. In Trace elements in crop prouduction. Science Publishers, Inc; Lebanon, NH 03766, USA.

Wareing, P.E.; Phillip, I.D.G. (1973). The control of growth and differentiation in plant. E.L.B.S. Ed. Pub. by Pergamon Press LTD. UK.

Yadava, U. L. (1986). A rapid and non-destructive method to determine chlorophyll in intact leaves. Hort. Sci., 21: 1449-1450.

Zaho, S. J. and Li, S. L. (1994). A physiological study of the effect of VA-mycorrhizas on promotion of sweet pepper growth. Acta. Agric., 9 (1): 81-86.

تأثيربعض الأسمده العضوية والحيوية وبعض معاملات الرش على محصول البسلة.

كوثر كامل ضوه ، السيد أحمد احمد طرطورة و محمد عبد العظيم درويش

قسم الخضر والزينة – كلية الزراعة – جامعة المنصورة .

اجريت تجربتان حقليتان بمزرعة خاصة بقرية ميت شرف مركز دكرنس بمحافظة الدقهلية خلال الموسم الشتوى ٢٠٠٣/ ٢٠٠٤ ،٢٠٠٤ / ٢٠٠٥ م و ذلك لدراسة تاثير بعض مصادر التسميد النيتروجينى بالاضافة الى منشطات النموالطبيعيه (مع او بدون) على النمو والمحصول فى البسلة صنف ماستر B.

اشتملت التجربة على ٢٤ معاملة لدراسة ٤ مصادر للسماد النيتروجينى (المعدني- البلدي- الدواجن – الكمبوست المصنوع من مخلفات سوق العبور) بالاضافه الى ٣ معاملات رش ورقى وهى (كنترول – مستخلص الخميرة بتركيز ٥٠ مل/لتر – بيوماجيك بتركيز ١٥ جرام/لتر) واستخدمت كل منها منفرده او مع التلقيح الحيوي بالريزوبيوم و الميكروهيزا.

تمت اضافه ١٠٠ وحده available-N للفدان من الاربعه مصادر السابقه وحددت كميات الاسمدة العضويه المضافه علي اساس نسبه عنصر النيتروجين الصالح available-N فى كل منها. اجرى الرش الورقى للخميرة والبيوماجيك فى اربعه مواعيد و هى ٣٠ ، ٤٠ ، ٥٠ ، ٦٠ يوم من الزراعة.

استخدم لاجراء التجربة تصميم القطاعات الكاملة العشوائية بنظام القطع المنشقة مرتين فى ثلاث مكررات وتم توزيع مصادر النيتروجين فى القطع الرئيسية و معاملات الرش فى القطع الشقية وخصصت القطع التحت شقية للتسميد الحيوى.

إتضح من النتائج ان:

بمقارنة معاملات مصادر النتروجين (كعوامل فردية) كان الأفضل السماد المعدنى (الكنترول) يليه السماد الداجنى يليه ال F.Y.M يليه ال compost وبمقارنة معاملات الرش (كعوامل فردية) تساوت الخميرة مع ال biomagic فى التأثير وكل منهم على حدة كان افضل من (بدون رش). اما مقارنة المعاملة بالأسمدة الحيوية (الرايزوبيم + الميكورهيزا) كعامل فردى مع (بدون) اتضح منهما ان التسميد الحيوى افضل.

اعطى التفاعل الثلاثي بين السماد الداجنى مع الرش بمستخلص الخميره او البيوماجيك و استخدام التسميد الحيوى بالريزوبيم و الميكروهيزا اعلى محصول اخضر و جاف للفدان بالمقارنه بباقى المصادر العضويه . وبإجراء Economical estimation إتضح ان المعاملة سالفة الذكر (التفاعل الثلاثى) حققت عائد مادى قيمته ٢,١٩ ضعف بالمقارنة بالكنترول.

J. Agric. Sci. Mansoura Univ., 33(5): 3573 - 3595, 2008

Table (5): Effect of nitrogen fertilizer sources, foliar applications, biofertilizer and their interactions on vegetative growth characters of pea plants during 2004 and 2005 seasons.

Parameters / Treatments	Plant length (cm)		No. of branches /plant		No. of leaves /plant		Fresh weight of plant (g)		Dry weight of plant (g)		Total chlorophyll (SPAD units)	
	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
A- Nitrogen fertilizer sources:												
Chemical fertilizers	46.333	47.467	2.403	2.343	12.903	13.057	10.873	12.186	1.373	1.509	48.173	48.643
FYM	43.583	44.850	1.952	1.838	10.597	10.881	9.218	10.575	1.218	1.335	41.760	40.877
Chicken manure	45.761	46.917	1.897	1.826	11.602	12.013	10.172	11.933	1.279	1.467	47.765	47.480
Compost	40.967	42.950	1.840	1.825	10.202	10.295	8.203	10.317	1.138	1.332	38.820	40.502
L.S.D. 5 %	1.340	2.794	0.148	0.198	0.812	0.991	0.290	0.441	0.014	0.017	1.357	2.831
1 %	2.029	-	0.223	0.300	1.230	1.501	0.439	0.667	0.020	0.026	2.055	4.286
B- Foliar applications:												
Without	42.200	43.513	1.879	1.814	10.820	11.100	9.144	10.715	1.199	1.355	42.521	41.973
Yeast extract	44.896	46.325	2.134	2.075	11.521	11.611	9.804	11.424	1.277	1.418	44.572	45.413
Biomagic	45.387	46.800	2.056	1.986	11.636	11.973	9.902	11.620	1.280	1.460	45.295	45.740
L.S.D. 5 %	1.441	1.525	0.139	0.134	0.533	0.533	0.287	0.386	0.010	0.012	2.136	2.537
1 %	1.984	2.100	0.192	0.184	0.735	-	0.395	0.532	0.013	0.017	2.941	-
C- Biofertilizer:												
Without	43.608	44.967	1.980	1.908	11.211	11.410	9.462	11.018	1.235	1.392	43.613	43.456
With	44.714	46.125	2.066	2.008	11.441	11.713	9.772	11.488	1.269	1.429	44.646	45.295
F. Test	**	**	**	**	**	**	**	**	**	**	**	**
D- Interactions:												
A X B	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	**	**	N.S.	N.S.
A X C	**	N.S.	N.S.	N.S.	N.S.	N.S.	*	**	**	**	N.S.	N.S.
B X C	*	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	**	*	N.S.	N.S.
A X B X C	**	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	*	*	*	N.S.

Table (7): Effect of nitrogen fertilizer sources, foliar applications, biofertilizer and their interactions on chemical constituents in seeds during 2004 and 2005 seasons.

Parameters / Treatments	N %		P %		K %		Reducing sugars %		Non-reducing sugars %		Total Sugars %		Carbohydrates %		Protein %	
	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
A- Nitrogen fertilizer sources:																
Chemical fertilizer	3.299	3.480	0.505	0.500	1.522	1.587	3.223	3.637	14.683	15.167	17.907	18.804	52.027	54.017	20.622	21.750
FYM	2.963	3.270	0.387	0.395	1.428	1.440	3.069	3.420	12.750	13.467	15.819	16.887	50.307	51.950	18.521	20.438
Chicken manure	3.128	3.312	0.449	0.496	1.478	1.497	3.282	3.415	13.217	14.050	16.498	17.465	51.375	53.600	19.552	20.701
Compost	2.879	3.202	0.384	0.389	1.324	1.367	3.115	3.447	12.583	13.517	15.698	16.963	49.535	51.932	17.997	20.010
L.S.D. 5 %	0.060	0.032	0.004	0.008	0.035	0.065	0.109	0.082	0.588	0.629	0.636	0.623	1.187	1.361	0.374	0.199
1 %	0.091	0.048	0.006	0.012	0.053	0.098	0.165	0.124	0.890	0.953	0.963	0.944	1.797	2.061	0.567	0.302
B- Foliar applications:																
Without	2.922	3.232	0.414	0.421	1.365	1.411	3.038	3.364	12.200	12.675	15.238	16.039	49.213	51.284	18.260	20.203
Yeast extract	3.122	3.355	0.439	0.456	1.474	1.480	3.219	3.517	13.688	14.363	16.906	17.880	51.511	53.440	19.513	20.969
Biomagic	3.159	3.360	0.441	0.458	1.475	1.526	3.260	3.558	14.037	15.112	17.297	18.670	51.708	53.900	19.745	21.003
L.S.D. 5 %	0.033	0.043	0.004	0.005	0.040	0.031	0.052	0.061	0.418	0.410	0.431	0.403	1.167	1.384	0.204	0.270
1 %	0.045	0.059	0.005	0.007	0.055	0.043	0.071	0.083	0.575	0.565	0.593	0.555	1.607	1.907	0.281	0.372
C- Biofertilizer:																
Without	3.023	3.266	0.424	0.440	1.400	1.446	3.140	3.435	12.908	13.667	16.049	17.102	50.304	52.324	18.892	20.411
With	3.112	3.366	0.439	0.449	1.476	1.499	3.204	3.524	13.708	14.433	16.912	17.957	51.318	53.425	19.453	21.038
F. Test	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
D- Interactions:																
A X B	**	N.S.	**	**	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	**	N.S.
A X C	N.S.	*	**	N.S.	N.S.	N.S.	*	*	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	*
B X C	N.S.	N.S.	N.S.	**	N.S.	N.S.	N.S.	*	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
A X B X C	N.S.	**	*	N.S.	N.S.	N.S.	N.S.	**	N.S.	*	N.S.	N.S.	**	N.S.	N.S.	**

Table (8): Effect of nitrogen fertilizer sources, foliar applications, biofertilizer and their interactions on yield and its components during 2004 and 2005 seasons.

Parameters / Treatments	Fresh pod length (cm)		Fresh pod weight (g)		No. of seeds /pod		Weight of 100 fresh seeds (g)		Weight of 1000 dry seeds (g)		No. of pods/plant		Yield/ Plant (g)		Total green pod yield (tons/fed.)		Total dry seed yield (kg/fed.)	
	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
A- Nitrogen fertilizer sources:																		
Chemical fertilizer	10.308	10.352	6.244	6.420	9.262	9.326	50.314	51.233	342.466	355.926	9.099	9.185	41.320	44.273	4.243	4.521	660.6	699.4
FYM	9.416	9.483	5.920	6.047	9.043	9.107	45.902	47.478	318.307	340.775	8.546	8.737	34.149	38.447	3.465	3.816	563.7	658.0
Chicken manure	9.878	9.934	6.061	6.172	9.178	9.273	49.291	50.920	334.713	349.392	9.048	9.106	35.950	39.604	3.744	3.952	595.6	660.8
Compost	8.701	8.772	5.613	5.828	8.778	8.799	43.626	44.825	308.408	334.920	7.330	7.493	32.624	35.307	3.373	3.660	555.0	623.4
L.S.D. 5 %	0.234	0.288	0.138	0.081	0.194	0.169	0.645	2.267	4.816	3.036	0.462	0.226	0.468	0.464	0.160	0.205	22.3	14.4
1 %	0.355	0.435	0.209	0.122	0.293	0.256	0.977	3.433	7.293	4.598	0.699	0.342	0.709	0.702	0.242	0.311	33.8	21.8
B- Foliar applications:																		
Without	9.093	9.152	5.483	5.540	8.762	8.825	45.571	46.871	318.215	337.700	7.917	8.045	33.219	35.032	3.399	3.504	551.2	606.2
Yeast extract	9.796	9.845	6.203	6.399	9.216	9.271	47.920	49.178	328.500	347.718	8.772	8.904	36.874	41.007	3.840	4.155	615.8	683.6
Biomagic	9.837	9.909	6.194	6.411	9.217	9.283	48.359	49.793	331.205	350.342	8.827	8.942	37.940	42.185	3.880	4.267	614.2	691.4
L.S.D. 5 %	0.147	0.215	0.141	0.168	0.153	0.076	0.565	1.860	5.785	5.393	0.330	0.192	0.321	0.378	0.142	0.099	14.8	16.0
1 %	0.202	0.296	0.194	0.232	0.211	0.104	0.779	2.562	7.968	7.427	0.455	0.264	0.443	0.521	0.196	0.137	20.4	22.0
C- Biofertilizer:																		
Without	9.482	9.533	5.858	6.022	9.013	9.081	46.946	48.187	322.603	342.264	8.394	8.537	35.436	38.520	3.652	3.899	582.9	649.0
With	9.669	9.738	6.062	6.211	9.117	9.172	47.621	49.041	329.344	348.242	8.617	8.723	36.585	40.296	3.760	4.051	604.6	671.9
F. Test	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
D- Interactions:																		
A X B	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	**	**	N.S.	*	N.S.	**
A X C	N.S.	*	**	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	*	**	N.S.	N.S.	**	N.S.	*	**	**
B X C	N.S.	N.S.	*	**	N.S.	N.S.	**	*	N.S.	N.S.	N.S.	**	N.S.	N.S.	N.S.	**	**	N.S.
A X B X C	N.S.	**	N.S.	N.S.	N.S.	N.S.	*	N.S.	N.S.	N.S.	N.S.	*	*	**	**	*	*	**

Table (9): Effect of the interactions among nitrogen fertilizer sources, foliar applications and biofertilizer on fresh and dry yield of pea plants during 2004 and 2005 seasons.

Treatments		Fresh yield (ton / fed)				Dry yield (kg / fed)			
(A) N - sources	(B) Foliar materials	2004		2005		2004		2005	
		(C) Biofertilizer		(C) Biofertilizer		(C) Biofertilizer		(C) Biofertilizer	
		Without	With	Without	With	Without	With	Without	With
Chemical fertilizer	Without	3.823	3.992	3.959	4.112	606.43	622.03	654.85	677.20
	Yeast	4.325	4.494	4.678	4.865	668.50	694.15	691.19	735.21
	Biomagic	4.391	4.434	4.651	4.863	681.91	691.11	697.15	741.15
FYM	Without	3.088	3.265	3.377	3.490	515.16	533.19	593.45	613.28
	Yeast	3.516	3.592	3.849	3.988	574.10	591.11	671.19	684.50
	Biomagic	3.631	3.697	3.978	4.216	579.69	589.19	688.10	697.81
Chicken manure	Without	3.346	3.467	3.411	3.552	547.18	564.33	574.13	599.64
	Yeast	3.894	3.972	4.015	4.217	600.73	641.15	681.74	699.11
	Biomagic	3.874	3.911	4.103	4.416	589.11	631.50	695.10	715.19
Compost	Without	3.018	3.195	3.185	3.244	496.10	525.65	560.76	576.34
	Yeast	3.411	3.512	3.771	3.854	564.74	592.25	641.42	665.11
	Biomagic	3.511	3.592	3.815	4.091	571.41	580.11	638.91	658.25
L.S.D. at 5 % level									
A X B		N.S.		0.198		N.S.		32.07	
A X C		N.S.		0.122		15.67		12.24	
B X C		N.S.		0.106		13.57		N.S.	
A X B X C		0.132		0.211		27.15		21.21	

Table (10): Estimation of net return for treatments.

Treatments			Average pod yield / 2 seasons (tons/fed.)	Treatment cost L.E./fed.	Total costs L.E./fed.	Total gross return L.E./fed.	Net return L.E./fed.	Order
Fertilizer sources	Foliar applications	Biofertilizer						
Chemical fertilizer	Control	Without	3.891	610	2130	3891	1761	24
		With	4.052	710	2230	4052	1822	23
	Yeast extract	Without	4.501	712	2232	4501	2269	20
		With	4.679	812	2332	4679	2347	19
	Biomagic	Without	4.521	1076	2596	4521	1925	22
		With	4.648	1176	2696	4648	1952	21
FYM	Control	Without	3.232	832	2352	6464	4112	16
		With	3.377	932	2452	6754	4302	14
	Yeast extract	Without	3.682	934	2454	7364	4910	7
		With	3.790	1034	2554	7580	5026	5
	Biomagic	Without	3.804	1298	2818	7608	4790	8
		With	3.956	1398	2918	7912	4994	6
Chicken manure	Control	Without	3.378	846	2366	6756	4390	12
		With	3.509	946	2466	7018	4552	9
	Yeast extract	Without	3.954	948	2468	7908	5441	2
		With	4.094	1048	2568	8188	5620	1
	Biomagic	Without	3.988	1312	2832	7976	5144	4
		With	4.163	1412	2932	8326	5394	3
Compost	Control	Without	3.101	1176	2696	6202	3506	18
		With	3.219	1276	2796	6438	3642	17
	Yeast extract	Without	3.591	1278	2798	7182	4384	13
		With	3.683	1378	2898	7366	4468	10
	Biomagic	Without	3.663	1642	3162	7326	4164	15
		With	3.841	1742	3262	7682	4420	11

Note:Treatment costs was estimated according to the following prices: price of N = 2.4 L.E/Kg (ammonium), price of P_2O_5=3.3 L.E/Kg (calcium superphosphate), price of K_2O = 4.4 L.E/Kg (potassium sulphate), FYM= 46 L.E/ton, Chicken manure= 210 L.E/ton, town refuse compost=100 L.E/ton, yeast extract 5.5 L.E/Kg, biomagic=60 L.E/kg, biofertilizer (Rhizobium+Mycorrhiza)=100 L.E/fed., price of product from chemical treatments=1000 L.E/ton and price of product from organic treatments =2000 L.E/ton. Production cost without treatments =1520 L.E/fed.