J. Agric. Sci. Mansoura Univ., 30 (8): 4753 - 4764, 2005

RESPONSE OF ASPARAGUS (*Asparagus officinalis* L.) PLANTS TO SOURCES AND RATES OF ORGANIC FERTILIZATION IN NEWLY RECLAIMED LANDS

Omran, A. E.

Potato and Vegetatively Propagated Crops Dept., Hort. Res. Inst., Agric. Res. Center, Giza, Egypt.

ABSTRACT

This study was conducted at Strawberry Improvement Center, Experimental Farm, Nobaria, El-Behira Governorate during the two successive seasons of 2002/2003 and 2003/2004 on Asparagus plants cv. UC157 to investigate the effect of seven different combinations from farmyard manure (FYM) and chicken manure (CM) on vegetative growth, early and total yield, early and total marketable yield and some chemical constituents in fern and spears.

The study indicates that using 50 m^3/feddan of chicken manure (CM) resulted in significant increments in plant height, number of main and lateral shoots, early and total yield, early and total marketable yield, average spear weight, spear diameter, dry matter of shoots, crowns and roots, TSS and ascorbic acid content in spears and the nitrogen, phosphorus and potassium content in fern and spears. Also, the same treatment showed the lowest values of spear fiber content. However, the lowest values for such studied characters were detected when using 50 m^3 of farmyard manure. The results showed also the gradual increments in vegetative growth characters were recorded by increasing chicken manure rates and decreasing farmyard manure. Results indicate also that, the application of 10 m^3 FYM + 40 m^3 CM increased also spear diameter and nitrogen, phosphorus and potassium content in fern and spears. The highest values of spear fiber content were found in check plants in addition to those fertilized with by 50 m^3 FYM.

The study concluded that it could be enhance vegetative growth characteristics, yield and quality of spears by using 50 m^3 of chicken manure in asparagus plantations mainly for export.

Keywords: Asparagus, (*Asparagus officinalis* L), organic fertilization, vegetative growth, spear diameter, early and total yield, NPK, fibers.

INTRODUCTION

Asparagus (*Asparagus officinalis* L.) is one of the most important vegetable crops grown in Egypt. Asparagus spears are favorite commodity in the European export markets.

Egyptian newly reclaimed lands are suffering from insufficient organic matter content as well as macro and micro-nutrients. So, supplying the soil with organic fertilizers might be a successful tool for improving physical and chemical characters of soil conditions which in turn could induce simulative effect on plant growth and productivity. Also, there is now an augment demand for organically grown food products for both local and export markets, which helps the fast spreading of bio agriculture all over Egypt and other countries. Verlodt and Kamoun (1982) found that organic manure increased vegetative growth characters of tomato plants, i.e., plant height, leaves and branches number, leaf area and dry matter content as well as

early and total yield. In addition, using the organic fertilizers could minimize the environmental pollution and the amount of added mineral fertilizers especially macro and micro nutrients as well as trace elements and to take place in the European market and to have the consumer who is willing to pay high price for a healthy safe products (Yoneyama, 1994). Also, Feher-Barvinko (1995) studied the effect of organic manure sources on the mineral content of Asparagus spears, he found that it enhanced the physical and chemical characteristics of the soil and improved the production. Abdel-Ati (1998) reported that increasing chicken manure application rate increased plant height and number of branches in potato plant. Moreover, Paschold *et al.*, (1999) stated that marketable yield of *Asparagus officinalis* was significantly higher in the soil with the higher organic matter content. Abd Allah *et al.*, (2001a) found that increasing the ratio of chicken manure up to 20 m^3/feddan improved stem height, number of branches/plant, dry matter content of leaves and branches, average pod weight, number pod/plant, total pod yield and TSS in cowpea. Abd Allah *et al.*, (2001b) reported that increasing chicken manure up to 45 m^3/feddan increased TSS and ascorbic acid content in tomato. In another study, Abou-Hussain *et al.,* (2002) declared that using chicken manure (10 m^3/fed.) combined with cattle manure (30 m^3) in sandy soil increased vegetative growth, i.e., plant height, number of leaves and stem fresh weight, dry weight and gave the highest yield of potato crop. Therefore, this study aimed to investigate the response of asparagus plants to sources and rates of organic fertilization in newly reclaimed soil under Nobaria conditions.

MATERIALS AND METHODS

This investigation was conducted at the Experimental Farm of Strawberry and Non Traditional Crops Improvement Center, Nobaria, El-Behira Governorate, during the two successive seasons of 2002/2003 and 2003/2004. The physical and chemical properties of the experimental soil are presented in Table A.

Table (A): Some Physical and Chemical properties of the Experimental soil Location.

Mechanical analysis	Sand %	84.9
	Silt %	11.09
	Clay %	4.11
	Texture grade	Sandy
Chemical Analysis	$CaCO_3$ %	9.71
	Organic matter %	0.10
	pH	7.98
	E.C.	1.81
	N %	0.013
	P %	0.40
	K %	0.57

The experiment was conducted on asparagus plants cv. U.C.157 aged five years under drip irrigation system. The experimental plot contained three rows, where the row was 9 m length and 1.5 m width with 30 cm between plants. Plot area was 40.50 m^2 contained 90 plants. All asparagus vegetative growth (fern) was cut at the soil surface before applying organic manure treatments in December 1st. The experiment included seven treatments representing six combinations of farmyard manure (FYM) and chicken manure (CM) in addition to the control treatment as follows:

1- Control (20 m^3 farmyard manure (FYM) as composted cattle manure + 300 kg ammonium sulfate (20.5 %)/feddan + 300 kg calcium super-phosphate (15.5 %)/feddan + 200 kg potassium sulfate (48 %)/feddan.
2- 50 m^3 FYM + Zero m^3 CM/feddan.
3- 40 m^3 (FYM) + 10 m^3 CM/feddan.
4- 30 m^3 (FYM) + 20 m^3 CM/feddan.
5- 20 m^3 (FYM) + 30 m^3 CM/feddan.
6- 10 m^3 (FYM) + 40 m^3 CM/feddan.
7- Zero m^3 (FYM) + 50 m^3 CM/feddan.

One third of each fertilizer quantities was randomly distributed in a complete randomized block design with four replicates during December 15th after fern removal and the two third of the quantities were added three times per week beginning from February 15th with the first irrigation until late September as extraction. The extract was prepared by using water at rate of /100 liter of water for each 20 kg of the different organic manure combinations and stored for 48 hr. then the extract was injected with the irrigation water. The chemical analysis of used organic fertilizers is shown in Table (B).

Table (B): Chemical analysis of the used organic fertilizers.

Contents	Cattle (FYM)	Chicken (CM)	Contents	Cattle (FYM)	Chicken (CM)
N %	1.65	3.26	Cu (ppm)	36	32
P %	0.51	0.74	Pb (ppm)	4.13	7.11
K %	0.96	1.52	Ni (ppm)	3.22	5.41
Fe (ppm)	3895	4322	E.C.(mmhos)	9.71	9.63
Mn (ppm)	373	211	Ph	7.3	7.65
Zn (ppm)	79	117	Organic matter %	21.2	39.2

The following data were recorded on 10 plants in each replicate as follows:-

Number of early spears/plant (all harvested spears in the first two weeks; from 15th February to 1st March as mentioned by (Ferrari *et al.* 1990), Number of early marketable spears/plant and weight (well formed with compact tips, straight or slightly curved with a diameter, more than 0.8 cm thickness) total spear yield (all harvested spears in each plot from 15th February to 15th May), spear diameter (cm), number of main shoots, number of lateral shoots, plant height were recorded. Dry matter in fern, crown and roots were recorded in grams by drying 100 g. fresh weight in an electrical oven at 70 °C until constant weight. Spear TSS % (determined using Carlzeiss hand refractometer), ascorbic acid (determined using 2.6 di-

chlorophynol indophenol as mentioned by A.O.A.C. (1970) and spear fiber content (determined as Coronnel *et al.* 1976). Mineral contents were estimated as follows:

- The nitrogen content was determined as (g./100 g. DW) according to Jackson (1973) using the micro-Kjeldahl apparatus.
- The phosphorus content was determined calorimetrically as (g./100 g. DW) according to the methods described by Jackson (1967).
- The Potassium content was determined as (g./100 g. DW) by using Atomic absorption spectrophotometer (Berkin Elmer-3300) according to Chapman and Pratt (1961).

All obtained data were statistically analyzed according to Gomez and Gomez (1984) and treatment means were compared according to Duncan (1955).

RESULTS AND DISCUSSION

1- Vegetative growth characters.

It is clear from results presented in Table (1) that the highest values of plant height and number of main and laterals shoots were obtained from plants fertilized by 50 m^3 chicken manure (CM) in the two tested seasons. On the other hand, the lowest values for the recorded characters were shown for those of 50 m^3 FYM without addition of CM in the two tested seasons. Results show also that increasing chicken manure and decreasing FYM rates resulted in gradual increments in plant height, number of main shoots and number of lateral shoots. Similar results were found by Verlodt and Kamoun (1982) who stated that organic manure increased vegetative growth characters of tomato plants i.e., plant height, leaves and branches, number and leaf area. Also Abd Allah *et al.*, (2001a and b) found that organic manure increased vegetative growth characters of cowpea and tomato plants. Such positive response in the recorded vegetative growth characters for chicken manure may be due to its high contents of mineral nutrients, i.e., nitrogen, potassium, phosphorus, iron, zinc and the organic mater percent as compared with farmyard manure as shown in (Table B) and improved the soil texture which encourage the plant to have a good root development by improving the aeration in the soil.

2- Early and total yield.

Generally, results presented in Table (2) and Fig (1 & 2) show that different organic manure rates and sources reflected significant effects on early and total spear yield where, the highest values of early and total yield as well as marketable early and total yield were obtained from plants supplied with 0 m^3 FYM + 50 m^3 CM in the two tested seasons. No significant differences in total and marketable yield were detected between 0 m^3 FYM + 40 m^3 CM and those 0 m^3 FYM + 50 m^3 CM. Results show also that adding 50 m^3 FYM only resulted in significant decrements in early and early marketable yield as well as total and total marketable yield. The differences in early marketable yield between plants supplied with 50 m^3 FYM + 0 m^3 CM and those of 40 m^3 FYM + 10 m^3 CM were not significant.

Table (1): Effect of different organic manure rates and sources on plant height, number of main shoots and number of lateral shoots in 2002/2003 and 2003/2004 seasons.

Treatments	Plant height		Number of main shoots		Number of lateral shoots	
	2002/2003	2003/2004	2002/2003	2003/2004	2002/2003	2003/2004
Control	130.0d	130.3c	18.52d	23.15cd	371.8d	534.0de
50 m^3 FYM + 0 m^3 CM	124.2e	123.3d	12.48e	18.20d	203.4e	389.3e
40 m^3 FYM + 10 m^3 CM	129.9d	132.9bc	13.07e	19.08d	211.9e	420.8d
30 m^3 FYM + 20 m^3 CM	130.8cd	134.5bc	19.90cd	26.23c	361.6d	629.1d
20 m^3 FYM + 30 m^3 CM	133.8c	136.6b	23.05c	31.58b	520.5c	913.1c
10 m^3 FYM + 40 m^3 CM	139.9b	143.7a	28.30b	37.85a	815.7b	1400.0b
0 m^3 FYM + 50 m^3 CM	143.2a	148.9a	34.17a	42.70a	1157.0a	1618.0a

Means followed by the same letter's within each column are not significantly differ from each other according to Duncan's multiple range at 0.5 % level. FYM = Farmyard manure. CM = Chicken manure.

Table (2): Effect of different organic manure rates and sources on early yield, early marketable yield, total yield and total marketable yield in 2002/2003 and 2003/2004 seasons.

Treatments	Early yield (g/plant)		Early marketable yield (g/plant)		Total yield (g/plant)		Total marketable yield (g/plant)	
	2002/2003	2003/2004	2002/2003	2003/2004	2002/2003	2003/2004	2002/2003	2003/2004
Control	75.05d	77.70d	53.78e	52.00d	303.60c	323.00c	201.40c	203.80c
50 m^3 FYM + 0 m^3 CM	58.13f	56.58f	40.60f	41.15e	266.10d	263.50e	154.40e	155.50e
40 m^3 FYM + 10 m^3 CM	63.75e	64.22e	43.40f	43.35e	294.10c	298.20d	172.80d	173.50d
30 m^3 FYM + 20 m^3 CM	79.18d	79.88cd	64.40d	64.38c	330.00b	336.40bc	203.00c	202.00c
20 m^3 FYM + 30 m^3 CM	84.13c	84.57c	72.93c	71.85b	344.90b	344.20b	220.00b	221.00b
10 m^3 FYM + 40 m^3 CM	96.47b	94.77b	83.32b	84.20a	396.50a	398.80a	268.40a	271.20a
0 m^3 FYM + 50 m^3 CM	101.70a	105.60a	89.40a	90.45a	402.80a	403.90a	274.00a	274.10a

Means followed by the same letter's within each column are not significantly differ from each other according to Duncan's multiple range at 0.5 % level.
FYM = Farmyard manure. CM = Chicken manure.

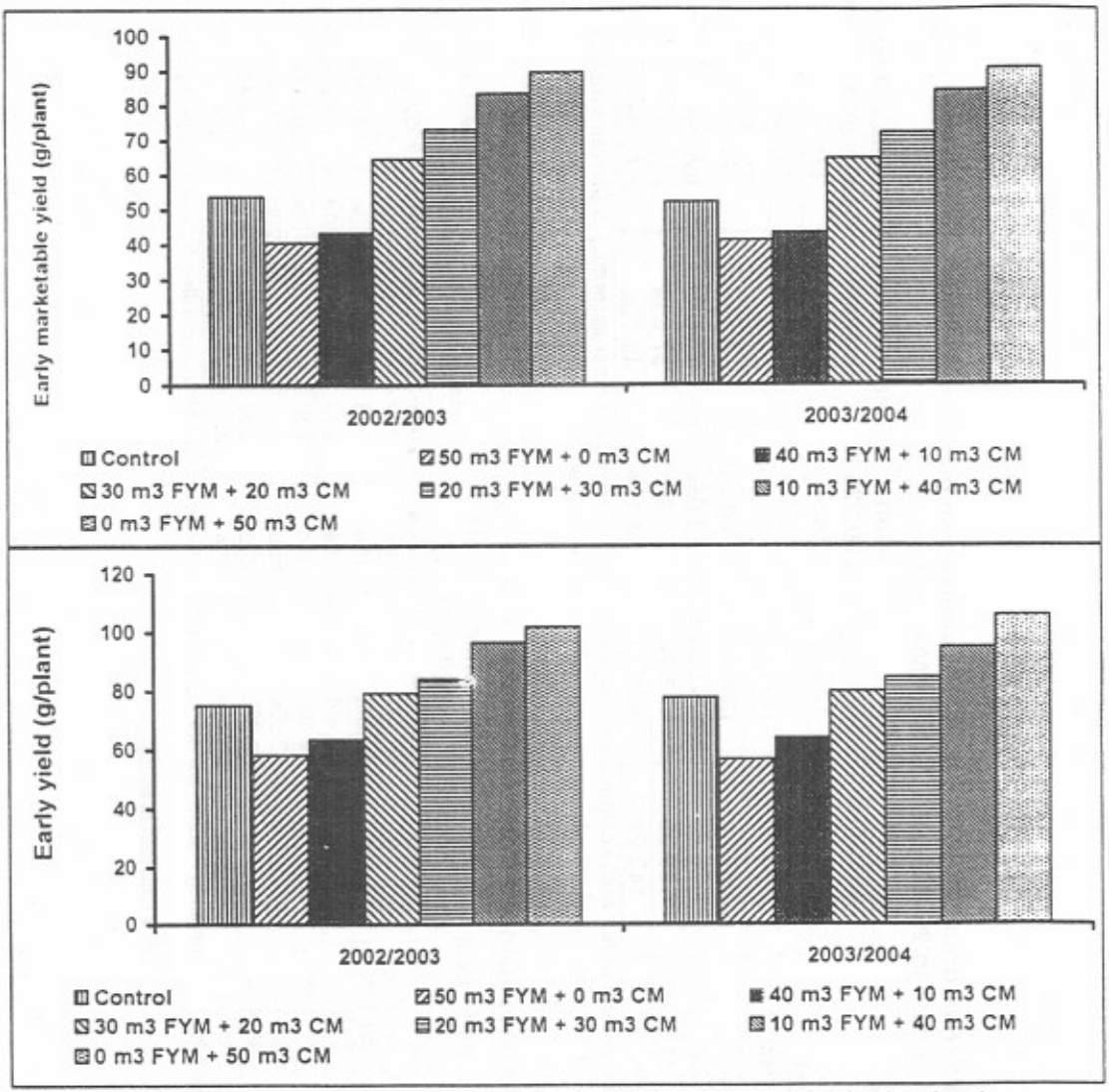

Fig. (1): Effect of different organic manure rates and sources on early yield (g/plant) and early marketable yield (g/plant) in 2002/2003 and 2003/2004 seasons.

FYM = Framyard manure. CM = Chicken manure.

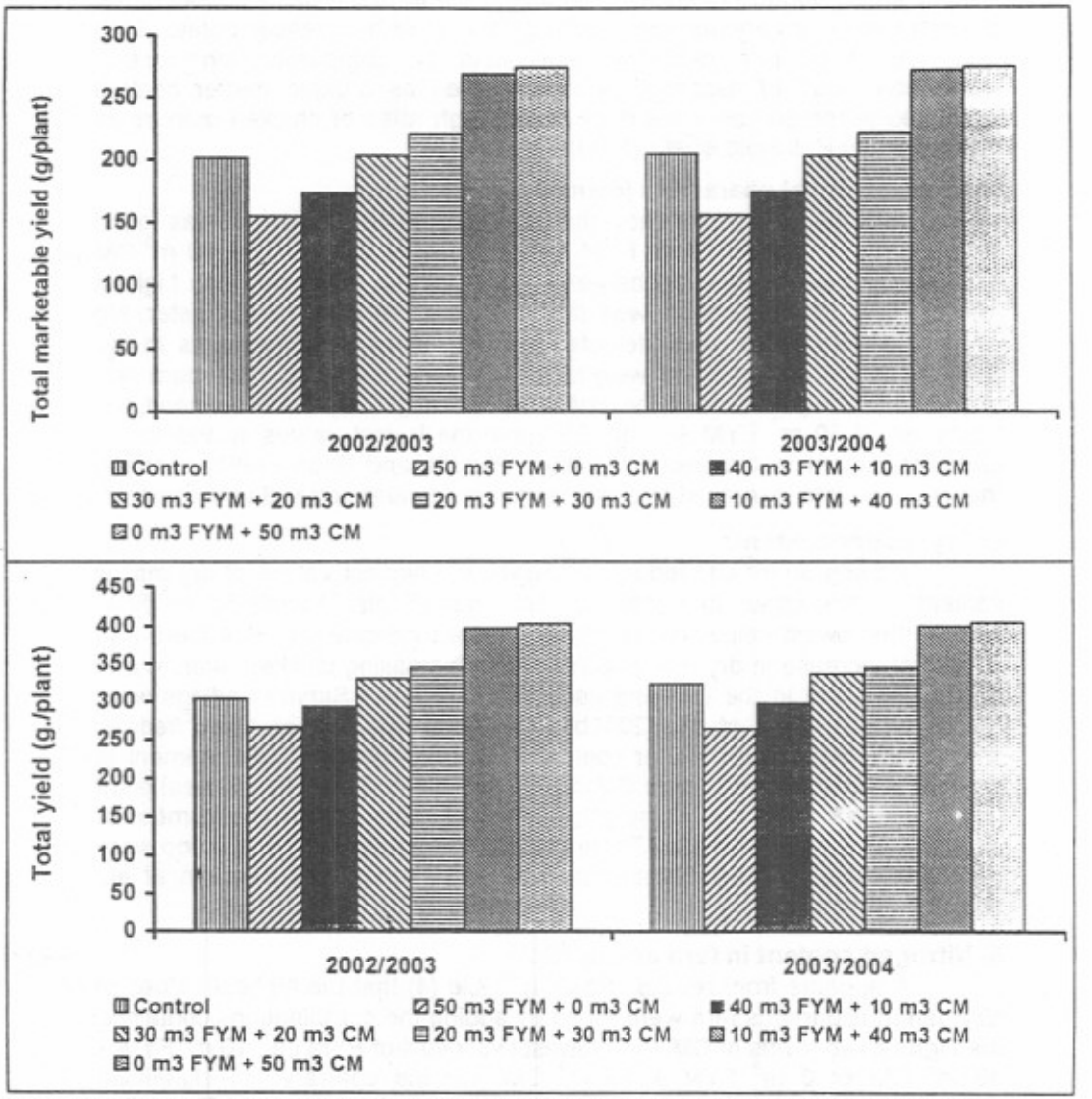

Fig. (2): Effect of different organic manure rates and sources on total yield (g/plant) and total marketable yield (g/plant) in 2002/2003 and 2003/2004 seasons.

FYM = Framyard manure. CM = Chicken manure.

Increasing early and total yield of asparagus due to high chicken manure rate might be due to maximizing growth rate which affected positively stored food in the roots and crowns during summer period. Similar results were found by Verlodt and Kamoun (1982) and Abou Hussein *et al.* (2002) who found that chicken manure as dry manure or extracted after 48 h increased potato yield.

FYM manure decrease total yield as compared with control. Marketable yield of asparagus was increased as organic matter content increased in the soil as a result of adding high rates of chicken manure as mentioned by Paschold *et al.*, (1999).

3- Spear physical characters (diameter and weight).

In Table (3) results show that the highest spear diameter was found by the combinations of 10 m^3 FYM + 40 m^3 CM or 0 m^3 FYM + 50 m^3 CM without significant difference between them. On the other side, the highest rate of FYM 50 m^3 only showed the lowest values of spear diameter. No significant differences were detected among most used treatments in the second season. As for spear weight, results indicate that the maximum rate of CM 50 m^3 only resulted in the highest spear weight. On the other hand, the treatment of 50 m^3 FYM + 0 m^3 CM gave the lowest values in addition to check treatment in the second season. Pandita and Bhan (1992) reported that spear weight increased by using farmyard manure and soil amendments.

4- Dry matter content.

Adding 50 m^3 CM/feddan only gave the highest values of dry matter content in fern, crown and roots of asparagus (Table 3) while 50 m^3 FYM showed the lowest values of dry matter. Results indicate also that there was a gradual increase in dry matter content with increasing chicken manure and decreasing FYM in the different used combinations. Similar findings were found by Abd Allah *et al.*, (2001b) who found that CM at 45 m^3/feddan showed the highest dry matter content in tomato hybrids. The increment in dry matter content due to high CM rates could be attributed to the ideal plant growth as reflected by plant height, number of main shoots and number of lateral shoots as indicated in Table (1). Similar results on potato crop were concluded also by Verlodt and Kamoun (1982) and Abou Hussein *et al.*, (2002) on tomato.

5- Nitrogen content in fern and spear.

It appears from results shown in Table (4) that the highest values of nitrogen in asparagus fern were found by adding the combinations contained the highest two levels of CM + the lowest two levels of FYM i.e., 10 m^3 FYM + 40 m^3 CM or 0 m^3 FYM + 50 m^3 CM. On the contrary, no significant differences were detected among all other tested treatments. Regarding spear nitrogen content as affected by different organic sources and rates, results in Table (4) indicate that no significant differences were found among the tested treatments. Results show also that control plants showed the lowest values of nitrogen in fern and spears. The results of Feher Barvinko (1995) confirm our results, he mentioned that adding organic manure improved the physical and chemical characteristics of sandy soils in Hungary for asparagus production.

Table (3): Effect of different organic manure rates and sources on spear diameter, average spear weight, dry matter of fern, dry matter of crowns and dry matter of roots in 2002/2003 and 2003/2004 seasons.

Treatments	Spear diameter (cm)		Average spear weight (g.)		Dry matter of fern (%)		Dry matter of crowns (%)		Dry matter of roots (%)	
	2002/2003	2003/2004	2002/2003	2003/2004	2002/2003	2003/2004	2002/2003	2003/2004	2002/2003	2003/2004
Control	1.25de	1.20d	15.15d	15.20e	23.05cd	25.70d	20.30d	22.60d	81.53d	84.57d
50 m^3 FYM + 0 m^3 CM	0.95f	1.00d	14.55e	14.85f	18.15e	20.23e	14.27e	16.73f	69.70e	71.00e
40 m^3 FYM + 10 m^3 CM	1.03ef	1.08d	15.45cd	15.25de	21.75d	23.98d	18.33d	19.80e	73.00e	75.50e
30 m^3 FYM + 20 m^3 CM	1.30cd	1.33cd	15.65c	15.57cd	22.67d	25.65d	20.53d	24.25cd	81.45d	84.20d
20 m^3 FYM + 30 m^3 CM	1.53bc	1.63bc	15.70c	15.73c	22.88c	28.75c	23.00c	25.70c	95.45c	97.88c
10 m^3 FYM + 40 m^3 CM	1.78ab	1.83ab	16.15b	16.15b	29.85b	34.13b	27.52b	29.73b	102.80b	104.40b
0 m^3 FYM + 50 m^3 CM	2.00a	2.10a	17.55a	17.15a	36.35a	39.35a	31.20a	34.28a	111.40a	116.60a

Means followed by the same letter's within each column are not significantly differ from each other according to Duncan's multiple range at 0.5 % level.

FYM = Farmyard manure. CM = Chicken manure.

Table (4): Effect of different organic manure rates and sources on nitrogen, phosphorus and potassium on fern and spear in 2002/2003 and 2003/2004 seasons.

Treatments	Fern						spear					
	N. (%)		P. (%)		K. (%)		N. (%)		P. (%)		K. (%)	
	2002/2003	2003/2004	2002/2003	2003/2004	2002/2003	2003/2004	2002/2003	2003/2004	2002/2003	2003/2004	2002/2003	2003/2004
Control	2.18d	2.20cd	0.858bc	0.820de	2.18c	3.00bc	1.03b	1.50cd	0.468d	0.440cd	0.178c	0.185b
50 m^3 FYM + 0 m^3 CM	2.10d	2.15d	0.810cd	0.800e	2.10c	2.95c	1.03b	1.33e	0.403e	0.408e	0.188bc	0.180b
40 m^3 FYM + 10 m^3 CM	2.25cd	2.33b-d	0.803d	0.820de	2.25bc	2.95c	1.02b	1.43de	0.570c	0.413de	0.188bc	0.180b
30 m^3 FYM + 20 m^3 CM	2.20cd	2.23cd	0.843b-d	0.838cd	2.20bc	3.00bc	1.04b	1.55b-d	0.600b	0.430c-e	0.198ab	0.193ab
20 m^3 FYM + 30 m^3 CM	2.35c	2.43bc	0.833cd	0.850c	2.35bc	3.03bc	1.20a	1.65a-c	0.598b	0.460c	0.203ab	0.198ab
10 m^3 FYM + 40 m^3 CM	2.68a	2.53ab	0.885ab	0.888b	2.53ab	3.28ab	1.23a	1.70ab	0.645ab	0.560b	0.203ab	0.198ab
0 m^3 FYM + 50 m^3 CM	2.78a	2.70a	0.913a	0.928a	2.78a	3.38a	1.25a	1.73a	0.660a	0.583a	0.205a	0.210a

Means followed by the same letter's within each column are not significantly differ from each other according to Duncan's multiple range at 0.5 % level.

FYM = Farmyard manure. CM = Chicken manur

6- Phosphorus content in fern and spears.

Results in Table (4) indicate that there was significant increase in phosphorus spear content when 50 m^3 CM were applied as compared with control while no significant differences were detected among the other tested treatments. As for phosphorus content in fern, results showed that the applications of 10 m^3 FYM + 40 m^3 CM and 0 m^3 FYM + 50 m^3 CM increased significantly phosphorus content in fern than the other tested treatments, while no significant differences were found among all other tested combinations.

7- Potassium content.

It appear from results shown in Table (4) that the highest potassium content in spears and fern was found by using 50 m^3 CM. Results indicate also that decreasing CM and increasing FYM rates results in decreasing potassium content in spears and fern.

The increments of nitrogen, phosphorus and potassium content in plants fertilized by 50 m^3 CM may be due to the source of organic manure i.e., CM which had high levels of NPK as detected in Table (B) and reflected high contents of such minerals in the fern and spears as one of the major quality components of asparagus spear.

8- Total soluble solids, ascorbic acid and fiber content in spears.

Results In Table (5) show clearly that the addition of 50 m3 CM resulted in significant increments in total soluble solids as well as ascorbic acid content in spears as compared with check plants or those treated with 50 m^3 FYM only results show also that no clear differences were detected among the other used combinations. Similar results were found by Abd Allah *et al.*, (2001 a & b) who found that 20 m^3 and 45 m^3 CM/feddan increased TSS and ascorbic acid in cowpea and tomato.

In Table (5), fiber content increased significantly in check treatment and spears supplied with 50 m^3 FYM only. On the other hand, the lowest fiber content was found in spears fertilized with 50 m^3 CM only the other tested combinations showed medium values.

Table (5): Effect of different organic manure rates and sources on TSS, ascorbic acid and spear fiber content in 2002/2003 and

Treatments	TSS (%)		Ascorbic acid content		Spear fiber content	
	2002/ 2003	2003/ 2004	2002/ 2003	2003/ 2004	2002/ 2003	2003/ 2004
Control	5.25de	5.38b-d	31.53de	32.45c	0.908ab	0.875ab
50 m^3 FYM + 0 m^3 CM	5.10e	5.13d	31.03e	30.83d	0.915a	0.898a
40 m^3 FYM + 10 m^3 CM	5.40cd	5.30cd	31.98de	32.47c	0.890bc	0.873ab
30 m^3 FYM + 20 m^3 CM	5.50cd	5.45bc	32.55cd	33.03bc	0.880cd	0.848bc
20 m^3 FYM + 30 m^3 CM	5.60bc	5.63b	33.55bc	33.95bc	0.873cd	0.843c
10 m^3 FYM + 40 m^3 CM	5.80b	5.68b	34.00b	34.47b	0.863d	0.840c
0 m^3 FYM + 50 m^3 CM	6.05a	6.10a	35.42a	36.72a	0.828e	0.810d

Means followed by the same letter's within each column are not significantly differ from each other according to Duncan's multiple range at 0.5 % level.
FYM = Farmyard manure. CM = Chicken manure.

The obtained results indicate the favorable effect of chicken manure on asparagus productivity. This results might be due to the role of organic manure for continuous supply of nutrients.

REFERENCES

Abd-Alla, A. M.; S. M. Adam and A. F. Abou-Hadid (2001a): Productivity of green cow pea in sandy soil as influenced by different organic manure rates and sources. Egypt. J. Hort. 28, No.(3) 331-34.

Abd-Alla, A. M.; S. M. Adam and A. F. Abou-Hadid (2001b): Response of some tomato hybrids to the organic fertilizer under newly reclaimed soil conditions. Egypt. J. Hort. 28, No.(3) 341-353.

Abdel-Ati, Y. Y. (1998): Yield and quality of potato as affected by phosphorus, chicken manure and seed tuber size. Assiut J. Agricultural Sciences. 29 (5), 129.

Abou-Hussein, S.D.; I. El-Oksh; T. El-Shorbagy and U. A. El-Bahiry (2002): Effect of chicken manure, Compost and Biofertilizers on vegetative growth, Tuber characteristics and yield of potato crop. Egypt. J. Hort. 29, No.1 pp.135-149.

Association Of Official Agricultural Chemists (A.O.A.C) (1970): "Official Methods Of Analysis" Benjamin Franklin Station, Washington, D.C., U.S.A., 495-510.

Chapman, H. D. and F. Pratt (1961): "Methods of Analysis for Soil, Plant and Water". Calif., Univ. USA.

Coronnel, J. S.; G. Vest and R. C. Herner (1976): Distribution of fiber content in asparagus cultivars. HortScience. 11 (2): 149-151.

Duncan, D. B. (1955): Multiple range and multiple F. tests. Biometrics, 11: 1-42.

Feher-Barvinko, E. (1995). Changes in the nutrient contents of asparagus (*Asparagus officinalis* L.) and soil under the influence of various materials. Acta-Agronomica-Hungarica. 43: 3-4, 277-288. (CAB Abst. 1996-1998).

Ferrari, V.; N. Acciarri; N. Ficcodenti and S. Porcelli (1990): Results of plant density on quantity and quality of early yield in green asparagus. Acta Hort. 271: 243-248.

Gomez, K. A. and A. A. Gomez (1984): Statistical procedures for Agricultural Research. P. 680. 2nd Ed. Jhon Wiley and Sons. Inc. New York.

Jackson, M. L. (1967): Soil Chemical Analysis. Prentice-Hall of India pp.144-197.

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

Pandita, P. N. and M. K. Bhan (1992): Effect of soil amendment on the yield of *Asparagus officinalis* L. Indian Journal of Physiology. 35: 3, 262-264.

Paschold, P. J.; B. Artelt and G. Hermann (1999): Influence of catch crops on leaching, yield and quality of white asparagus (*Asparagus officinalis* L.). Acta. Horticulturae 479, 439-445.

Verlodt, H. and S. Kamoun (1982): The influences of bag size and the addition of rotted FYM on a tomato crop in growing bags on a substrate of marine grass posidnia oceanica (1). Acta Hort. 126, 263-268.

Yoneyama, S. (1994): Organic farming: Japanese farmers. Searched for survival strategy. Proceedings of the Tenth International organic Agriculture, Lincoln University New Zealand, 11-16 December. (CAB Abst.1998-2000)

استجابة نباتات الأسبرجس لمصادر ومعدلات التسميد العضوى فى الأراضى المستصلحة الجديدة

أبو العز عيسى عمران

قسم البطاطس والتكاثر الخضرى – معهد بحوث البساتين – مركز البحوث الزراعية – الجيزة - مصر

أجريت هذه الدراسة فى المزرعة البحثية لمركز تنمية الفواكة والمحاصيل غير التقليدية التابعة لكلية الزراعة جامعة عين شمس بالنوبارية خلال الموسمين ٢٠٠٢/٢٠٠٣، ٢٠٠٣/٢٠٠٤ على نباتات الأسبرجس صنف (يو سى ١٥٧) بهدف دراسة تأثير سبعة معاملات تشمل تراكيب مختلفة من سماد مخلفات حيوانات المزرعة المتحلل القديم وسماد الدواجن على صفات النمو الخضرى والمحصول المبكر والكلى والمحصول القابل للتسويق وبعض المكونات الكيماوية فى الأفرع والمهاميز فى الاسبرجس.

وقد أوضحت النتائج أنه تم الحصول على أعلى ارتفاع للنبات وعدد الأفرع الرئيسية والفرعية، المحصول الكلى والمبكر ومتوسط وزن المهماز وسمك المهماز والمادة الجافة للأفرع والتيجان والجذور ومحتوى المهاميز من المواد الصلبة الذائبة الكلية وحمض الأسكوربيك ومحتوى الأفرع والمهاميز من النيتروجين والفوسفور والبوتاسيوم واقل محتوى من الألياف عند التسميد بمعدل ٥٠ م^3 سماد دواجن خلال موسمى الدراسة بينما كانت أقل القيم لهذه الصفات عند إضافة ٥٠ م^3 من سماد مخلفات حيوانات المزرعة فقط بدون إضافة سماد الدواجن وكان هناك زيادة تدريجية فى صفات النمو الخضرى المدروسة بزيادة سماد الدواجن ونقص سماد مخلفات حيوانات المزرعة. كما أظهرت نتائج الدراسة أن استخدام ١٠ م^3 سماد مخلفات حيوانات المزرعة بالإضافة إلى ٤٠ م^3 سماد دواجن أو ٥٠ م^3 سماد دواجن فقط أعطت أعلى القيم لسمك المهماز ومحتوى الأفرع والمهاميز من النيتروجين والفوسفور والبوتاسيوم. وأشارت النتائج إلى أن أعلى محتوى من الألياف فى المهاميز وجدت فى معاملتى المقارنة و ٥٠ م^3 من سماد مخلفات حيوانات المزرعة بدون فرق معنوى بينهما.

وتجمل الدراسة أنه يمكن تحسين صفات النمو الخضرى ومحصول وجودة مهاميز الاسبرجس باستخدام ٥٠ م^3 سماد دواجن خاصة عند التصدير.