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COMPARATIVE STUDIES OF ORGANIC MANURES, FAST AND SLOW-RELEASE NITROGEN FERTILIZERS ON GROWTH, YIELD, QUALITY AND CHEMICAL COMPOSITION OF CABBAGE

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ABSTRACT: Two field experiments were conducted at the experimental Farm of the Faculty of Agriculture, Moshtohor, Zagazig University during the winter seasons of 2000 / 200a and 2001 / 2002, to study the effect of organic manures (chicken, biogas and FYM), fast (Ammonium nitrate) and slow-release N-fertilizer (insiabeen) on vegetative growth, head physical characters, yield, quality and chemical composition of cabbage. Obtained results could be summarized as follows:

- **Applying chicken manure followed by biogas manure were the most effective treatments which resulted in the highest values in both growing seasons of growth parameters of cabbage plants (plant height, stem length and diameter, fresh weight of stem, leaves /plant and total plant as well as the dry matter of leaves), head physical characteristics (head length diameter, number and weight of un-wrapped leaves/plant and ediple head weight), total yield / fed. as well as chemical composition or nutritive value of cabbage head (nitrogen percentage, uptake, NO_3-N and nitrogen use efficiency (NUE), P, K percentage and uptake, Zn and Mn content, total protein, carbohydrates and T.S.S. percentage).**
- **Moreover, the use of ammonium nitrate resulted in the best values of most studied characters than insiabeen or FYM.**

INTRODUCTION

Cabbage *(Brassica oleraceae var. capitata, L.)* is a popular winter vegetable crop in Egypt. The local adapt cabbage cultivar called Balady Mohassan is generally desirable to Egyptian consumers. There is a great attention to the use of bioagriculture in cabbage production, by using organic fertilizers, in order to improve plant growth and yield through its effect on physical, chemical and biological properties of the soil and also to reduce the consumption of mineral fertilizers and minimize its hazard effect.

Organic manures such as chicken, biogas and FYM have a considerable effect on plant growth characters (Almazov and Kholuyako, 1990 and El-Shimi, Nahed 1998 on cabbage), head physical characters and total yield (Arenfalk and Hagelskier, 1995; Warman and Harvard, 1996 and Dixit, 1997 on cabbage), head minerals content (Rubeiz *et al.*, 1993 and El-Shimi, Nahed, 1998 on cabbage, El-Kassas *et al.*, 1997 and Osman, Fatma, 2004 on sweet pepper) and cabbage head nutritive value (Edmond *et al.*, 1981).

Inorganic nitrogen fertilizers (fast minerals fertilizers) such as ammonium nitrate, 33.5% N as conventional fertilizer is one of the major one that affect on growth, yield and quality of cabbage crop.

Recently, improvement of N-fertilizer recovery through control of nutrient transformation process in soil can be achieved by using slow - release nitrogen fertilizer, i.e Insiabeen (ureaform, 40% N) which have many advantages including : a) less toxicity during germinating seedlings, b) reducing N-loss by leaching and runoff, c) more uniform growth through the season without repeated nitrogen application, d) greater effectiveness per unit of applied nitrogen, Awad *et al.* 1990, El-Sherbieny *et al.*, 1990, Osman, Fatma *et al.*, 1998 and Osman Fatma, 2004).

In this respect, many investigators studied the effect of conventional N fertilizer, i.e ammonium nitrate or slow-release N fertilizer, i.e insiabeen (ureaformaldehyde) (Dixit, 1997; El-Shimi, Nahed, 1998 and El-Shabrawy *et al.*, 1999 on cabbage, El-Kassas *et al.* 1997 and Osman,

Fatma, 2004 on sweet pepper, El-Sherbieny *et al.*, 1990 on lettuce).

This study aimed to investigate the effect of organic N-fertilizers (organic manures), i.e., chicken, biogas and FYM) and fast N-fertilizer (inorganic-fertilizers) i.e., ammonium nitrate as traditional mineral fertilizer and Insiabeen (ureaform) as slow-release N-fertilizer, on the growth, head characters and total yield and head chemical composition and nutritive value of cabbage.

MATERIALS AND METHODS

Two field experiments were carried out at the Experimental Farm of the Faculty of Agriculture, Moshtohor, Zagazig University during 2000/2001 and 2001/2002.

The treatments were:

1- Chicken manure
2- Biogas manure
3- Farmyard manure
4- Ammonium nitrate as conventional N-fertilizer
5- Insiabeen as slow released N-fertilizer.
6- Untreated plants as control

The physical and chemical properties of the experimental soil and the organic manure tested were tabulated in Tables 1 and 2 respectively.

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

Particle size distribution:	
Coarse sand %	8.00
Fine sand %	10.60
Silt %	35.00
Clay %	40.40
Textural class	Clay loam
pH (1:2.5 suspevsion)	7.90
E.C. (1:5)	0.18
$CaCO_3$ %	2.3
Soluble ions (meq/l)	
Na^+	2.35
K^+	0.60
Ca^{++}	1.30
Mg^{++}	0.98
HCO_3^-	2.10
Cl^-	0.40
$SO_4^=$	2.73
Available N (ppm)	
NH_4-N	600
NO_3-N	250

Seeds of c.v. Balady Mohassan were sown on July 25th in both seasons and transplanted in September 25th and 19th at 2000 and 2001, respectively.

A complete randomized block design with four replicates was adopted. The plot area was 11.2m^2. Each plot consisted of 4 ridges (3.5m length and 80 cm wide). The transplants were spaced at 50 cm

Table (2): Chemical properties and the application rate of organic manures used in the experiment.

Parameters	Chicken manure		Biogas manure		FYM	
	Season					
	1st	2nd	1st	2nd	1st	2nd
N%	2.00	2.20	1.45	1.55	0.99	1.10
P%	0.80	0.92	0.89	0.95	0.66	0.68
K %	1.20	1.30	1.00	1.20	0.85	0.90
Zn (ppm)	1.27	1.29	1.25	1.20	1.40	1.64
Mn (ppm)	4.57	4.64	4.55	4.60	3.42	3.71
Organic matter %	40.60	44.70	60.73	59.30	13.40	13.90

Table (3): The quantity of organic and inorganic fertilizers needed to form the total N-fertilizer as 80 Kg / fed.

Inorganic fertilizer			Organic fertilizers						
N-rate Kg/fed	Kind of fertilizer	Fertilizer Kg/fed	N-rate Kg/fed	Chicken manure Kg/fed		Biogas manure Kg/fed		FYM Kg/fed	
				1st	2nd	1st	2nd	1st	2nd
80	Ammonium nitrate	238.81	80	4000.00	3636.36	5517.24	5161.29	9411.76	8888.89
80	Insiabeen	200.00							

apart on one side of the ridge. A guard ridge was left between the treatments.

All the different N-sources were reached to the standard level of cabbage N-fertilization, i.e. 80 Kg N/fed., unless the control treatment.

Organic manures were added to the soil and left two weeks before transplanting. Each of ammonium nitrate and Insiabeen were added as single application at transplanting time.

The amount of organic fertilizer was applied based on the total nitrogen percentage in each manure to provide 80 kg N/fed. shown in Table (3).

Phosphorus and potassium fertilizers were added, 48 Kg P_2O_5 as calcium superphosphate (15% P_2O_5) and 24 Kg K_2O as potassium sulphate (48% K_2O) per feddan at two equal portions after 4 and 8 weeks from transplanting.

All other agricultural practices were carried out as commonly followed in the district.

Data recorded:

120 days after transplanting, five plants from each experimental plots were randomly taken to measure the following characters: vegetative growth, i.e. Plant height (cm), stem length and diameter (cm), fresh weight of stem, leaves / plant and total plant weight as well as the dry matter of leaves (%). Head physical characters, i.e. head length diameter and circumference (cm), No. and weight of un-wrapped leaves / plant (Kg), Ediple head weight (Kg) and total yield (ton / fed.)

Chemical composition of plant leaves:

Total N, P and K were determined in plant leaves according to Bremner and Mulvaney (1982), Olesen and Sommers (1982) and Jakson (1970), respectively.

Total protein by multiplying N-values by 6.25, zinc and manganes as Raw (1973), No_3-N content as Singh (1988), total carbohydrates (Michel *et* al (1956) and T.S.S. A.O.A.C. (1970).

Nitrogen Use Efficiency (NUE):

It was determined according to the equation of Craswell and Godwin (1984) as follow:

$$NUE = \frac{\text{Yield of fertilized} - \text{yield of control}}{\text{Fertilizer N applied}} \text{ Kg yield/KgN}$$

Statistical analysis:

All obtained data were subjected to statistical analysis at

the level of 0.05 L.S.D. according to Gomez and Gomez (1983).

RESULTS AND DISCUSSION

1-Vegetative growth characteristics:

Data in Table (4) show that all used treatments of organic manures and inorganic nitrogen fertilizers, significantly increased cabbage plants growth over the control Such data indicate that fertilizing of cabbage plants using 80 Kg N/fed. supplied from chicken manure followed by biogas manure showed significant increments for all studied plant growth characters as compared with the control or the other used treatments in both growing seasons of this trial. It was also obvious that, applying ammonium nitrate was more effective than Insiabeen for all growth parameters of cabbage plants in both growing seasons.

Organic manures such as chicken, biogas and FYM contribute to plant growth through improving the physical and chemical soil characteristics, i.e. bulk density, hydraulic conductivity, soil strength, available water content, pH value, organic matter content and the released content of available nutrients, i.e., N, P, K, Fe, Mn, Zn, as well as, it extends to plant content of these nutrients (El-Sayed *et al.*, 2002).

In this respect, application of chicken manure was very important for the previous estimated plant parameters, where the superiority of the applied amendments were in the descending order chicken manure > biogas > FYM. This is mainly due to the relatively high contents of both organic matter content and essential macro and micro nutrients of chicken manure as compared to the other used ones. Also, application of biogas manure increased organic matter content and incorporated high-levels of organic carbon and nitrogen in the soil and this led to increase plant growth (El-Shimi *et al.*, 1987 and El-Sayed *et al.*, 2002.

In this concern, the superiority of each chicken and biogas manures compared with FYM may be due to the complete decomposition of organic matter of both and release nutrients in the available form, than FYM (Tahoun *et al.*, 2000 and Awad *et al.*, 2003). Similar results were obtained by Almazov and Kholuyako, 1990 on cabbage.

Regarding the best values of ammonium nitrate than Insiabeen (ureaform) of all studied growth

Table (4): Effect of organic and inorganic nitrogen fertilization on the vegetative growth characteristics of cabbage plant.

Season	2000/2001							2000/2001						
Characters / Treatments	Plant height (cm)	Stem length (cm)	Stem diame-ter (cm)	Fresh weight (Kg)			Dry matter of leaves (%)	Plant height (cm)	Stem length (cm)	Stem diame-ter (cm)	Fresh weight (Kg)			Dry matter of leaves (%)
				Stem	Leaves	Plant					Stem	Leaves	Plant	
Control	63.62	21.50	6.66	0.600	4.125	4.725	8.64	67.80	19.26	6.80	0.610	4.690	5.300	8.80
Chic*. M	80.12	25.62	7.66	0.975	7.650	8.625	11.14	83.88	24.77	7.90	1.000	8.220	9.220	11.92
B.**M	78.25	25.12	7.44	0.850	7.150	8.000	10.81	80.00	24.62	7.65	0.909	7.600	8.509	10.99
FYM***	75.25	23.87	7.23	0.700	5.885	6.585	9.56	74.70	21.25	7.26	0.800	6.300	7.100	9.96
In.****	73.37	23.25	7.26	0.738	6.494	7.232	9.93	75.13	21.63	7.45	0.790	7.010	7.800	10.28
Amm.N.*****	76.75	24.62	7.36	0.775	7.075	7.850	10.01	77.80	23.62	7.47	0.840	7.21	8.050	10.78
L.S.D. at 0.05	1.64	0.77	0.27	0.02	0.11	0.09	0.31	1.16	0.02	0.27	0.03	0.13	0.02	0.22

* Chicken manure ** Biogas manure *** Farmyard manure **** Insiabeen *****Ammonium nitrate

characters of cabbage plants as shown in Table (4), this may be due to the release of ureaform nitrogen is dependent on the same soil factors which regulate plant growth, i.e. temperature, moisture, pH, other fertilizer nutrients, microbial activity and aeration which means that the nitrogen release is coordinated with plant growth requirements (Hegazy, 1985). Many investigators reported that, the best fertilizers for short period crops like cabbage were the conventional fertilizers, such as ammonium nitrate, whereas the controlled release fertilizers did not increase nitrogen absorption during late growth (Lorenz *et al.*, 1972 and Balba and Sheta, 1973).

These results were coincided with those reported by El-Shimi, Nahed, 1998 and El-Shabraway *et al.*, 1999 on cabbage and El-Sherbieny, *et al.*, 1990 on lettuce.

2-Head physical characteristics and total yield:

Data presented in Table (5) illustrate that head physical characteristics expressed as head length, diameter and circumference, un-wrapped leaves number and weight per plant, edible head weight and total yield per feddan were significantly increased by using organic N-fertilizers, such as chicken, biogas and FYM or inorganic, i.e., ammonium nitrate or Insiabeen compared with the control. Chicken manure followed by biogas manure recorded the highest values in all measured characters of both seasons. The relative increase of yield by using chicken or biogas reach to 176% and 172% in the first season and 175% and 171% in the second season, respectively compared with control.

The benefical effect of organic manure on yield may be due to improving the soil structure conditions, which encouraged the plant to have a good root development by improving soil water holding capacity and this permitted favourable plant supply with water, nutrients which in turn, resulted in higher values of cabbage yield (Cooke, 1972). These results are in accordance with those reported by Arenfalk and Hagelskier, 1995 and Warman and Harvard, 1996 on cabbage.

Moreover, the same data in Table (5), show also that ammonium nitrate was the most effective treatment than Insiabeen which resulted in the highest values of head physical parameters

Table (5): Effect of organic and inorganic nitrogen fertilization on head physical characteristics and total yield of cabbage plant

Season / Characters / Treatments	2000-/2001 season								2001/2002 season							
	Head (cm)			Un-weapped leaves /plant		Edible head weight (Kg)	Market able yield (ton/fed.)	Relative increase (%)	Head (cm)			Un-weapped leaves /plant		Edible head weight (Kg)	Market able yield (ton/fed.)	Relative increase (%)
	Length	Diam-eter	Circumf-erence	Num-ber	Weight (Kg)				Length	Diam eter	Circumf-erence	Weight (Kg)	weight (Kg)			
Control	20.50	29.13	87.63	9.50	0.825	3.300	43.586	100.00	24.63	30.88	88.00	10.75	0.982	3.708	44.774	100.00
Cbic*.M.	30.75	40.63	103.50	13.25	1.350	6.300	76.718	176.015	34.25	44.30	104.13	14.30	1.520	6.700	78.748	175.878
B.**M.	30.63	39.45	101.88	12.75	1.260	5.890	75.279	172.713	31.38	43.25	102.00	13.63	1.480	6.120	76.656	171.206
FYM***	27.00	38.23	100.00	11.85	0.990	4.895	67.653	155.217	30.75	40.30	100.75	12.60	1.100	5.200	68.305	152.555
In.****	28.25	37.72	100.06	116.3	1.100	5.394	68.773	157.766	31.00	42.20	100.25	12.30	1.178	5.832	69.753	155.789
Amm. N.*****	28.62	38.32	101.75	12.10	1.150	5.925	69.287	158.966	31.13	42.50	101.88	12.75	1.300	5.910	70.915	158.384
L.S.D. at 0.05	1.18	1.15	1.39	0.45	0.10	0.05	0.26		1.04	0.95	1.33	0.64	0.03	0.01	0.22	

* Chicken manure ** Biogas manure *** Farmyard manure **** Enciaben *****Ammonium nitrate

and total yield in both growing seasons.

These results are in harmony with those reported by Dixit, 1997; El-Shimi, Nahed, 1998 and El-Shabrawy *et al.*, 1999 on cabbage and El-Sherbieny *et al.*, 1990 on lettuce.

3- Head minerals content:

a-Nitrogen percentage, uptake, NO_3-N and NUE:

Data in Table (6) indicate that, addition of organic manures (chicken, biogas and FYM) or mineral fertilizer (ammonium nitrate or Insiabeen) increased nitrogen concentration, uptake, NO_3-N and nitrogen use efficiency (NUE) in head cabbage plants more than the control and the highest values were obtained by chicken manure. The effect of different treatments on these parameters can be arranged as follows: chicken, biogas manures, ammonium nitrate, insiabeen and FYM. Similar trend was observed during both growing seasons.

Both chicken and biogas manures compared with FYM gave the highest amount of leaf N content indicating the high potential fertility of the soil, on the same time, superiority of both for N uptake and NUE can be attributed to its higher content of available N.

In this concern, the decomposition of organic manure due to the microorganisms attack, enhance the release of nutrients slowly to the soil, then nitrogen can be adsorbed on the adsorptive sites of organic matter and soil colloids and that protect the nutrients from leaching (Cooke, 1972 and Yassen *et al.*, 2004).

Moreover, the results in Table (6) indicate that the highest and lowest NO_3-N content of cabbage leaves is detected as a result of using chicken, biogas and FYM, respectively. The same findings were also reported by Rubeiz *et al.*, 1993 and El-Shimi, Nahed, 1998.

In this respect, nitrogen percentage, uptake and NUE in the cabbage head leaves of plots treated with soluble fertilizer (ammonium nitrate) was significantly higher than those received slow release fertilizer (insiabeen), this may be due to that N-addition as traditional fertilizer, positively affected nitrogen percentage and uptake in the plant and resulted in increasing vegetative growth and consequently, increased N-absorption and accumulation in

Table (6): Effect of organic and inorganic nitrogen fertilization on total and nitrogen uptake, nitrate concentration and nitrogen use efficiency of cabbage head (mg/head).

Season	2000-/2001 season				2001/2002 season			
Characters	N (%)	N-uptake	NO_3-N mg/kg	NUE	N (%)	N-uptake	NO_3-N mg/kg	NUE
Control	3.586	941.92	321	-	3.631	998.58	331	-
Chic.* M.	4.713	3320.62	481	41.42	4.753	3635.72	490	42.46
B.**M	4.661	2918.35	470	39.62	4.678	3146.33	481	39.85
FYM***	4.135	1876.73	432	30.08	4.358	2081.11	452	29.41
In.****	4.373	2228.79	370	31.48	4.371	2273.08	385	31.22
Amm. N.*****	4.471	2602.07	391	32.13	4.566	2565.27	401	32.68
L.S.D at 0.05	0.006	9.131	2.898		0.018	9.180	3.316	

* Chicken manure ** Biogas manure *** Farmyard manure **** Insiabeen *****Ammonium nitrate

plant tissues. (Abady Khadra *et al.*, 1997 on onion and Osman, Fatma, 2004 on pepper).

On the other hand, it could be noticed that NO_3-N concentration was higher in the plants fertilized by fast release fertilizer (ammonium nitrate) compared to slow release one Insiabeen, this could be attributed to the readily available of N from ammonium nitrate which leads to an increase in N uptake rate more than its assimilation rate, and consequently, the accumulation of soluble N forms occurs in the plants. Which clearly the suitability of using slow release fertilizer as an alternative N source to reduce nitrate accumulation in plant tissue (Eppendorfer, 1978 and Abady Khadra *et al.* 1997).

Such results coincides with those obtained by Spiegel *et al.*, 1988 and El-Shimi, Nahed, 1998 on cabbage; El-Sherbieny *et al.*, 1990 on lettuce and Etman, 1993 on spinach.

b-Phosphorus, potassium concentration and uptake and concentration of some mioner elements (Zn and Mn):

Data presented in Table (7) illustrate that the greatest contents of P and K were observed by using organic nitrogen fertilizer such as, chicken, biogas and FYM, respectively.

Such results might be due to that adding organic matter and manure improves soil tilth, supply appreciable amounts of P and K, the relative potential fertility and organic matter content of soil, (Tahoun *et al.*, 2000 and El-Sherbieny *et al.*, 2003).

With respect to the effect of inorganic fertilizers, it is evident from the data in Table (7) that ammonium nitrate had significantly higher foliage K content and P uptake in both growing seasons of study, while K uptake in the first season compared with Insiabeen treatment. On the other hand, insiabeen showed the highest detected phosphorus percentage in both seasons and potassium uptake in the second season.

Significant differences among treatments were also observed for foliage micronutrients content, i.e., Zn and Mn. The highest concentration of both were detected by using chicken manure follows by biogas and FYM.

In this concern, the highest values of Zn and Mn were obtained by using ammonium

Table (7): Effect of organic and inorganic nitrogen fertilization on the minerals content of cabbage head.

Season	2000-/2001 season						2001/2002 season					
Characters / Treatments	P (%)	P-uptake (mg/head)	K (%)	K-uptake (mg/head)	Zn	Mn	P (%)	P-uptake (mg/head)	K (%)	K-uptake (mg/head)	Zn	Mn
Control	0.668	243.09	2.510	910.27	0.540	0.211	0.686	257.33	2.600	974.91	0.583	0.251
Chic*. M.	0.788	554.87	3.001	2114.33	0.883	0.297	0.798	533.76	3.014	2302.18	0.887	0.375
B.**M	0.779	487.68	2.841	1784.92	0.840	0.287	0.791	515.47	2.921	1964.88	0.870	0.362
FYM***	0.756	344.05	2.723	1235.87	0.780	0.281	0.782	373.53	2.782	1328.62	0.817	0.342
In.****	0.752	362.67	2.665	1358.33	0.630	0.228	0.772	379.77	2.683	1660.18	0.645	0.324
Amm.N.*****	0.741	437.70	2.695	1569.50	0.640	0.269	0.750	474.33	2.704	1395.60	0.660	0.338
L.S.D. at 0.05	0.022	11.919	0.019	10.573	0.022	0.012	0.015	12.756	0.011	19.308	0.027	0.136

* Chicken manure ** Biogas manure *** Farmyard manure **** Insiabeen *****Ammonium nitrate

Table (8): Effect of organic and inorganic nitrogen fertilization on the nutritive value of cabbage head.

Season / Characters / treatments	2000-/2001 season			2001/2002 season		
	Protein (%)	Carbohyd-rates (%)	Total soluble solids (%)	Protein (%)	Carbohyd-rates (%)	Total soluble solids (%)
Control	22.41	13.50	4.55	22.69	15.05	4.63
Chic.* M.	29.45	19.58	5.83	29.71	20.93	5.93
B.**M.	29.13	18.80	5.28	29.23	19.88	5.75
FYM***	25.84	15.27	5.10	27.23	16.79	4.93
In.****	27.33	16.89	4.65	27.31	17.62	5.50
Amm. N.*****	27.94	17.89	4.83	28.53	19.42	5.30
L.S.D. at 0.05	0.037	0.26	0.320	0.109	0.051	0.351

* Chicken manure ** Biogas manure *** Farmyard manure **** Insiabeen *****Ammonium nitrate

nitrate compared with insiabeen. Obtained results are going in the same trend at both growing seasons.

The observed increase in mineral composition in leaf tissue with organic manure treatments in general and chicken manure in particular is in agreement with many investigators among them Hseih and Hsu, 1993, El-Kassas *et al.*, 1997 and EL-Mansi *et al.*, 2004 who reported that these results are mainly due to the different components of these manures formation and accumulation of some gases, i.e, methan, ethylene and carbone dioxide with different amounts as a result of the biological decomposition of it, which increase soil acidity, organic matter, available N, P, K, exchangeable Zn and Mn and this in turn affect plant growth, dry matter and absorption of macro and micronutrients. Similar findings were demonstrated by Rubeiz *et al.*, 1993 and El-Shimi, Nahed, 1998 on cabbage and El-Kassas *et al.*, 1997 and Arisha *et al.*, 2003 on sweet pepper.

c- Total protein, carbohydrates and T.S.S. percentage:

Data tabulated in Table (8) show that all studied fertilizers treatments significantly increase protein, carbohydrates and TSS percentages. In this respect, the highest increments of each parameter as percentage were observed in case of using chicken manure followed by biogas compared with the other treatments and control.

Moreover, ammonium nitrate achieved best results than insiabeen fertilizer in this concern. Such results are true during both growing seasons. In this respect, the superiority of organic manure especially chicken manure may be due its high N-content which increase the protein synthesis and activity of carbohydrates hydrolyzing enzymes (Edmond *et al.*, 1981).

REFERENCES

Abady, Khadra, A.; Barakat, Azza; M.I. El-Mallah and A.Kh. Ahmed (1997). The effect of some slow release fertilizers on onion yield and successive sweet corn growth I- The effect on onion bulb yield, bulb quality and chemical constituents. Egypt. J. Appl. Sci., 12 (3): 245-261.

Almazov, B.N. and K. Kholuyako (1990). Change in productivity of vegetable crop relation and

fertility of leached chernozem soil in relation to application of organic manures and mineral fertilizers. I- Effect of peat and mineral fertilizers on yield and quality of vegetable crops and potatoes. Agrokhimiya,11 (1): 53-60.

A.O.A.C. (1970). Association Official Agricultural Chemists. 11th Ed. Publ. by the A.O.A.C., P.O. Box 540, Washnigton, D.C., USA.

Arenfalk, O.and L. Hagelskier (1995). The use of different types of manure in organic vegetable growing sp. Rapport. Statens Planteavlsforsog, (6) 27 [C.F. Hort. Abst., 66 (5), 4097].

Arisha, H.M.E.; A.A. God and S.E. Younes (2003). Response of some pepper cultivars to organic and mineral nitrogen fertilizers under sandy soil conditions. Zagazig J. Agric. Res., 30 (5) : 1875-1899.

Awad, E.; I.R. Mohamed and I.A. El-Garhi (1990). Effect of slow available nitrogen fertilizers on the availability of some nutrients to Sudan grass, Zagazig J. Agric. Res. 17 (4B): 1367-1374.

Awad, Y.H.; H.A. Ahmed and O.F. EL-Sedfy (2003). Some chemical properties and NPK availability of sandy soil and yield productivity as affected by some soil organic amendments. Egypt. J. Appl. Sci, 18 (2): 356-365.

Balba, A.M. and T.H. Sheta (1973). Nitrogen balance sheet of $(NH_4)_2$ SO_4-gypsum pellets and mixture and urea formaldehyde applied to corn in pots of sand. Plant and Soil, 39 : 293-302.

Bremner, J.M. and C.S. Mulvaney (1982). Total nitrogen. In: Page, A.L.; R.H. Miller and D.R. Keeney (Eds.) Methods of Soil Analysis. Part 2, Amr. Soc. Agron. Madison, W.I. USA pp. 595-624.

Cooke, G.W. (1972). Fertilization for Maximum Yield. Richard Clay (the Chaucer press) LTD. Bungary. Suffok. Great Britian. Pp. 457.

Craswell, E.T. and D.C. Godwin (1984). The efficiency of nitrogen fertilizers applied to cereals in different climates. Adv. Plant Nutrition,3 (1): 1-55.

Dixit, S.P. (1997). Effect of nitrogen and farmyard manure on the productivity of cabbage

in dry temperate high hills zone of Himachal Pradesh. Annals of Agric. Res., 18 (2):120-125.

Edmond, J.B.; T.L. Senn; F.S. Znderws and R.G Halfacre (1981). Fundamentals of Horticulture, Published by Tata Mc-Graw-Hill Publishing Co., Limited, Indian.

El-Kassas, H.I; A.F. Abou-Hadid and N.M.H. Eissa (1997).Effect of different organic manures on the yield and elemental composition of sweet pepper plants grown on sandy soil. Egypt. J. Appl. Sci., 12 (3): 262-281.

El-Mansi, A.A.; A. Bardisi; A.N. Fayed and E.E. Abou El-Khair (2004). Effect of water quality and Farmyard manure on garlic under sandy soil conditions I. Dry weight and plant chemical composition. Zagazig J. Agric. Res., 31 (2): 523-547.

El-Sayed, A.K.; S.E.D.B. Ibrahim and A. Awadalla (2002). Utilization of some organic farm residues for improving the productivity of the newly reclaimed soils at El-Fayoum governorate, Egypt. Egyptian Soil Science Society. 6th Nat. Congress, Oct., 29-30, Cairo.

El-Shabraway, R.A.; F.I. Mohamed and W.R. Rezkallah (1999). Effect of sulphur, nitrogen and phosphorus soil application on growth, yield, quality and chemical contents of cabbage plants (Brassica oleraceae Var. Capitata L.). J. Agric. Sci. Mansoura Univ., 24 (9): 4999-5009.

El-Sherbieny, A.E.; E. Awad; M.R. Gabal and H.E. EL-Aila (1990). Effect of slow-release nitrogen fertilizers on growth and chemical composition of lettuce plants. Zagazig J. Agric. Res., 17 (4B): 1357-1365.

El-Sherbieny, A.E.A.; E. Awad; M.M.M. El-Sawy and A.M. Helmy (2003). Wheat response to some Agro-industrial wastes and conventional N-fertilizers: Zagazig J.Agric. Res., 30 (2): 385-406.

El-Shimi, S.A.; M.H. Mahmoud, M.N. Alaa EL-Din and I.M. Abd El-Aziz (1987). Utilization of biogas manures as a complete fertilizer for vegetables. First Conf. of fertilizers SWRI, 13th 16th, No. 31: 422-430.

El-Shimi, Nahed M. (1998). Comparative studies of organic manures and chemical

fertilizers on yield and quality of cabbage. M. Sc. Thesis, Faculty of Agriculture, Moshtohor, Zagazig University. 95 pp. ,Egypt.

Eppendorfer, W.H. (1978). Effect of N-fertilization on amino acid composition and nutritive value of spinach, Kale, Cauliflower and potatoes. J. of Sci. of Food and Agric., 29 (4): 305-311.

Etman, A. (1993). Response of spinach to soil and foliar urea fertilization. Annals Agric. Sci., Ain Shams Univ., 38 (2): 667-673. ,Egypt.

Gomez, K.A. and A.A. Gomes (1983). Statistical procedures for agricultural research, 2nd Ed. John Wiely & Sons Pub., pp. 139-153.

Hegazy, M.N. (1985). A study on the behaviour of some new and developed fertilizers. Ph. D. Thesis, Faculty of Agriculture, Cairo University. 76pp. ,Egypt.

Hseih, C.F. and K.N. Hsu. (1993). An experiment on the organic farming of sweet corn and vegetable soybeans. Bulletin of Taichung District Agricultural Improvement Station 39(3) : 29-39.

Jackson, M.L. (1970). Soil Chemical Analysis Prentice Hall, Englewood Ceiffs, N.J.

Lorenz, O.A.; B.L. Weir and J.C. Bishop (1972). Effect of controlled – release nitrogen fertilizers on yield and nitrogen absorption by potatoes, cantaloupes and tomatoes. J. Amer. Soc. Hort. Sci., 97 : 334-337.

Michel, K.G.; J.K. Hamilton, P.A. Robens and F. Smith (1956). Colorimetric method for determination of sugars and related substances. Analytic Chemistry, 28: No. 3.

Olsen, S.R. and L.E. Sommers (1982). Phosphorus. In: Page, A. L.; R.H. Miller and D.R. Keeney (Eds). Methods of Soil Analysis. Part 2, Amer. Soc. Agron. Madison, W.I. USA pp. 403-430.

Osman, Fatma, A.A.; S.M.M. Dahdouh and F.M. Saleem (1998). Increasing fertilizer nitrogen efficiency for wheat. Egypt. J. Appl. Sci. 13 (7): 636-650.

Osman, Fatma A.A. (2004). Effect of organic manure inorganic fertilizers and their combinations on yield and nutrients content of pepper

plants under sandy soil conditions. Zagazig J. Agric. Res. 31 (5): 2267-2285.

Raw, G.L. (1973). Food Analysis by Atomic Absorption Spectroscopy Varian. Techtrom, Australia, USA, Switzerland, pp 89.

Rubeiz, I.G.; A.S. Sabra; I.A. Al-Assir and M.T. Farran (1993). Layer and broiler poultry manure as nitrogen fertilizer sources for cabbage production. Communications in Soil Sci. and Plant Analysis, 24 (13/14): 158 3-1589.

Singh, I.P. (1988). A rapid method for determination of nitrate in soil and plant. Extracts plant and Soil, 110:137-139. Ckluwer Academic Publishers.

Spiegel, Y.; U. Kafkafl and F. Pressman (1988). Evaluation of a portion – chitin derivative of crustacean shells as a slow – release nitrogen fertilizer on Chinese cabbage. J. of Hort. Sci., 63 (4): 621-627.

Tahoun, S., Abdel-Bary, E.A. and Atia, N.A. (2000). A greenhouse trial in view of organic farming in Egypt. Egypt. J. Soil Sci., 40 (4): 469-479.

Warman, P.R. and K.A. Harvard (1996). Yield, vitamin and mineral content of four vegetable grown with either compost manure or conventional fertilizer. J. of Vegetable Crop Production, 2 (1): 13-25.

Yassen, A.A.; M.A. Khalil and Sahar, M. Zaghloul (2004): Effect of humic substances and farmyard manure in combination with iron on sorghum plants. Egypt. J. Appl. Sci.; 19 (6B): 784-798.

دراسات مقارنة للأسمدة العضوية والأسمدة النيتروجينية السريعة والبطيئة الذوبان على النمو والمحصول والجودة والتركيب الكيماوى للكرنب

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تم إجراء تجربتين حقليتين بمزرعة البحوث بكلية الزراعة بمشتهر - جامعة الزقازيق خلال الموسم الشتوى (٢٠٠٠/٢٠٠١، ٢٠٠١ / ٢٠٠٢م) بهدف دراسة تأثير الأسمدة العضوية (دواجن- بيوجاز - حيوانات المزرعة) والأسمدة النيتروجينة السريعة الذوبان (نترات الأمونيوم) والبطيئة الذوبان (انسيابين) على النمو الخضرى والصفات الطبيعية للرأس والمحصول والجودة والتركيب الكيميائى للكرنب. ويمكن تلخيص النتائج المتحصل عليها فى الآتى:

كانت إضافة سماد الدواجن يليه سماد البيوجاز هى المعاملات الأكثر فعالية حيث أعطت أعلى القيم خلال موسمى النمو لصفات نمو نباتات الكرنب (إرتفاع النبات، طول وقطر الساق، الوزن الغض للساق والأوراق لكل نبات والنبات ككل، بالإضافة إلى النسبة المئوية للمادة الجافة للأوراق)، الصفات الطبيعية للرأس (طول وقطر الرأس، عدد ووزن الأوراق الغير ملفوفة لكل نبات، وزن الرأس "الجزء الإقتصادى"، المحصول الكلى للفدان) وكذلك التركيب الكيماوى أو القيمة الغذائية لرأس الكرنب (النسبة المئوية للنتروجين وإمتصاصه، والنترات، ومدى الإستفاده من النيتروجين، النسبة المئوية للفوسفور والبوتاسيوم وإمتصاصهما، المحتوى من الزنك والمنجنيز، نسبة البروتين والكربوهيدرات والمواد الذائبة الكلية).

بالإضافة إلى ذلك فقد أدى إستخدام نترات الأمونيوم إلى الحصول على أفضل القيم لمعظم الصفات المدروسة عند المقارنة بالإنسيابين أو سماد حيوانات المزرعة.