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IMPACT OF MINERAL, ORGANIC AND BIOFERTILIZATION ON GROWTH , YIELD AND QUALITY OF CANTALOUPE

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ABSTRACT

Two field experiments were carried out in a private farm at Gamassa district, Belqas Center, Dakahlia Governorate, Egypt, during the two successive summer growing seasons of 2013 and 2014 to study the effect of mineral nitrogen fertilizer rates, organic manure and foliar fertilization treatments with biofertilizers , biostimulants as well as their interactions on growth and yield of cantaloupe cv. Primal. The field experiments were laid-out in strip-split plot design with three replications. The most important results obtained from this investigation can be summarized as follows:

Increasing mineral nitrogen fertilizer rates from 75 to 100 and 125 kg N/fed tended to increase growth, yield and its components, thus the highest values of these characters were resulted from adding the highest rate of nitrogen fertilizer (125 kg N/fed) in both seasons.

Organic fertilizing of cantaloupe plants with chicken manure at the rate of 15 m^3/fed significantly increased growth, yield and its components as compared with control treatment (without organic manure) in both seasons.

Foliar spraying cantaloupe plants with yeast extract at rate of 5g /1L significantly surpassed other treatments (without, spraying with EM or Agrispon) and produced the highest values of all studied growth, yield and its components in both seasons.

It can be recommended that organic fertilizing cantaloupe with 15 m^3 chicken manure/fed and foliar spraying plants with yeast extract and mineral fertilizing with 100 kg N/fed in order to increase cantaloupe yield over the control treatment and reduce the environment pollution and production costs under the environmental conditions of Dakahlia Governorate, Egypt.

Keywords: Cantaloupe, organic fertilization, biofertilization, mineral nitrogen fertilization, growth, yield.

INTRODUCTION

Cantaloupe (*Cucumis melo* var. cantaloupensis L.) is a member of family cucurbitaceae and consider as popular vegetable crops, and one of the main vegetable crops in Egypt. It is often picked and shipped before fully ripping. It is normally eaten as a fresh, as a salad or dessert with ice cream or custard. In addition, it also has a medical value, it is rich in carotenes content (the source of vitamin A.)

There is important need for scientific studies under Eg

yptian conditions to establish recommendation for reducing the chemical fertilizers addition to increase the quantity, improve the quality and limit the environmental pollution by using organic and biofertilization.

Nitrogen is an important nutrient for cantaloupe production. However there is scanty information about the amount necessary to maintain an appropriate balance between growth and yield. Cantaloupe vegetative organs must develop sufficiently to intercept light and accumulate water and nutrients but it is also important to obtain a large reproductive-vegetative dry weight ratio to maximize the fruit yield. Early studies by Gorski (1985) on cantaloupe showed that nitrogen fertilizer has been reported to increase the early yield with observation showing that plants that received low N level are smaller and show N deficiency symptoms. Also, Olaniyi (2008) found that the dry matter yield of Egusi melon increased as N and P rates increased. Castellanos *et al.* (2011) reported that the melon crop shows two patterns of growth as a response to the applied N. The vegetative part gradually increased as N supply increased. Conversely, the relative fruit yield increased up to maximum values as N supply decreased. Dai *et al.* (2011) reported that nitrogen has indirect impact on harvest date of individual cucumber fruit through its effect on leaf area. Simsek and Comlekcioglu (2011) found that nitrogen levels were found to be significant for all fruit quality parameters and fruit yield of melon.

Organic manure such as chicken manure contributes to plant growth through its impact on physical, chemical and biological properties of the soil. Moreover, organic fertilizers supply soil with essential nutrients such as N, P, K and some micro nutrients after its mineralization under soil conditions (El-Nagar, 1996). Mahmoud *et al.* (2009) showed that application of compost to cucumber plants promoted plant growth parameters, *i.e.*, shoot fresh and dry weight. Odebode and Fajinmi (2009) reported that poultry manure treatments (10 or 20 ton/ha.) significantly increased plant height and number of leaves of pepper plants. Shehata *et al.* (2011a) indicated that application of compost at 4 ton/fed. increased pod diameter and total yield of snap bean plants as compared to the treatment of 8 ton/fed. Lindani and Brutsch (2012) indicated that tomato which received a combination of compost + mineral fertilizer gave the highest fruit yield, with a 51% fruit yield increasment compared to the control treatment.

Bio-fertilizers are microbial preparations containing, living microorganisms which play beneficial role in famishing a proper rhizosphere for plant growth thus, it causes minerals solubilizing, facilitate minerals (especially N) uptake. Swelam (2012) mentioned that foliar application of yeast extract on tomato and pepper plants increased total fruit yield (ton/feddan) as compared to the control treatment. Recently, Shehata *et al.* (2012) studied the effect of foliar application of yeast rates (1, 2, 3 and 4 g/L) on cucumber yield and its component and showed that active dry yeast increased significantly cucumber yield, number of fruits/plant, mean weight of fruit, fruit length and fruit diameter. Sakr *et al.* (2013) revealed that yeast extract increased soybean seed yield.

Agrispon is a biologically derved biostimulant for soil and plants .It is a natural solution for healthier soils , it enhances root zone activity and improves soil structure . Agrispon promotes crops yields by hastening germination, increasing drought resistance, fixing atmospheric N_2 and generally stimulating plant growth. It contained insufficient nutrients to

substitute for recommended fertilizer additions. It contained only 10 times more bacteria than let bridge tap water and none of the bacteria isolated plant or human pathogens. Agrispon had surprisingly low numbers of fungi, approximately 101 ml and no algae were isolated (Elegba and Rennie, 1984).

EM is a mixture of beneficial and effective microorganisms that is used as a soil amendment (Woodward, 2003). EM contains selected species of microorganisms, including predominant populations of lactic acid bacteria, yeasts, smaller numbers of photosynthetic bacteria, actinomycetes and other types of organisms. All of these are claimed to be mutually compatible with one another and are able to coexist in culture. EM increases microorganisms living in the soil and help plant growth by increasing the number and biological activity of desired microorganisms in the root environment. Also, increases its ability to release plant growth promoters, activate absorption and efficiency of nutrients as well as the metabolism processes and improved root growth and functions (Anwar, 2005). Javaid and Bajwa (2011) studied the effect of EM application on mung bean plants and found the growth of plants treated with EM was insignificant effect on shoot length. Helmy (2013) found that spraying pea plants with EM increased values of plant height, number of branches/plant, number of leaves/plant and dry weight of plant.

The present investigation aimed to study the effect of organic manure, foliar fertilization treatments and mineral nitrogen fertilizer rates on growth, yield, chemical constituents and quality characters of cantaloupe fruits under the environmental conditions of Dakahlia Governorate, Egypt.

MATERIALS AND METHODS

Two field experiments were carried out in a private farm at Gamassa district, Belqas Center, Dakahlia Governorate, Egypt, during the two successive summer growing seasons of 2013 and 2014 to study the effect of organic manure, foliar fertilization treatments with biofertilizers and biostimulants and mineral nitrogen fertilizer rates as well as their interactions on growth, yield, chemical constituents and quality of cantaloupe (*Cucumis melo* var. cantaloupensis L.) cv. Primal.

The field experiments were laid-out in strip-split plot design with three replications. Each experiment included 24 treatments, which were the combinations between 2 levels of organic fertilizer (chicken manure), 4 levels of foliar application (without, EM, Agrispon and Yeast) and 3 levels of mineral fertilizer (N).

Each experimental basic unit (sub-plot) included five ridges, each of 70 cm width and 3.0 m length, resulted an area of 10.5 m^2 (1/400 fed). The preceding winter crop was wheat (*Triticum aestivum* L.) in both seasons.

The vertical plots were devoted for organic fertilizer, while the horizontal plots were assigned for foliar application treatments. The mineral nitrogen fertilizer levels were randomly distributed in the sub-plots. The experimental studied treatments were as follows:

Mineral nitrogen fertilizer rates:

Mineral nitrogen fertilizer was added as ammonium nitrate (33.5 % N) at the three rates of 75, 100 and 125 kg N/fed. Only half dose of nitrogen was applied after two weeks from transplanting (before the first irrigation). The remaining portion was applied two weeks later (before the second irrigation).

Some physical and chemical properties of the investigated soil profile of cultivated area (0.0 to 50 cm depth) are given in (Table 4). Methods of Black (1965) and Page *et al.* (1982) were used for determinations. Physical and chemical analysis of experimental soil were conducted at Soil and Water Analysis Institute, Mansoura Laboratory, Agricultural Research Center (ARC).

Organic manure:

Organic manure (chicken manure) was added at two levels of zero and 15 m^3/fed. Chicken manure was obtained from a private Farm in Gamassa district. Experimental soil was mixed with chicken manure at previously mentioned level 15 days before transplanting of cantaloupe seedlings to elucidate the damage of seedlings and their roots from the heat of decomposition. Chemical analysis of chicken manure used in the experiment during the two seasons is presented in(Table 1).

Foliar application treatments:

a) Spraying with tap water only (control treatment).
b) Spraying with EM at the rate of 20 ml/10 Liter.
c) Spraying with Agrispon at the rate of 40 ml/10 Liter.
d) Spraying with yeast extract at the rate of 5 g /1 Liter.

Diffuser material was added to every previous solution. Foliar fertilization with

EM, Agrispon and yeast extracts was carried out twice at the aforementioned rates after 20 and 35 days from transplanting. The chemical composition of Agrispon presented in (Table 2).

Yeast extract was prepared according to El-Ghamriny *et al*. (1999), where, Baker's yeast (soft yeast) was mixed with sugar at a ratio of 1:1 and left for 3 hours at room temperature, freezing for disruption of yeast tissue and releasing their content. Chemical and organic composition of yeast extract according to Nagodowithana (1991) as shown in (Table 3). Seedling of 30 days old were transplanted into open field at mid of February in the two seasons.

During the growing seasons, all agricultural practices were performed according to the Ministry of Agriculture and Land Reclamation recommendations. The experimental field was well prepared, through two perpendicular ploughs. After plough and good leveling, the field area was divided into experimental units (sub-sub plots). Calcium-super phosphate (15.5 % P_2O_5) was added at the rate of 150 kg into the experimental units during experimental field preparation. Growing plants were fertilized with 50 kg potassium sulphate (48 % K_2O) in two equal portions at two times (the first application after 20 days from transplanting and the second application before flowering time). Other cultural practices including weed and pest control were done.

Table 1: Chemical analysis of chicken manure used in the experiment during the two seasons.

Properties	2013	2014
Organic matter %	49.93	52.00
N %	2.08	2.40
P %	0.50	0.49
K/N	1.70	1.67
C %	8.8	9.13
Mg %	2.29	3.20

*** Soil and Water Analysis Institute, Mansoura Lab., Agricultural Research Center (ARC).**

Table 2: Chemical composition of Agrispon.

Chemical composition	Value (mg/ml)
N	567
K_2O	5628
Mg	5
Fe	0.542
Mn	0.09
Cu	0.014
B	0.037
Ph	7.8

Table 3: Composition of yeast extract according to Nagodowithana (1991).

Constituents	Value	Constituents	Value
Protein	47 %	Carbohydrates	33 %
Minerals	8 %	Nucleic acids	8 %
Lipids	4 %		
Approximate composition of vitamins			
Thiamine (B1)	60-100 mg/g	Riboflavin (B2)	35-50 mg/g
Niacin	300-500 mg/g	Pyridoxine HCL (B6)	28 mg/g
Pantorhenate (B4)	70 mg/g	Biotin	1.3 mg/g
Cholin	4000 mg/g	Folic acid	5-13 mg/g
Vitamin (B12)	0.001 mg/g		
Approximate composition of minerals			
Na	0.12 mg/g	Cu	8.00 mg/g
Ca	0.75 mg/g	Se	0.10 mg/g
Fe	0.02 mg/g	Mn	0.02 mg/g
Mg	1.65 mg/g	Cr	2.20 mg/g
K	21.00 mg/g	Ni	3.00 mg/g
P	13.50 mg/g	Va	0.04 mg/g
S	3.90 mg/g	Mo	0.40 mg/g
Zn	0.17 mg/g	Sn	3.00 mg/g
Si	0.03 mg/g	Li	0.17 g/g

Table 4: Mechanical and chemical soil characteristics at the experimental sites during the two growing seasons of 2013 and 2014.

Soil characters	2013	2014
OM (%)	0.40%	0.32%
Coarse sand (%)	43.32 %	41.52%
Fine sand (%)	49.91%	44.32%
Silt (%)	3.14%	2.89%
Clay (%)	3.63%	3.88%
Soil texture	Sandy soil	Sandy soil
Ph	7.8	7.9
Available N (ppm)	9.4ppm	8.9ppm
Available P (ppm)	4.5ppm	4.88ppm
Available K (ppm)	62ppm	57ppm

SAMPLING AND COLLECTING DATA:

A- Vegetative growth characters:

- At 60 days after transplanting, ten plants were randomly chosen from every sub-plot to determine the following characters:

1- Plant height (cm).
2- Number of branches/plant.
3- Number of leaves/plant.
4- Fresh weight of leaves and branches (g/plant).
5- Dry weight of leaves and branches (g/plant). To determine dry weight, plant samples were oven dried at 70 ˚C till constant weight and weighed.
6- Leaf area/plant: It was measured in (m^2), fresh leaf samples were collected from each plant and by known diameter cork borer, twenty disks were made, then oven dried at 70 ˚C till reaching constant weight. Leaf area was calculated according to the formula described by Koller (1972) as follows :

$$\text{Total leaf area/plant} = \frac{\text{Dry weight of} \times \text{Area of the disks } (cm^2)}{\text{leaves/plant}}$$

B- Yield and its components:

Fruits harvesting was done according to the standard characteristics for marketing. Two pickings were done through harvesting seasons. All harvested fruits from each sub-plot were used to calculate the following characters:

1- Average fresh weight of fruits/plant (g). The weight of all harvested fruits per plant in each picking divided by their number.
2- Average dry weight of fruits/plant (g). To determine dry weight of fruits in each picking, harvested fruits per plant were divided into small parts and air-dried, then oven dried at 70^0C till constant weight obtained.

3- Total number of fruits/plant. The number of all harvested fruits (all over the season) per each sub- plot divided by the number of plants in the same plot.
4- Fruit diameter (cm). It was measured by using a varnier caliper as the means of random five fruits.
5- Fruit size (cm^3). It was determined by putting five cantaloupe fruits in the given volume of water then measures the displacement (cm^3).
6- Total fruit yield (t/fed). It was calculated according to the following equation:

Total fruit yield = Fruit yield/plant × number of plants/fed

Quality characteristics:

1- Total carbohydrate percentage in fruits was determined using the method described by Dubois *et al.* (1956).
2- Vitamin C concentration in fruits was determined in fresh cantaloupe fruits according to the method described by the AOAC (1990).
3 -Total soluble solids (TSS %): was measured in the juice of sweet pepper fruits by using a hand refractometer

All obtained data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the strip-split plot design to each experiment as published by Gomez and Gomez (1984) by using "MSTAT-C" computer software package. Least Significant Difference (LSD) method was used to test the differences between treatment means at 5 % level of probability as described by Snedecor and Cochran (1980**)**.

RESULTS AND DISCUSSION

Effect of interaction on vegetative growth:

The interaction among organic manure, foliar fertilization treatments and mineral nitrogen fertilizer rates had a significant effect on plant height, number of branches and leaves/plant in both seasons, except number of branches and leaves/plant in the second season only. It can be observed that the highest values of plant height (115.33 and 140.00 cm), number of branches/plant (4.33 and 5.33) and number of leaves/plant (161.6 and 167.0) were resulted from organic fertilizing cantaloupe with 15 m^3 chicken manure/fed and foliar spraying plants with yeast extract at rate of 5g/1 L beside mineral fertilizing with 125 kg N/fed in the first and second seasons, respectively (Table 5). Organic fertilizing cantaloupe with 15 m^3 chicken manure/fed and foliar spraying plants with yeast extract at rate of 5 g / 1L beside mineral fertilizing with 100 kg N/fed came to in the second rank after previously mentioned treatment without significant differences in most cases in both seasons.

Table5: Plant height, number of branches and leaves/plant as affected by the interaction among organic manure, foliar fertilization treatments and mineral nitrogen fertilizer rates during 2013 and 2014 seasons.

Treatments / Characters / Seasons			Plant height (cm)		Number of branches/ plant		Number of leaves/plant	
			2013	2014	2013	2014	2013	2014
Chicken manure	Without	75 kg N/fed	81.22	83.14	2.92	3.33	80.14	91.2
		100 kg N/fed	90.12	91.23	3.00	3.66	92.36	101.2
		125 kg N/fed	93.25	94.36	3.33	3.95	96.56	111.3
	EM	75 kg N/fed	79.33	90.00	3.33	3.66	122.6	138.3
		100 kg N/fed	82.66	90.66	3.33	3.66	128.0	145.3
		125 kg N/fed	107.33	110.66	4.33	4.66	144.6	146.0
	Agrispon	75 kg N/fed	88.33	91.00	3.33	3.66	82.0	125.3
		100 kg N/fed	94.66	98.66	3.33	4.33	100.3	128.6
		125 kg N/fed	105.66	112.66	4.00	4.00	114.3	134.6
	Yeast extract	75 kg N/fed	85.66	114.00	3.00	4.00	95.0	150.6
		100 kg N/fed	105.66	134.00	4.33	5.33	135.3	158.0
		125 kg N/fed	115.33	140.00	4.33	5.33	161.6	167.0
Without	Without	75 kg N/fed	51.24	62.35	2.12	2.33	52.6	61.5
		100 kg N/fed	53.25	67.14	2.66	2.66	61.5	70.2
		125 kg N/fed	60.12	72.45	3.00	2.96	70.6	72.3
	EM	75 kg N/fed	62.33	67.00	2.33	3.66	66.3	84.6
		100 kg N/fed	69.33	77.33	3.00	4.00	73.0	90.3
		125 kg N/fed	71.00	80.33	3.00	4.00	73.6	94.0
	Agrispon	75 kg N/fed	54.66	69.00	2.33	2.66	57.6	69.3
		100 kg N/fed	57.00	70.00	2.66	3.33	64.0	73.0
		125 kg N/fed	62.00	74.66	2.66	3.33	79.0	77.3
	Yeast extract	75 kg N/fed	73.00	82.33	2.66	4.00	83.6	99.6
		100 kg N/fed	76.33	95.00	3.33	4.33	115.3	105.0
		125 kg N/fed	79.66	96.00	3.66	4.66	124.3	109.0
F. test			*	*	*	NS	*	NS
LSD at 5 %			7.67	8.12	0.90	-	24.2	-

The interaction among organic manure, foliar fertilization treatments and mineral nitrogen fertilizer rates had a significant effect on fresh and dry weights/plant and leaf area/plant, except dry weight/plant and leaf area/plant in the second season only. From obtained results in(Table 6), it could be recorded that the highest values of fresh weight (461.0 and 484.3 g/plant), dry weight (61.23 and 64.03 g/plant) and leaf area/plant (100.46 and 110.46 cm^2) were resulted from organic fertilizing cantaloupe with 15 m^3 chicken manure/fed and foliar spraying plants with yeast extract beside mineral fertilizing with 125 kg N/fed in the first and second seasons, respectively. Organic fertilizing cantaloupe with 15 m^3 chicken manure/fed and foliar spraying plants with EM and mineral fertilizing with 125 kg N/fed came in the second rank after previously mentioned treatment in both seasons.

Table 6:Fresh and dry weights (leaves and branches)/plant and leaf area/plant as affected by the interaction among organic manure, foliar fertilization treatments and mineral nitrogen fertilizer rates during 2013 and 2014 seasons.

Characters / Treatments / Seasons			Fresh weight (g/plant)		Dry weight (g/plant)		Leaf area (cm^2/plant)	
			2013	2014	2013	2014	2013	2014
Chicken manure	Without	75 kg N/fed	214.2	220.1	25.12	28.45	67.45	61.85
		100 kg N/fed	305.9	302.4	38.45	39.12	81.45	88.45
		125 kg N/fed	360.4	375.6	47.65	50.12	90.45	95.65
	EM	75 kg N/fed	249.2	257.5	34.50	36.10	79.03	82.83
		100 kg N/fed	341.2	362.0	44.96	47.86	87.70	91.43
		125 kg N/fed	427.0	446.3	56.16	57.26	97.10	100.96
	Agrispon	75 kg N/fed	219.5	231.8	30.73	33.00	76.96	66.43
		100 kg N/fed	310.6	322.5	41.96	43.00	85.03	95.13
		125 kg N/fed	393.1	411.3	54.13	48.96	93.80	105.06
	Yeast extract	75 kg N/fed	279.0	288.2	38.73	39.66	82.83	97.20
		100 kg N/fed	366.3	384.2	47.06	48.76	90.20	89.46
		125 kg N/fed	461.0	484.3	61.23	64.03	100.46	110.46
Without	Without	75 kg N/fed	205.4	211.3	25.45	26.87	61.45	68.89
		100 kg N/fed	264.5	285.6	35.45	38.76	66.78	76.54
		125 kg N/fed	345.2	360.8	41.65	45.65	81.45	86.54
	EM	75 kg N/fed	252.2	264.2	32.73	34.40	73.13	79.46
		100 kg N/fed	310.6	296.2	36.10	37.76	76.30	88.56
		125 kg N/fed	379.4	396.7	51.10	52.16	89.90	99.26
	Agrispon	75 kg N/fed	210.9	221.8	28.26	30.30	68.60	74.60
		100 kg N/fed	281.7	327.7	39.50	41.60	79.06	87.16
		125 kg N/fed	374.9	415.6	47.40	48.80	87.30	92.46
	Yeast extract	75 kg N/fed	266.1	244.3	32.33	36.20	71.56	76.90
		100 kg N/fed	338.9	360.4	42.46	46.66	83.50	82.40
		125 kg N/fed	398.0	416.7	56.70	58.26	93.50	101.06
F. test			*	*	*	NS	*	NS
LSD at 5 %			5.5	2.25	2.36	-	1.23	-

Effect of interaction on yield and its components:

The interaction among organic manure, foliar fertilization treatments and mineral nitrogen fertilizer rates had a significant effect on fruit diameter of cantaloupe plants in the first season only. While, total number of fruits/plant in both seasons and fruit diameter in the second season did not showed significant effect due to the interaction among three studied factors of this study. From obtained results in(Table 7), it could be recorded that the highest values of total number of fruits/plant (5.33 and 13.00) and fruit diameter (13.40 and 11.80 cm) of cantaloupe plants were resulted from organic fertilizing cantaloupe with 15 m^3 chicken manure/fed and foliar spraying plants with yeast extract beside mineral fertilizing with 125 kg N/fed in the first and second seasons, respectively. Organic fertilizing cantaloupe with 15 m^3 chicken manure/fed and foliar spraying plants with yeast extract and mineral fertilizing with 100 kg N/fed came in the second rank after previously mentioned treatment in both seasons.

Table 7: Total number of fruits/plant and fruit diameter as affected by the interaction among organic manure, foliar fertilization treatments and mineral nitrogen fertilizer rates during 2013 and 2014 seasons.

Characters / Treatments / Seasons			Total number of fruits/plant		Fruit diameter (cm)	
			2013	2014	2013	2014
Chicken manure	Without	75 kg N/fed	2.33	3.66	8.21	6.74
		100 kg N/fed	3.66	5.33	9.23	8.56
		125 kg N/fed	4.00	6.00	11.56	10.65
	EM	75 kg N/fed	3.33	5.00	9.63	8.30
		100 kg N/fed	4.66	7.33	10.83	10.20
		125 kg N/fed	4.66	8.66	10.33	11.13
	Agrispon	75 kg N/fed	2.66	4.66	9.23	7.06
		100 kg N/fed	4.00	6.00	10.73	9.83
		125 kg N/fed	4.66	8.00	12.36	11.10
	Yeast extract	75 kg N/fed	4.00	7.33	11.83	9.90
		100 kg N/fed	5.33	9.33	12.96	11.40
		125 kg N/fed	5.33	13.00	13.40	11.80
Without	Without	75 kg N/fed	1.33	3.00	8.02	6.35
		100 kg N/fed	2.00	3.66	9.10	8.22
		125 kg N/fed	2.13	3.78	10.56	10.13
	EM	75 kg N/fed	2.00	5.00	9.13	8.56
		100 kg N/fed	2.66	5.33	10.40	9.16
		125 kg N/fed	3.66	6.00	12.30	10.70
	Agrispon	75 kg N/fed	1.66	3.33	8.66	8.03
		100 kg N/fed	2.33	4.00	9.86	9.16
		125 kg N/fed	2.33	4.00	11.63	10.40
	Yeast extract	75 kg N/fed	2.33	5.33	9.36	9.66
		100 kg N/fed	3.00	7.66	11.20	10.23
		125 kg N/fed	3.66	9.33	12.90	10.93
F. test			NS	NS	*	NS
LSD at 5 %			-	-	0.36	-

The interaction among organic manure, foliar fertilization treatments and mineral nitrogen fertilizer rates had a significant effect on fresh and dry weights of fruits/plant , except dry weight of fruits/plant in the second season only. It can be observed that the highest values of fresh weight of fruits (861.2 and 701.3 g/plant) and dry weight of fruits (38.90 and 41.93 g/plant) in the second picking were resulted from organic fertilizing cantaloupe with 15 m^3 chicken manure/fed and foliar spraying plants with yeast extract at rate of 5 g/ 1 L beside mineral fertilizing with 125 kg N/fed in the first and second seasons, respectively (Table 8). Organic fertilizing cantaloupe with 15 m^3 chicken manure/fed and foliar spraying plants with EM beside mineral fertilizing with 125 kg N/fed came to in the second rank after previously mentioned treatment in both seasons.

Table 8: Fresh and dry weights of fruits/plant in the second picking as affected by the interaction among organic manure, foliar fertilization treatments and mineral nitrogen fertilizer rates during 2013 and 2014 seasons.

Characters / Treatments / Seasons			Fresh weight of fruits (g/plant)		Dry weight of fruits (g/plant)	
			2013	2014	2013	2014
Chicken manure	Without	75 kg N/fed	365.2	350.4	26.45	21.45
		100 kg N/fed	405.6	401.5	29.87	24.76
		125 kg N/fed	512.3	496.8	37.89	28.78
	EM	75 kg N/fed	462.8	443.7	30.06	26.76
		100 kg N/fed	623.9	595.4	32.26	33.30
		125 kg N/fed	800.0	657.5	38.23	38.66
	Agrispon	75 kg N/fed	394.5	376.2	29.66	22.56
		100 kg N/fed	437.4	422.3	36.16	25.40
		125 kg N/fed	554.7	499.1	38.03	29.83
	Yeast extract	75 kg N/fed	514.4	500.7	32.83	30.13
		100 kg N/fed	680.3	555.1	35.76	35.06
		125 kg N/fed	861.2	701.3	38.90	41.93
Without	Without	75 kg N/fed	350.1	327.9	24.89	19.78
		100 kg N/fed	395.8	370.8	27.89	23.45
		125 kg N/fed	500.2	450.6	31.45	26.89
	EM	75 kg N/fed	431.9	405.2	26.43	24.80
		100 kg N/fed	579.8	512.5	30.06	30.86
		125 kg N/fed	618.7	606.4	36.96	36.43
	Agrispon	75 kg N/fed	373.2	347.3	25.80	20.56
		100 kg N/fed	532.6	389.3	28.30	24.70
		125 kg N/fed	603.1	460.6	33.66	27.73
	Yeast extract	75 kg N/fed	479.1	462.4	27.53	28.20
		100 kg N/fed	638.2	549.3	31.83	32.73
		125 kg N/fed	786.2	663.4	34.93	39.63
F. test			*	*	*	NS
LSD at 5 %			19.4	3.1	0.87	-

The interaction among organic manure, foliar fertilization treatments and mineral nitrogen fertilizer rates had a significant effect on fruit size and total fruit yield/fed of cantaloupe in both seasons, except fruit size of cantaloupe fruits in the second season only. From obtained results in(Table 9), it could be recorded that the highest values of fruit size (1227.0 and 1221.9 cm^3) and total fruit yield/fed (11.747 and 11.917 t/fed) of cantaloupe were resulted from organic fertilizing cantaloupe with 15 m^3 chicken manure/fed and foliar spraying plants with yeast extract beside mineral fertilizing with 125 kg N/fed in the first and second seasons, respectively. Organic fertilizing cantaloupe with 15 m^3 chicken manure/fed and foliar spraying plants with yeast extract and mineral fertilizing with 100 kg N/fed came in the second rank after previously mentioned treatment in both seasons.

Table 9: Fruit size and total fruit yield/fed as affected by the interaction among organic manure, foliar fertilization treatments and mineral nitrogen fertilizer rates during 2013 and 2014 seasons.

Characters / Treatments / Seasons			Fruit size (cm^3)		Total fruit yield (t/fed)	
			2013	2014	2013	2014
Chicken manure	Without	75 kg N/fed	366.2	389.4	8.245	8.562
		100 kg N/fed	545.5	546.2	8.993	9.235
		125 kg N/fed	845.2	699.9	9.123	9.784
	EM	75 kg N/fed	452.6	473.9	9.163	9.710
		100 kg N/fed	655.3	693.6	9.500	10.083
		125 kg N/fed	840.3	995.6	9.897	10.293
	Agrispon	75 kg N/fed	398.3	409.6	8.543	9.260
		100 kg N/fed	627.0	653.6	9.003	9.767
		125 kg N/fed	985.3	790.0	9.740	10.260
	Yeast extract	75 kg N/fed	537.3	613.9	10.250	10.707
		100 kg N/fed	1099.6	996.1	10.490	11.203
		125 kg N/fed	1227.0	1221.9	11.747	11.917
Without	Without	75 kg N/fed	322.4	335.6	5.263	5.985
		100 kg N/fed	465.2	470.8	5.578	6.245
		125 kg N/fed	789.4	689.4	6.563	6.564
	EM	75 kg N/fed	385.6	442.2	5.920	6.130
		100 kg N/fed	584.3	645.9	5.757	6.530
		125 kg N/fed	949.0	1037.8	6.753	6.847
	Agrispon	75 kg N/fed	331.0	380.9	5.650	6.110
		100 kg N/fed	503.3	607.9	5.510	6.147
		125 kg N/fed	812.3	927.3	6.033	6.757
	Yeast extract	75 kg N/fed	440.0	570.2	6.317	6.123
		100 kg N/fed	717.0	925.5	6.260	6.760
		125 kg N/fed	1089.6	1043.5	7.507	7.870
F. test			*	NS	*	*
LSD at 5 %			24.7	-	0.037	0.027

Effect of interaction on fruit quality:

The interaction among organic manure, foliar fertilization treatments and mineral nitrogen fertilizer rates had a significant effect on total soluble solids (TSS), total carbohydrate percentages and Vitamin C concentration in cantaloupe fruits in the second picking fruits, except Vitamin C concentration in cantaloupe fruits in the second picking fruits in the second season only. From obtained results in(Table 10), it could be recorded that the highest percentages of total soluble solids (12.74 and 10.93 %), total carbohydrate (31.08 and 30.82 %) and Vitamin C (35.80 and 34.30 mg/100 g F.W.) in cantaloupe fruits in the second picking were resulted from organic fertilizing cantaloupe with 15 m^3 chicken manure/fed and foliar spraying plants with yeast extract beside mineral fertilizing with 125 kg N/fed in the first and second seasons, respectively. Organic fertilizing cantaloupe with 15 m^3

chicken manure/fed and foliar spraying plants with yeast extract and mineral fertilizing with 100 kg N/fed came in the second rank after previously mentioned treatment in both seasons.

Table 10: Total soluble solids (TSS), total carbohydrate percentages and Vitamin C concentration in the second picking fruits as affected by the interaction among organic manure, foliar fertilization treatments and mineral nitrogen fertilizer rates during 2013 and 2014 seasons.

Treatments / Characters / Seasons			TSS (%)		Total carbohydrate (%)		Vitamin C (mg/100 g F.W.)	
			2013	2014	2013	2014	2013	2014
Chicken manure	Without	75 kg N/fed	8.75	6.56	26.45	26.54	26.56	25.61
		100 kg N/fed	9.52	8.12	27.56	27.56	28.65	26.45
		125 kg N/fed	11.36	9.56	26.31	29.36	31.56	30.25
	EM	75 kg N/fed	9.61	8.23	28.06	27.84	30.33	28.40
		100 kg N/fed	10.51	9.02	29.03	28.55	32.53	30.83
		125 kg N/fed	10.94	9.43	29.84	29.45	34.53	31.83
	Agrispon	75 kg N/fed	9.14	7.45	27.58	27.28	28.30	26.86
		100 kg N/fed	10.06	9.33	28.74	28.52	30.56	28.76
		125 kg N/fed	11.79	10.15	30.26	29.94	35.13	33.13
	Yeast extract	75 kg N/fed	11.44	9.83	28.54	28.23	31.90	29.36
		100 kg N/fed	12.29	10.71	30.82	30.39	35.70	33.23
		125 kg N/fed	12.74	10.93	31.08	30.82	35.80	34.30
Without	Without	75 kg N/fed	6.35	5.50	25.60	25.64	25.65	24.56
		100 kg N/fed	8.25	7.56	26.00	26.56	27.56	26.91
		125 kg N/fed	9.87	8.63	26.45	27.56	30.12	28.46
	EM	75 kg N/fed	8.08	7.72	26.56	26.86	27.63	27.06
		100 kg N/fed	9.26	8.50	27.36	28.13	29.60	28.36
		125 kg N/fed	10.58	10.09	27.98	29.93	32.43	31.80
	Agrispon	75 kg N/fed	7.67	5.88	26.21	26.69	27.36	25.43
		100 kg N/fed	8.95	8.89	26.67	27.98	28.76	27.20
		125 kg N/fed	10.09	9.55	27.60	29.30	31.53	31.83
	Yeast extract	75 kg N/fed	8.56	10.81	26.57	27.60	28.16	30.63
		100 kg N/fed	9.75	8.43	27.63	28.87	31.30	29.20
		125 kg N/fed	11.02	10.30	28.24	30.17	33.30	32.03
F. test			*	*	*	*	*	NS
LSD at 5 %			0.06	0.09	0.10	0.11	0.85	-

Obtained results can be discussed by clarifying the direct and indirect effects of used treatment on vegetative growth, yield and its components.

Effect of mineral nitrogen fertilizer rates:

It plays a pivotal role in many physiological and biochemical processes in plants . Nitrogen is a component of many important organic compounds

runging from proteins to nucleic acids . It is a constituent of the chlorophyll molecule , which plays an important role in plant photosynthesis . Many enzymes are proteinaceous , hence , N plays a key role in many metabolic activities . It is also a structural constituent of cell walls .

Nitrogen deficiency also decreases leaf area index , lower radiation use efficiency , and lower photosynthesis activity in plant . (Fageria and Bligar, 2005a)

Also , increasing the rates of nitrogen fertilizer in soil solution a round rooting zone caused an increase in the soulubility and availability of nutrients hence increasing the absorption of the nutritional elements in plant tissues , as reported by Faten *et al* (2002) .

Our results are in harmony with those obtained by Adam et al (2002) on cantaloupe , Sarg and Hassan (2004) on cucumber , Olaniyi (2008) on egusi melon and Abou El- yazied et al (2012) on cantaloupe .

Effect of organic manure:

The positive impacts of chicken manure on physical and chemical properties of soil such as the other organic fertilizers , where it improves soil drainage , ventilation and increases the soil ability to water retain and it improves holding capacity of soil and increases availability of elements, for these reasons the experimental units received chicken manure gave an inereament in vegetative growth parameters which reflected possitively on cantaloupe fruit yield and it is components .

These results are in harmony with those obtained by El- Nagar , (1996) , kandil and Gad (2010) , Shahata *et al* (2011a) and Lindani and Brutsch (2012)

Effect of foliar application treatments:

Obtained results show superiority of bio-fertilizers (EM , Agrispon and yeast) over the control treatment . Where yeast extract occupied the first order followed by EM and Agrispon . These biofertilizers contain many different types of micro organisms , the positive impact that happened may be due to the effect of these organisms on growth and yield whether directly or indirectly .

EM is a mixture of beneficial and effective micro organisms that used as a soil amendment (wood ward , 2003).

Our results are in the line with those obtained by Okorski *et al* . (2010) on pea ,Javaid and Bajwa (2011) on mung bean and Helmy (2013) on pea.

Concerning the effect of Agrispon , it is a biologically derived biostimulant soil and plant . It is antural solution for healthier soil , it enhances root zone activity and improves soil structure , Agrispon increases drought resistance , fixing atmospheric N2 and generally stimulating plant growth (Elegba and Rennie , 1984)

Yeast extract gave the heighest values of vegetative growth, yield and it components measurements as shown in tables 6 , 7 and 8 .

It is a natural bio-substance suggested to be of useful promotional and nutritional functions , due to threir hormones , sugars , amino acids , nucleic acids , vitamins and and minerals content . It contains a natural growth regulators , especially, cytokinins which play an importrant rule and had a stimulative effect on cell division , enlargement protein and nucleic acids

synthesis . The yeast also contains tryptofan which considered the precursor of IAA which increased plant growth .

Obtained results took the same direction with those obtained by Ghoname *et al* (2010) , Shehata *et al* (2012) , Swelam (2012) and Sakr *et al* (2013) .

CONCLUSION

It can be recommended that organic fertilizing cantaloupe with 15 m^3 chicken manure/fed and foliar spraying plants with yeast extract beside mineral fertilizing with 125 kg N/fed in order to maximize its growth and productivity. Meanwhile, organic fertilizing cantaloupe with 15 m^3 chicken manure/fed and foliar spraying plants with yeast extract and mineral fertilizing with 100 kg N/fed increased cantaloupe yield over the control (without organic and foliar application). Hence, this treatment is recommended where the mineral fertilization is reduced and this in turn decreases the environment pollution and production costs under the environmental conditions of Dakahlia Governorate, Egypt.

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حسام محمد السعيد عبدالنبي ، كوثر كامل ضوه ، السيد إبراهيم الجميل و يوسف فرج الشريف
قسم الخضر والزينة – كلية الزراعة – جامعة المنصورة

أجريت تجربتان حقليتان علي محصول الكانتلوب صنف " بريمال " في مزرعة خاصة بالقرب من مدينة جمصة محافظة الدقهلية خلال موسمي الزراعة ٢٠١٣ – ٢٠١٤ لدراسة تأثير التسميد النيتروجيني المعدني (٧٥ ، ١٠٠ ، ١٢٥ كيلو جرام / فدان) والتسميد العضوي (سماد دواجن) بمستويين 0 ، ١٥ م^{٣} / فدان والتسميد الحيوي رشاً علي المجموع الخضري (بدون ، EM ، أجرسبون ، مستخلص الخميرة) علي النمو والمحصول للكانتلوب .

ويمكن تلخيص النتائج المتحصل عليها فيما يلي :-

زيادة معدل التسميد النيتروجيني المعدني من ٧٥ إلي ١٠٠ أو ١٢٥ كيلو جرام /فدان سبب الزيادة المعنوية للنمو الخضري والمحصول ومكوناته في كلا الموسمين .

التسميد العضوي لنباتات الكانتلوب بأستخدام سماد مخلفات الدواجن بمعدل ١٥م^{٣} / فدان سبب زيادة النمو الخضري والمحصول ومكوناته مقارنة بمعاملة الكنترول وكانت الفروق معنوية .

التسميد بالرش بمستخلص الخميرة ، EM ، الأجرسبون سبب زيادة في النمو الخضري والمحصول ومكوناته زيادة معنوية مقارنة بالكنترول . إلا أن الخميرة كانت الأكثر تفوقاً .

بأستخدام التسميد المعدني بمعدل ١٢٥كيلو جرام / فدان متداخلاً مع التسميد بسماد الدواجن بمعدل ١٥م^{٣} / فدان والرش بالخميرة بمعدل ٥ جرام / لتر قد أعطي محصولاً أعلي من المعدل ١٠٠ كيلو جرام / فدان إلا أن تقليل تكاليف التسميد المعدني خاصة بعد إرتفاع الأسعارفي السنوات الأخيرة وتقليل التلوث البيئي وتحسن خواص الثمار تجعلنا نوصي بأستخدام المعاملة (١٥م^{٣} من سماد مخلفات الدواجن للفدان + الرش بمستخلص الخميرة وبتركيز ٥ جرام / ١ لتر + التسميد النيتروجيني المعدني بمعدل ١٠٠ كيلو جرام / فدان) وذلك لزيادة إنتاجية الكانتلوب وتحسين صفات الجود