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Influence of Mineral Fertilization Rate and Foliar Application of Yeast and Ascorbic Acid on Yield, Vegetative Growth and Fruits Quality of Eggplant.

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ABSTRACT

The experiments were carried in clay soil at the Experimental Farm of Faculty of Agricultural, El-Mansoura University, Egypt, to investigate the effect of foliar application with yeast and ascorbic acid on plant growth, yield and quality of eggplant (*Solanum melongena* L.) under different levels of NPK fertilization. Vegetative growth measurements (plant height, No. of leaves/plant, No. of branches/plant, fresh and dry weight), yield (fruits length, fruit diameter, No. of fruits and total yield), N, P, K and chlorophyll content as well as quality of fruits (C.protien, T.carbohydraties, D.faiber, V.C and V.A) were recorded to study the effects. As for, parameters of eggplant as affected by application of NPK fertilization there were a significantly increase with increasing rate of NPK from 50 up to 100% of the recommended dose then decreased with 150% NPK. The highest significant values of the aforementioned parameters were recorded with spraying plants by yeast extract (5 g/L.) comparing with the untreated plants. It could be observed that eggplants supplied with 100% NPK fertilization and foliar application of yeast gave the highest significant values of parameters under study.

INTRODUCTION

Eggplant (*Solanum melongena*, L.) is one of the most popular and vital vegetable crops in Egypt and is treated as a patriotic diet in many other tropical and sub-tropical countries. Increasing the quality and productivity of eggplant crop can be accomplished through improving the particularly, cultural practices, the utilization efficiency of applied fertilizers.

Eggplant (*Solanum melongena var. esculenta* L.), known as Brinjal, Guinea squash or Aubergine is one of the non-tuberous kinds of the night shade family Solanaceae (Kantharajah and Golegaonkar, 2004). Fruits of eggplant fruits include a huge amount of proteins, carbohydrates and some minerals (Mahmoud, 2000). Fruits of eggplant are recognized for having a mineral composition beneficial and being low in calories for human health. They are also a rich source of magnesium, potassium, iron and calcium (Zenia and Halina, 2008).

According to Sabo and Dia (2009) eggplant contains phytonutrients i.e. nasunin and chlorogenic acid. Nasunin is a free radical scavenger and potent antioxidant that has been shown to safeguard cell membranes from damage. Also, eggplant is a very good source of potassium, dietary fiber, copper, manganese and vitamin B6, folate, niacin and magnesium. It is a precious vegetable for canning industries for garden-egg paste, sautéed eggplant and other products. The fruits are stewed, marinated, fried and intended in other ways. The eggplant with its bitter taste and spongy texture could really make an amazing pot of stew and eaten with boiled yam or rice. Medicinally, a meal of garden egg is proven to be of benefits to patients suffering from raised intraocular pressure (glaucoma) and convergence insufficiency, as well as in heart diseases and Arterioscerosis (Harish *et al*., 2008). This oil is refined and used for industrial products such as soap, candle and other products. Agree with Ayodele and Salami (2006), its rating as vegetable crop on the one hand and oil crop on the other hand.

Plants need nitrogen, phosphor and potassium as a certain mineral nutrients to grow and to produce yield, being required in the largest quantities and generally become deficient first in the soil. Availability of nutrient has been reported to be directly related to yield (Roberts, 2001). Although this practice have been described and condemned as inadequate, efforts to change it has not been successful (Adeoye and Chude, 2006). Sharma and Brar (2008) in a review on the nutrient requirements of eggplant stated that studies show that the eggplant gives changing response to application of fertilizers under different agro-climatic conditions, stressing that response to nutrients varies from (75 to 300 Kg N), (30 to 224 Kg P) and (0 to 80 Kg K/ha).

Moreover, Bendegumbal (2007) found that the trouble of high cost of chemical fertilizers to completely meet the nutrient requirement of crops is a major constraint. Thus, in Egypt, farmers have understand the need for plant amendments and soil using available resources such ascorbic acid and yeast.

Dry yeast is a normal bio-substance proposed to have protective functions, stimulating and nutritional when used on vegetables. Dry yeast in foliar way increased growth parameters, yield and quality of much vegetable crops (Kabeel *et al*., 2005 and Fawzy, 2007). In the same link, reported that yeasts have been enriched source of vitamins, phytohormones (especially cytokinins), minerals, enzymes and amino acids (Khedr and Farid, 2002 and Mahmoud, 2001). It was also emphasized its stimulatory effects on protein, cell division, nucleic acid synthesis, enlargement and chlorophyll formation also, participates in a useful role during stress according to its cytokinins content (Barnett *et al.* 1990). El-Tohamy *et al*.(2008) on eggplant, El-Ghamriny *et al.* (1999) and Fathy *et al*.(2000) on tomatoes, Taha and Omar (2010) and Ahmed *et al.* (2011) on potato plants. All of them found reported that, using active yeast extract, improved growth and productivity of vegetable crops.

The applied of ascorbic acid may have a stimulatory effect on plants, such as, the using of ascorbic acid during cold season gives a significant increases on growth vegetative parameters and tomato total yields (Abdel-Halim, 1995). Other investigators recorded similar results on the stimulatory effects of vitamin C on other plants such as on potato (El-Banna *et al*., 2006), pepper (Shehata *et al*., 2002) and on pea plants (Helal *et al*., 2005).

Thus, the objective of the present work was to determine the effects of yeast and ascorbic acid on productivity and quality of eggplant under mineral fertilization.

MATERIALS AND METHODS

The experiments were carried in clay soil at the experimental farm of faculty of agricultural, El-Mansoura University, Egypt, to investigate the effect of foliar application with yeast and ascorbic acid on growth, yield and quality of eggplant (*Solanum melongena* L.) under different levels of NPK fertilization. Physical and chemical properties of the experimental soil are presented in Table (1).

Nine treatments were coordinated in split plot design, which were the possible simple combination between three rates of NPK (50, 100 and 150% recommend dose) and three treatments of foliar applications are control (tap water), yeast (5 g/l) and ascorbic acid (100 mg/l) with 3 replicates. Thus, the total numbers of plots used for each season were 27 plots. Foliar application were done at flowering stage, twice with 10 days intervals.

The plot area was 43 m^2, included 4 ridges (70 cm width and 10 m length and 50 cm apart) in each plot, seedlings of eggplant *(Solanum melongena* L*)* c.v Black Beauty

Table 1. Pysical-chemical properties of the soil used during experiment.

Soil properties		
Particle size distribution (%)	Coarse sand	6.05
	Fine sand	21.12
	Silt	31.08
	Clay	41.75
	Texture class	Clay
E.C. dS.m^{-1}(1:5)		1.19
pH (1:2.5)		7.93
S.P. %		54.5
O.M. g Kg^{-1}		14.9
T. CaCO3 g Kg^{-1}		36.8
Available (mg/kg)	N	53.08
	P	5.65
	K	264.8

Nitrogen fertilization added at rate of 254 kg N / ha as ammonium sulphate (20.5% N) and potassium fertilization added at the rate of 210.82 kg K/ha as potassium sulphate (40%K), all of nitrogen and potassiume were added in three doses; two after one month interval from planting and the third dose during flowering stage. As for Phosphorus fertilizer, was added to the soil before planting at the rate of 66.45 kg P/ha as super phosphate (7% P). All mineral fertilization was added according of the ministry of agricultural.

The following data were recorded:

Vegetative growth parameters:

A random sample of 5 plants from each plot was taken at 75 days after transplanting. All vegetative growth parameters i.e., plant length (cm), number of leaves/plant, number of branches/plant, fresh weight of leaves/plant (g) and dry weight of leaves/plant (g) were determined.

Yield and fruit quality:

At harvest stage the mature fruits of eggplant were harvested twice every week along the harvesting season. At harvest time the fruit length (cm), fruit diameter (cm), average one fruit weight(g) and fruit yield (kg/m2) of each plot were recorded and the total yield as ton/ha was calculated.

Chemical constituents:

Leaves samples were oven dried at 70 °C then fine ground and wet digested. Leaves N, P and K contents were determined according to the methods mentioned by Mertens, (2005a & b) and *Agrilasa, (2002) respectively*.

Chlorophyll content in fresh weight was estimated as the method described by *Gavrilenko and Zigalova (2003).*

At 3rd picking; eggplant fruits random samples were randomly chosen from each plot, oven dried at 70°C and ground for the determination of N, P and K contents according to the methods mentioned by Mertens, (2005a & b) and *Agrilasa, (2002),* and T.carbohydraties% (Shumaila and Safdar, 2009), faiber according to (AOAC, 2000), V.A according to Parrish, (1977) and V.C. determined according to the method described by Mazumdar and Majumder, (2003).

Protein content (%) was calculated according to (AOAC, 2000) as follow: multiplying % N percentage by the = Nitrogen (%) x 6.25.

* Mechanical analysis of particle size estimated by *Haluschak, (2006)* and NPK availability in the soil were measured according to the methods of*, Reeuwijk, (2002).*

Statistically analyzed of data were done using CoSTATE Computer Software, according to Gomez and Gomez, (1984).

RESULTS AND DISCUSSION

Vegetative Growth:-

Vegetative growth parameters of eggplants as affected by the application of NPK-fertilization, the mean values of parameters (plant height, No. of leaves/plant, No. of branches/plant, fresh and dry weight) in Table 2 indicated that were a significant increase with increasing rate of NPK from 50 up to 100% from recommended dose then decreased with 150% NPK during the season. The highest values in 81.60, 47.52, 4.05, 332.90 and 72.58 recorded with NPK fertilizers at the rate of 100% from RD as compared with 50% for plant height, number of leaves and branches/plant, fresh and dry weight, respectively. This result could be attributed to the vital role of nitrogen in plant which, found in nuclic acids, co-enzymes and proteins. As for, phosphorus also has a part in enhance nodulation of plant, nitrogen fixation, and increase photosynthesis of plant, while potassium activates some K+ ions and enzymes which, play an important part in control stomatal guard cells of leaves and as well increase photosynthsis (Abd-El- Aal,1990 and Said, 1997). This result is in agreement with those of Nafiu *et al.,* (2011), Suge et al., (2011), Oyewole *et al.,* (2014), Lawal *et al.,* (2015) and Muoneke *et al.,* (2016).

Data presented in Table 2 clearly showed that all growth parameters was significant affected by foliar application treatments of yeast extract and ascorbic acid as comparing to the untreated plants. It's clear that aforementioned parameters highest values were significant at Table 2 which, recorded with spraying plants by yeast extract (5 g/L.). These increases were true and significant. The increases in plant growth parameters as obtained from spraying yeast extract may be attributed to the yeast role, which contains growth factors and a relatively larger proportion of cytokinins, free amino acids and short peptides of two or three amino acids a long with protein hydrolisates, several vitamins as well as normal elements (Na, Ca, Fe, Mg, K, P, S, Zn & Si) and organic compound which as shown in Table 4 have an important role and stimulative effect on cell division and enlargement traits. Similar result were mentioned by El-Tohamy *et al.* (2008) on eggplants, El-Sayed *et al.* (2010) and Abou El-Yazied and Mady (2011) on tomato plants and El-Nemr *et al.,* (2015) on eggplants.

Table 2. Effect of NPK fertilization, foliar application of yeast and ascorbic acid and their interaction on vegetative growth parameters.

Treatments		plant height cm	No. of leaves /plant	No of branches /plant	Fresh weight (g)	Dry weight (g)
Effect of mineral fertilization						
50% NPK		64.73	37.62	3.21	264.56	56.91
100% NPK		81.60	47.52	4.05	332.90	72.58
150% NPK		76.04	44.33	3.80	308.57	68.61
LSD $_{at\ 5\%}$		1.52	1.82	0.05	7.13	2.37
Effect of growth regulators application						
Untreated		58.20	33.84	2.89	236.99	52.03
Yeast		83.71	48.90	4.18	339.51	74.71
Ascorbic acid		80.45	46.73	3.99	329.53	71.36
LSD $_{at\ 5\%}$		1.94	1.21	0.12	8.13	2.85
Effect of interaction						
50% NPK	Untreated	53.28	30.48	2.62	215.10	47.01
	Yeast	72.51	42.69	3.64	297.37	64.99
	Ascorbic acid	68.41	39.69	3.38	281.20	58.74
100% NPK	Untreated	58.39	34.29	2.88	237.69	51.55
	Yeast	93.41	54.38	4.65	379.89	83.09
	Ascorbic acid	92.98	53.89	4.63	381.13	83.10
150% NPK	Untreated	62.93	36.75	3.17	258.17	57.54
	Yeast	85.22	49.62	4.25	341.28	76.03
	Ascorbic acid	79.97	46.62	3.97	326.25	72.25
LSD $_{at\ 5\%}$		3.36	2.09	0.22	14.09	4.93

It could be observed that eggplants supplied with 100% NPK fertilization and foliar application of yeast gave the highest significant values of plant height, No. of leaves/plant, No. of branches/plant, fresh and dry weights. This may be due to increased N availability to the plants from the organic and inorganic fertilizer combinations. Therefore, increasing nitrogen levels increased multiplication of cells which enhances the amount of metabolites necessary for building plant organs and consequently the vegetative growth of plants while, the increment in plant growth due to P could be interpreted as a reflection to its role in root proliferation and growth, photosynthesis, energy storage, cell division and enlargement.

Chemical composition:

The different comparisons tabulated in Table 3 indicated that with adding more rate of NPK fertilization from 50 to 150% from recommended dose N, P and K percentages in the leaves of eggplant significantly increased. The highest mean values for the above mentioned traits were found to be associated with the addition of 100% RD-NPK recorded during the season as 1.35% for N, while the suitable rate for P and K content was 150% NPK which recorded as 0.174% and 1.86 % in the leaves, P and K percentages, respectively. These increase could be realized to the availability of N, P and K element in soil for plant then increasing root growth, so, improving the absorbing area of root. Similar result was reported by Baddour (2010) found that application of NPK-level from 50 to 75% and, fatherly to 100% RD significantly increased N, P and K percentages in the leaves of tomato plants.

Regarding the effect of spraying eggplant plants with yeast extract and ascorbic acid, data in Table 3 clearly showed, comparing with the untreated plant a significant effect on N, P and K percentages in leaves was found. Data indicated that the highest significant values of N percentages were recorded with spraying yeast extract, while P and K % showed the highest value with ascorbic acid comparing with the untreated plants give the lowest mean values of the chemical parameters. The enhancement of yeast extracts may be due to that it contain components such as macro- and microelement nutrients, amino acids, vitamins, cytokinins, auxins, and abscisic acid (ABA) which encourage vegetative growth parameters (Table 2) and enhanced nutrients absorption by roots. Our findings are connected with findings of El-Tohamy et al., (2008), Oyewole et al., (2014) and El-Nemr et al., (2015) reported that using yeast extract increased N, P and K contents of eggplant. The effect of ascorbic on chemical composition of eggplant leaves was evident (El-Banna et al., 2006) and El-Tohamy et al., (2008) they found that application of ascorbic acid were significantly increased leaves contents of N, P and K.

Interaction effect between mineral fertilization and foliar application on chemical content of eggplant leaves, such as N, P and K percentages are present in Table 3. The most suitable treatment, which gave the best values was connected with the plants treated with the NPK-fertilizers at rate of 100 % from the recommended doses in the presence of foliar application of yeast extract at 5 g/L for N percentage and 150% NPK with ascorbic acid for P and K %. The present results are in agreement with the findings of Ayeni *et al.* (2010), Baddour (2010) Mahila *et al.* (2010) on tomato plants.

Table 3. Effect of NPK fertilization, foliar application of yeast and ascorbic acid and their interaction on N, P and K percentage in leaves.

Treatments		N%	P%	K%
Effect of mineral fertilization				
50% NPK		1.07	0.116	1.28
100% NPK		1.35	0.155	1.69
150% NPK		1.27	0.174	1.86
$LSD_{at\ 5\%}$		0.13	0.004	0.06
Effect of growth regulators application				
Untreated		0.97	0.130	1.42
Yeast		1.39	0.152	1.64
Ascorbic acid		1.33	0.163	1.77
$LSD_{at\ 5\%}$		0.14	0.003	0.04
Effect of interaction				
	Untreated	0.88	0.104	1.17
50% NPK	Yeast	1.21	0.116	1.28
	Ascorbic acid	1.13	0.126	1.39
	Untreated	0.97	0.137	1.48
100% NPK	Yeast	1.55	0.158	1.71
	Ascorbic acid	1.54	0.170	1.89
	Untreated	1.05	0.148	1.62
150% NPK	Yeast	1.42	0.182	1.93
	Ascorbic acid	1.33	0.193	2.04
$LSD_{at\ 5\%}$		0.24	0.006	0.07

Chlorophyll content:

Data in the Table 4 indicated that at 100% level of NPK – fertilizers significantly increasing the average values of chlorophyll a, b and total of eggplant leaves over those obtained from 50% RD. besides that, the above mentioned traits connected with the treatment of 100 % RD gave the highest mean values which, recorded 0.666 mg/g FW, 0.468 mg/g FW and 1.134 mg/g for chlorophyll a, b and total, respectively. The effects of application with NPK fertilizers on the chlorophyll content could be listed to role of NPK in the chlorophyll molecule or its pigment synthesis in the plant tissues. These findings are corresponding to those reported by Saif-El-Deen (2000) on sweet potato and Nabih (2002) on potato.

Table 4. Effect of NPK fertilization, foliar application of yeast and ascorbic acid and their interaction on chlorophyll content.

Treatments		Chlorophyll a (mg/ g FW)	Chlorophyll b (mg/ g FW)	Total chlorophyll (mg/g FW)
Effect of mineral fertilization				
50% NPK		0.633	0.440	1.073
100% NPK		0.666	0.468	1.134
150% NPK		0.657	0.458	1.115
$LSD_{at\ 5\%}$		0.006	0.004	0.003
Effect of growth regulators application				
Untreated		0.617	0.428	1.045
Yeast		0.675	0.474	1.149
Ascorbic acid		0.663	0.464	1.127
$LSD_{at\ 5\%}$		0.005	0.003	0.006
Effect of interaction				
50% NPK	Untreated	0.604	0.421	1.025
	Yeast	0.652	0.454	1.106
	Ascorbic acid	0.642	0.446	1.088
100% NPK	Untreated	0.617	0.427	1.044
	Yeast	0.697	0.494	1.190
	Ascorbic acid	0.684	0.483	1.167
150% NPK	Untreated	0.630	0.437	1.067
	Yeast	0.678	0.474	1.151
	Ascorbic acid	0.664	0.463	1.127
$LSD_{at\ 5\%}$		0.008	0.007	0.010

Illustrated data in Table 4 show that spraying egg plants with yeast extract and ascorbic acid comparing with the controlled plant a significantly increased was found in the chlorophyll a, b and total of eggplant. Data showed that the highest significant values of the above parameters were recorded by spraying yeast extract. Regarding the effect of yeast on chlorophyll, it might be due to that yeast contain amounts of cytokinins, auxins and betaines, which enhance chlorophyll content in the leaves. Also this increase may be due to a decrease in chlorophyll degradation. Our findings are in agreement with those obtained by Bhat et al., (2010) who showed that use of seaweed as an organic amendment increased the total chlorophyll content, and fruit yield in tomato, sweet pepper, and lettuce. Similarly, El-Tohamy and EL-Greadly (2007) in snap bean plants, found that application of yeast extract increased chlorophyll a and b as well as carotenoids.

Application of mineral fertilization and foliar application in the present investigation at Table 4, had a marked effect on chlorophyll a, b and total of eggplant as illustrated in Table 4. Eggplants fertilized with 100% NPK from recommended doses and foliar applications with yeast were found to be superior for increasing the measured parameters during the season.

Quality of fruits:

With respect to the effect of NPK-fertilization, it can be noticed from the data in Table 5 that application of NPK-fertilizers significantly increased the parameters of C.protien, T„carbohydraties, D.faiber, V.C and V.A, NPK-fertilization at the rate of 100% RD was superior for increasing the average values of this parameters in fruits compared with the lowest treatment, which recorded as 5.87 %, 23.82 %, 13.33 %, 3.92 mg/100g & 32.73 IU

for C.protien, T,,carbohydraties, D.fiber, V.C and VA in fruits, respectively. This might be due to more availability and better utilization of nutrients at higher NPK levels. These results corroborate the findings of Baddour (2010) who found that application of NPK-fertilizers only at rate of 75% RD was excellent for increasing the average values of TSS, Acidity % and V .C (mg/100g) over the control treatment. In the report, an increase in nutritional value of eggplant was observed with availability of adequate amount of nutrients. With this, nutrient uptake, and assimilation as well as dry matter production and partitioning were all found to be enhanced. This invariably improved the quality of the crop economic products. This implied having produce of high nutritional value with adequate fertilizer application. The obtained results are, generally, in accordance with those found by Nafiu *et al.,* (2011) and Lawal *et al.,* (2015)

Table 5. Effect of NPK fertilization, foliar application of yeast and ascorbic acid and their interaction on eggplant quality fruits.

Treatments		C. protien %	T.carbohydraties %	D. fiber %	VC (mg/ 100g)	VA IU
Effect of mineral fertilization						
50% NPK		4.83	22.90	12.64	3.35	29.91
100% NPK		5.87	23.82	13.33	3.92	32.73
150% NPK		5.47	23.70	13.15	3.75	31.71
$LSD_{at\ 5\%}$		0.05	0.18	0.07	0.03	0.93
Effect of growth regulators application						
Untreated		4.42	22.01	12.31	3.08	28.74
Yeast		6.04	24.43	13.53	4.03	33.36
Ascorbic acid		5.70	23.97	13.29	3.91	32.26
$LSD_{at\ 5\%}$		0.03	0.22	0.11	0.04	0.59
Effect of interaction						
50% NPK	Untreated	4.11	22.02	12.03	2.94	27.77
	Yeast	5.35	23.56	13.06	3.61	31.47
	Ascorbic acid	5.01	23.14	12.85	3.51	30.50
100 % NPK	Untreated	4.42	21.30	12.29	3.07	28.70
	Yeast	6.78	25.34	13.99	4.38	35.37
	Ascorbic acid	6.41	24.82	13.71	4.30	34.13
150 % NPK	Untreated	4.74	22.71	12.61	3.22	29.77
	Yeast	5.99	24.41	13.54	4.09	33.23
	Ascorbic acid	5.67	23.97	13.30	3.94	32.13
$LSD_{at\ 5\%}$		0.05	0.37	0.19	0.07	1.01

Concerning the C.protien, T,,carbohydraties, D.fiber, V.C and V.A, it is very clear that spraying eggplants with both yeast extracts and ascorbic acid significantly increased their values as compared with the untreated (tap water). The yeast extract was the best in this concern. Yeast has higher contents of higher percentage of proteins, protein and different nutrients as reported by Meyer and Phaff (1969) and Subba Rao (1984). This may explain the increase of C.protien, T,,carbohydraties, D.fiber, V.C and V.A in response to yeast application. This result are in agreement with those obtained by Abou El-Yazied and Mady (2011) who said that minerals chemical composition and some bio-constituents i.e. total soluble solids, vitamin C and carbohydrates in tomato fruits were also increased with application of 4 g/l yeast extract.

With respect to the effect of interaction between NPK-fertilization and foliar application treatments on the previous parameters in fruits of eggplants, it is event from such data presented in Table 5 that the highest records of the parameters values were obtained by plants fertilized with NPK-fertilization at 100% RD and yeast extract at 5 g/L. comparing with other treatments.

Yield and its components:

As for using different application rates of NPK-fertilizers, data in Table 6 show that the mean values of fruits yield, were significantly increased as the level of NPK-applied was increased from 50 to 150% RD. The plants treated with mineral NPK gave 19.35 cm, 5.88 cm, 25.53 & 63.04 ton/ha for fruits length, fruit diameter, No. of fruits and total yield for the treatments of 100% RD., respectively. The increasing by the treatment of NPK fertilization could be due to increasing in plant dry weight due to increasing uptake of N and P which resulted in increased number of leaves and branches (Table, 2). The better carbohydrate build up improved by plant growth which increased the plant fruit yield and its components. In this respect many investigators found that increasing application of NPK fertilization level increased the yield of eggplants (Nafiu *et al.,* (2011), Suge *et al.,* (2011), Oyewole *et al.,* (2014), Lawal *et al.,* (2015) and Muoneke *et al.,* (2016)).

Foliar application, i.e., tap water, yeast extract and ascorbic acid effect on fruits length, fruit diameter, No. of fruits and total yield of eggplants, it was found as shown in Table 6 that using these materials significantly enhanced yield ad its components of eggplants as compared to the control (sprayed with tap water) during the season. Its clear that yeast extract significantly recorded the highest measured parameters. Respecting the yield and its components enhancing potential of the yeast extract might be attributed to that its a biostimulant, which provide eggplant with macro, micro and significant amount of cytokinins, auxins and betaines (Blunden *et al*., 1991) which illustrated that by boosting the photosynthetic process, thereby stimulating vegetative growth parameters (Table 2), resulted an increase in chlorophyll production. So that, plant performance would be increased accordingly and reflect on its productivity. Our finding coincide with some earlier findings of El-Tohamy *et al.,* (2008) on eggplants, El-Sayed *et al.,* (2010) and Abou El-Yazied and Mady (2011) on tomato plants and El-Nemr *et al.,* (2015) on eggplants.

It is clear from the data presented in Table 6 that increasing NPK fertilization up to 150% under different foliar applications significantly affected the yield and its components and the most suitable treatment was realized for the plants treated with NPK fertilizers at the rate of 100 % from the recommended doses and sprayed with the yeast extract.

Table 6. Effect of NPK fertilization, foliar application of yeast and ascorbic acid and their interaction on yield and its components.

Treatments		Fruit length (cm)	Fruit diameter (cm)	No. of fruit/ plant	Total yield ton/ha
Effect of mineral fertilization					
50% NPK		15.32	4.65	20.06	49.76
100% NPK		19.35	5.88	25.53	63.04
150% NPK		18.02	5.51	23.85	58.85
$LSD_{at\ 5\%}$		0.53	0.10	0.67	2.18
Effect of growth regulators application					
Untreated		13.78	4.17	18.33	44.79
Yeast		19.87	6.06	26.00	64.83
Ascorbic acid		19.04	5.80	25.12	62.04
$LSD_{at\ 5\%}$		0.41	0.17	0.47	1.41
Effect of interaction					
50% NPK	Untreated	12.59	3.77	16.30	40.44
	Yeast	17.30	5.27	22.63	56.40
	Ascorbic acid	16.06	4.90	21.25	52.43
100% NPK	Untreated	13.75	4.16	18.72	45.05
	Yeast	22.22	6.74	28.83	72.09
	Ascorbic acid	22.09	6.74	29.04	71.98
150% NPK	Untreated	14.99	4.59	19.96	48.88
	Yeast	20.10	6.18	26.54	66.01
	Ascorbic acid	18.97	5.77	25.06	61.70
$LSD_{at\ 5\%}$		0.72	0.30	0.81	2.62

The effect of different treatments was significant effect on soil available N, P and K after harvest of eggplant (Table 7). The significantly highest values of available N (61.89 mg/kg), P (7.67 mg/kg) and K (201.63 mg/kg) were recorded by treatment 150% NPK comparing with the treatment 50% which recorded the lowest values. Increasing availability of N, P, and K could be attributed to the result from changes in soil nutrient transformation rates due to change in properties ecosystem. Soil nutrient turnover rate consist of chemical complexation, mineralization, decomposition, weathering, adsorption or nutrient uptake by crops and soil organisms (Marrs,

1993). The results are in a good agreement with those reported by (Kamble and Kathmale, 2015), they found that the significantly highest available nitrogen (213 kg ha-1), phosphorus (14.42 kg ha-1) were recorded in 125 % recommended dose of NPK to onion appears to be improving soil fertility.

Available soil N, P and K:

Table 7. Effect of NPK fertilization, foliar application of yeast and ascorbic acid and their interaction on soil available N, P and K mg/kg after harvesting.

Treatments		available N mg/kg	available P mg/kg	available K mg/kg
Effect of mineral fertilization				
50% NPK		56.44	5.50	178.47
100% NPK		60.41	7.03	193.53
150% NPK		61.89	7.67	201.63
LSD $_{at\ 5\%}$		0.02	0.03	0.49
Effect of growth regulators application				
Untreated		57.93	6.06	184.03
Yeast		59.87	6.93	192.90
Ascorbic acid		60.94	7.22	196.70
LSD $_{at\ 5\%}$		0.05	0.02	0.33
Effect of interaction				
50% NPK	Untreated	55.41	5.08	174.50
	Yeast	56.38	5.52	178.60
	Ascorbic acid	57.52	5.91	182.30
100% NPK	Untreated	58.66	6.33	186.70
	Yeast	60.74	7.28	195.80
	Ascorbic acid	61.83	7.49	198.10
150% NPK	Untreated	59.72	6.76	190.90
	Yeast	62.49	7.98	204.30
	Ascorbic acid	63.46	8.26	209.70
LSD $_{at\ 5\%}$		0.08	0.05	0.57

CONCLUSION

The above studies demonstrate that both mineral manures and foliar application have their own parts to play in fertility of soil management but none can exclusively supply every one of the supplements and different conditions of growth for producing eggplant. Growth and yield parameters increasing in this study might be related with the supply of essential elements by the addition of NPK at 100% from recommended dose and using yeast extract as foliar application, which gave the best results for growth and yield components and quality of eggplant.

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تأثير معدل التسميد المعدني والرش الورقي بكل من الخميرة وحمض الاسكوربيك على المحصول والنمو الخضري وجوده ثمار الباذنجان.

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نفذت تجربه حقليه فى مزرعه كليه الزراعه جامعه المنصوره لدراسة تأثير الرش بالخميره و حمض الاسكوربيك علي النمو الخضرى والمحصول و جوده نبات الباذنجان تحت تأثير مستويات مختلفه من التسميد المعدنى. تم اخذ القياسات التاليه من النمو الخضرى (طول النبات، عدد الاوراق، عدد الافرع، الوزن الطازج والجاف للأوراق)، و المحصول (طول الثمار، قطر الثمار، عدد الثمار و المحصول الكلي) و التركيب الكيميائى (النيتروجين، الفوسفور ، البوتاسيوم فى الاوراق) بالاضافه الى محتوى الكلوروفيل كذلك جوده الثمار من حيث (البروتين، الكربوهيدرات، الالياف، فيتامين سى و أ). بالنسبه لتأثير التسميد المعدنى على القياسات السابقه وجد زياده معنويه بزياده معدل التسميد المعدنى من ٥٠% الى ١٠٠% من الموصى به ثم انخفضت عند ١٥٠%. وجد اعلى زياده للقياسات تحت الدراسه عند الرش بالخميره بمعدل ٥ جم للتر مقارنه بالنباتات الغير مرشوشه. ومن هنا وجد ان التأثير المشترك بين التسميد المعدنى والرش اعطى افضل النتائج عند استخدام ١٠٠% من الموصي به تسميد معدنى والرش بالخميره.