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Effect of Organic, Chemical Fertilizations and Plant Stimulants on Eggplant (*Solanum melongea* L.) Yield and Quality under Conditions of Saline Soil

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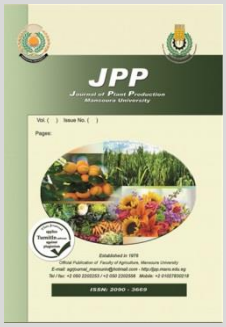

ABSTRACT

Two experiments were carried out at a private Farm in Rowad Village belong to Sahl El-Husseiniya, Sharkia Governorate through 2019 and 2020 seasons to determine the impact of organic,chemical fertilizations and spraying with some plant stimulants (yeast extract, potassium silicate and chicken manure tea) on growth traits, yield and its components and chemical ingredients of eggplant(Black Beauty cultivar) grownup under saline soil. The experiments were conducted using split-plots design with three replications. Organic and chemical fertilization treatments were arranged in the main-plots. The sub-plots were assigned to some plant stimulants (yeast extract, potassium silicate and chicken manure tea) treatments.The obtained results showed that growth, yield and its components and chemical ingredients of both eggplant leaves and fruits were significantly affected by the different levels of organic and chemical fertilization in both time of years. The supreme values of these traits were obtained from using 100%of (NP and K)chemical + 0% of (FYM) farmyard manure fertilizers,50%of NP and K+ 50% of FYM and75%of NP and K+ 25% of FYM fertilizers.Spraying eggplant plants with potassium silicate, chicken manure tea and yeast extract significantly improved growth, yield and its components and chemical in gredients in leaves and fruits through both years. It could be recommended that spraying eggplant plants with yeast extract with using50%of NP and K+ 50% of FYM to enhance growth, yield and its components and chemical ingredients under the ecological situation of this research.

Keywords: Eggplant, foliar spraying, yeast extract, farmyard manure, chemical fertilizers, potassium silicate

INTRODUCTION

Eggplant (*Solanum melongea*L.) is one of the first-born and prevalent vegetable crops in Egypt. It is grown in most grown area in Egypt.Eggplant fruits include a considerable amount of carbohydrates, protein and vitamins.

Plants need nitrogen, phosphorous and potassium as certain mineral nutrients for growth and crop production, and they are required in large quantities and generally become deficient first in the soil. It has been reported that nutrient availability is directly related to yield (Roberts, 2001). Although this practice has been described and condemned as insufficient. Sharma and Berar (2008), in a review on the nutritional requirements of eggplant, explained that eggplant gives a variable response to the application of fertilizers under different agro-climatic conditions, confirming that the response to nutrients. Moreover, Bendegumbal (2007) found that the problem of high cost of chemical fertilizers to fully meet crop nutritional needs is a major obstacle. Thus, in Egypt, farmers understood the need for plant modifications. An appropriate No. of inorganic fertilizers containing nitrogen, phosphorous and potassium are essential for vegetal growth and reproduction (Rao and Subramanian, 1994). An insufficient proportion of agrochemicals including synthetic fertilizers adversely affected the physiological process of plants (Cooke, 1972) while their excess had some negative effects on human health.

Increasing eggplant production under salt conditions faces a big problem. Because salinity is singular one of the major abiotic pressures in arid and organic fertilizers may increase soil fertility, thus the potential for crop production may be through changes in the physical and chemical properties of the soil including nutrient bioavailability, soil structure, water retention capacity, and exchange capacity. Cationic, soil pH reduction, community and microbial activity (Muhammad and Khattak, 2009). Therefore, the use of both synthetic and natural fertilizers in the right amount and proportion, at the correct time and in the available form is required to achieve optimal eggplant production due to their positive effect on the plant nutritional properties of the crop (Dumas *et al*., 2003). Compost plays a direct role in soil fertility, microbial counts, and improves plant growth by providing micro and macronutrients in available form, which ultimately led to increased productivity (Shaheen *et al.*, 2015). With regard to compost, several researchers found that the addition of compost had a positive effect on the growth and quantitative and qualitative characteristics of eggplant (Agbo *et al*., 2012; Sarhan *et al*., 2011 and Christo *et al*., 2011). Organic nutrition should be preferred to improve food quality and provide health security for people. Organic composts such as farm manure (FYM) and poultry manure improve the growth, yield and quality of eggplant (Rehman *et al*., 2015 and Jan *et al*., 2017). Braga *et al*. (2009) found that the increased yield of tomatoes due to the use of SiO could be attributed to the effects of utility of Si in the plant, as an improvement of the structure to show more upright leaves, which intercept higher solar luminosity increasing the efficiency of photosynthesis and higher chlorophyll content. El-Hedek (2013) also found that spraying potassium silicate on leaves led to a significant improvement in the components

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of the wheat crop and an increase in its content of potassium, calcium and phosphorous ratios. In addition, Ismail *et al.* (2017) found that spraying of pea plants with potassium silicatee at a rate of 4 cm / liter resulted in a significant increase and produced the uppermost average values for all studied vegetal growth parameters and their chemical components and components in leaves and seeds. Spraying of yeast has been found to increase the growth, productivity and quality of many vegetable crops (Abu Al-Nasr *et al.* 2001; Kapil *et al.* 2005 and Fawzi, 2007). In this regard, yeasts have been reported to be a rich source of phytohormones (especially cytokinins), vitamins, enzymes, amino acids and minerals (Khodr and Farid, 2002 on Tomato and Mahmood., 2001 on Magnolia). Amer (2004) scored improving the growth and productivity of vegetable crops by applying an active yeast extract. Its stimulatory effects on protein, cell division, DNA synthesis, hypertrophy and chlorophyll formation have also been emphasized, and it also participates in a beneficial role during stress according to its cytokinin content (Barnett *et al.*, 1990). El-Tohamy *et al.*,(2008) on eggplant, Fathy *et al.*(2000) on tomatoes, Taha and Omar (2010), Ahmed *et al.* (2011) on potato and Fouda and Abd-Elhamied *et al.*(2017) all of them found that using active yeast extract improved the growth and productivity of vegetable crops.

Thus, the purpose of this investigation was to determine the effect of organic,chemical fertilization and plant stimulantson eggplant growth, yield and its components and chemical ingredients under the ecological condition of Sahl El-Husseiniya, Sharkia Governorate.

MATERIALS AND METHODS

The experiment layout was a split-plots system in a randomized complete blocks design with three replications.The main-plots were arranged with organic, chemical fertilization treatments as follows:

1- 100% N,P and K of recommended doses+ 0% of farmyard manure fertilizer(control).
2- 75%of N,P and K + 25% of FYM .
3- 50%of N,P and K + 50% of FYM.
4- 25%of N,P and K + 75% ofFYM.
5- 0% of N,P and K + 100% of FYM.

Farmyard manure fertilizer(90 days old) was added to the experimental units before transplanting in the interior of ridges and then turned over via hack

The sub-plots were assigned to some plant stimulants (yeast extract, potassium silicate and chicken manure tea) as follows:

1- Tap water (control).
2- Potassium silicate 4cm/L.
3- Chicken manure 100g/L.
4- Yeast 1g/L+ black honey 1 cm/L.

Plant stimulants being taken to spray all plant foliage. Foliar application of studied plant stimulants was done three times beginning of 25 days after transplanting and replicated each 15 days periods through the two growth years.

For each experimental unit comprises 4 ridges, 3.75 m long and 0.70 m width capturing an area of 10.5 m^2 (1/400 feddan).

The trials were conducted in a clay loam soil through medium fertility. Soil testers were indiscriminately selected from the investigational field area at a complexity of 0 to 50 cm earlier to soil planning to establish physical and chemical soil traits as demonstrated in Table 1.

Table 1. Physical and chemical soil traits of the experimental sites throughout the double growing years.

Soil analyses		2019	2020
A: Mechanical analysis			
Clay (%)		49.00	52.00
Silt (%)		26.90	30.10
Fine sand (%)		17.70	15.20
Coarse sand (%)		2.21	2.96
Texture class		Clay	Clay
Organic matter (%)		1.65	2.94
B: Chemical analyseis			
pH (1 : 2.5)		7.77	8.00
E.C. ds m^{-1} (1 : 5)		5.23	5.10
Saturation percentage (SP %)		71.12	70.12
Available N (ppm)		46.63	47.51
Available P (ppm)		4.24	4.57
Exchangeable K (ppm)		275	298
Cations (meq/100 g soil)	Ca^{++}	1.35	2.65
	Mg^{++}	0.57	2.31
	Na^{+}	3.05	2.73
	K^{+}	0.21	0.26
Anions (meq/100 g soil)	CO_3^{-}	-	-
	HCo_3^{-}	1.88	3.71
	Cl^{-}	2.16	2.33
	So_4^{-}	1.98	2.55

Table 2. Chemical analysis of chicken manure and farmyard manure during the two years.

Contents	Chicken Manure		Farmyard manure (FYM)	
	2019	2020	2019	2020
Organic matter (OM) %	44.30	42.60	36.20	37.10
C %	25.80	26.9	20.30	21.20
N %	1.09	1.07	1.42	1.39
C/N	23 : 7	23 : 2	14 :3	15 :2
P %	0.19	0.18	0.27	0.28
K %	0.14	0.13	0.15	0.14
pH (1 : 5)	4.90	4.80	6.20	6.10
EC (1 : 10)	5.10	5.20	4.20	4.10

The ordinary recommended fertilizers (N, P and K) as mineral form were utilized at the level of 350 kg ammonium sulfate (20.6 % N), 250 kg calcium superphosphate (15.5 % P_2O_5) and 100 kg potassium sulfate (48.52 % K_2O). Completely doses of these fertilizers were operated as following; 30% 4 weeks later than transplanting, 35 % 8 weeks later than transplanting and 35 % 12 weeks later than transplanting.

During soil preparation, farmyard manure as a source of organic fertilizer was added to the experimental unite corresponding to chosen experimental desing in the interior of ridges and then turned over via hack.Before that, samples of FYM and chicken manure were taken to estimate its chemical analysis as shown in Table 2.

The transplanting was passed throughout the first week of May in together years. The seedlings (40 days old) transplanted on mutually sides of the ridges at 50 cm spaced out. The harvest was performed after 90 days as of transplanting (every 5 days periodsup to 45 day from starting the harvest) in the both years. The ordinary farming practices for plantation eggplant was doing corresponding to the suggestions of Ministry of Agriculture were monitored, except the factors in study.

The data recorded:

A- Vegetal growth characters:

At 70 days later transplanting a haphazard sample of four guarded plants was taken from the internal ridges from each sub-plot to assess plant growth characters as follows:

1- Height of the plant 2- No. of leaves per the plant. 3- Total chlorophylls (SPAD) assessed by SPAD-502 (Minolta Co. Ltd., Osaka, Japan).

4- Leaves fresh and dry weight.

B- Yield and its components:

The harvest was done after 90 days from transplanting and continue 45 days through 9 pickings (the fruits were harvested every 5 days).

1- Early yield weight (first 3 pickings).

2- Yield weight (from the fourth picking till end of harvesting).

3- Total yield weight (1 + 2).

Random samples of fruits at harvesting time (from the fourth picking) were in use from each sub-plot to determine the following traits:

1- Average fruit weight. 2-Average fruit diameter

3-Average fruit length.

C- Chemical constituents:

Haphazard samples of leaves at 70 days later than transplanting were taken from each sub-plot to decide the following characters:

1- Total nitrogen (%) was determined dealing to the method expressed by Pregle (1945) using micro-Kjeldahl.

2- Phosphorus (%) was determined as described by Jackson (1967).

3- Potassium (%) was determined using a flame photometer dealing to Black (1965).

4- Proline % in the leaves was estimated according to AOAC (1990).

Random samples of fruits at harvesting time (from the fourth picking) were taken from each sub-plot to determine the following traits:

1- Total nitrogen (%).2-Phosphorus (%). 3-Potassium (%).

4- Total soluble solids (TSS %) was estimated using as mentioned by Brown and Zerban (1938).

5- Total iron was measured using the Atomic Absorption spectrophotometer according to Chapman and Pratt (1961).

D-Economic feasibility:

The economic feasibility of eggplant plants as affected by organic, chemical fertilization and plant stimulants treatments levels in addition their interaction.

E-Statistical analyses: All data of this study were statistically analyzed according to Gomez and Gomez (1984) by means of "MSTAT-C" Computer software package.LSD method was used to examination the differences amongmeans of the treatment at 5 % level of probability (Snedecor and Cochran, 1980).

RESULTS AND DISCUSSION

A- Vegetal growth:

1- Effect of organic, chemical fertilization levels:

Data in Tables 3 and 5 show that application of organic, chemical fertilization levels caused significant increases on vegetal growth characters *i.e.* (the height of plant, No. of leaves/plant, fresh, dry weight, nitrogen, phosphorus, potassium, proline percentages and Total chlorophylls (SPAD)) in leaves after 70 days after transplanting of eggplant plants in the two years. The uppermost values of these growth traits were obtained by using 100%of N.P and K+ 0% of FYM(control),50%of N.P and K + 50% of FYM and 75%of N.P and K + 25% of FYM treatments in both years.Also,there were no significant differences between 100%of N.P and K + 0% of FYM(control) and 50%of N.P and K+ 50% of FYM treatments in both years.

The enhancing effect of application 50%of N.P and K + 50% of FYM treatments may be due to organic manures may increase soil fertility and thus the crop production potential possibly by changes in the soils physical and chemical properties including nutrient bioavailability, soil structure, water holding capacity, cation exchange capacity, reduce soil pH, microbial community and activity (Muhammad and Khattak, 2009). addition,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 .The obtained findings are in harmony with those of Roberts (2001) and Ismail(2013) on eggplant.

Table 3. Vegetal growth of eggplant after 70 days after transplanting as affected by organic,chemical fertilizer levels and plant stimulants treatments during 2019 and 2020 years.

Characters	The height of plant (cm)		No. of leaves/plant		Fresh weight of leaves (g)		Dry weight of leaves (g)	
Treatments	2019	2020	2019	2020	2019	2020	2019	2020
A- levels Organic,Chemical fertilizer:								
100% N,Pand K (control)	47.15	49.09	47.23	48.65	91.78	95.13	18.70	19.46
75%N,Pand K+25% FYM	45.32	46.08	45.65	44.68	85.94	87.43	15.65	14.97
50% N,Pand K+50% FYM	46.66	48.23	46.65	47.09	88.76	90.86	17.87	16.98
25% N,P and K+75% FYM	44.07	46.12	40.59	42.60	81.18	86.12	14.55	14.90
100% FYM	41.57	43.63	35.68	36.91	70.05	73.70	12.29	13.25
LSD at 5 %	1.58	0.87	1.30	0.74	1.72	0.46	0.88	0.93
B- Plant stimulants:								
Tap water (control)	41.54	43.94	36.91	39.55	72.45	75.35	12.66	13.56
Potassium silicate	45.69	46.83	43.55	44.30	87.66	88.45	15.34	16.74
Chicken manure tea	42.76	44.67	40.32	41.68	82.75	84.81	14.24	14.97
Yeast extract	47.26	48.69	44.23	45.99	89.77	92.34	17.08	17.99
LSD at 5 %	0.55	0.87	0.75	0.99	0.79	1.82	0.94	0.61
C- Interaction: A×B	*	*	*	*	*	*	*	*

2- Effect of plant stimulants treatments:

The obtained results as presented in Tabls 3 and 4 show that ,in both years, spraying of eggplant plants with potassium silicate, chicken manure tea and yeast extract caused significant increases on vegetal growth characters *i.e.* the height of plant, No. of leaves/plant, fresh , dry weight ,

Nitrogen, phosphorus, potassium, proline percentages and Total chlorophylls (SPAD)) in leaves of eggplant plants after 70 days from transplanting.The uppermost values of these growth traits were obtained from spraying of eggplant plants with yeast extract and potassium silicate,respectively in both years.The lowest values of these growth traits were obtained from spraying of eggplant plants with chicken manure tea in both years as compared with control treatment.

These results may be due to yeast extract helps in increase the growth rate by yeasts which a source of vitamins, phytohormones (especially cytokinins), minerals, enzymes and amino acids.These results are in agreement with those obtained by(Khedr and Farid., 2002 ; Mahmoud., 2001; Kabeel *et al*., 2005 and Fawzy, 2007).

Table 4. Vegetal growth of eggplant after 70 days after transplanting as affected by the interact between organic, chemical fertilizer levels and plant stimulants treatments during 2019 and 2020 years.

Treatments		The height of plant (cm)		No. of leaves/plant		fresh weight of leaves (g)		dry weight of leaves(g)	
		19-20		19-20		19-20		19-20	
100%N,Pand K(control)	Tap water (control)	44.35	43.99	44.22	44.78	69.24	70.73	16.09	16.93
	Potassium silicate	48.32	49.54	47.35	48.63	95.34	96.45	18.26	19.57
	Chicken manure tea	46.28	47.15	46.37	47.07	93.55	94.83	17.05	17.99
	Yeast extract	52.03	53.12	50.13	52.45	99.59	99.99	20.75	21.68
75%N,Pand K+ 25%FYM	Tap water (control)	44.01	44.02	44.33	45.01	67.25	66.83	15.06	15.47
	Potassium silicate	47.24	48.65	46.34	47.25	95.03	96.56	17.06	18.10
	Chicken manure tea	46.32	45.98	45.14	46.08	93.74	95.04	16.36	17.27
	Yeast extract	49.33	48.49	48.28	48.92	97.56	94.49	18.45	19.27
50%N,Pand K+ 50%FYM	Tap water (control)	43.08	43.79	45.54	44.78	65.74	67.58	15.26	16.17
	Potassium silicate	49.51	50.56	47.87	48.86	96.57	97.23	16.38	16.89
	Chicken manure tea	46.77	47.98	46.34	46.91	95.63	96.24	15.64	16.01
	Yeast extract	51.22	53.58	49.89	50.09	98.86	98.20	17.57	18.64
25%N,Pand K+ 75%FYM	Tap water (control)	40.34	40.89	40.21	41.43	63.24	65.02	13.04	14.25
	Potassium silicate	43.44	44.56	43.24	44.26	93.27	94.35	15.38	15.99
	Chicken manure tea	41.53	42.64	42.34	43.05	92.05	93.68	14.28	14.87
	Yeast extract	45.14	46.35	45.23	46.15	95.56	96.08	16.25	17.58
100% FYM	Tap water (control)	39.21	40.01	35.21	36.42	61.66	63.58	11.18	11.95
	Potassium silicate	42.45	43.63	38.23	39.34	89.38	90.53	13.57	14.08
	Chicken manure tea	41.68	42.02	37.10	38.04	87.58	88.89	12.24	12.99
	Yeast extract	44.04	44.98	40.14	41.32	92.46	91.79	14.68	15.18
LSD at 5 %		1.04	1.25	0.90	1.05	0.92	0.65	1.06	0.84

3- Effect of the interact among organic, chemical fertilizer levels and plant stimulants:

The interact among organic,chemical fertilizer levels and plant stimulants treatments had significant effects on most studied characters as shown from data in Tables 4 and 6. The favourable interact treatment that produced the uppermost values of100%of N.P and K+ 0% of FYM (control),50%of N.P and K+ 50% of FYM and75%ofN.P and K + 25% of FYM respectively with foliar spraying eggplant plants with yeast extract in both years.On the other hand ,there were insignificant differences between 100%of N.P and K+ 0% of FYM (control) and 50%of N.P and K + 50% of FYM treatments with foliar spraying plants with yeast extract in both years.

These results may be due to the role of natural fertilizers in appropriate amount, proportion, at correct time and available form are required for the optimum production of eggplant due to their positive impact on the phyto-nutritional attributes of a crop .Organic manures play a direct role in soil fertility, microbial population, improves plant growth by providing micro and macro nutrients in available form, which eventually increased productivity .Moreover,The beneficial effects of yeasts have been enriched source of vitamins, phytohormones (especially cytokinins), minerals, enzymes and amino acids.

These results are in agreement with those obtained by (Khedr and Farid., 2002 ;Mahmoud., 2001;Dumas *et al*., 2003 and Shahein *et al*., 2015).

Table 5. Nitrogen, phosphorus, potassium, proline percentages and Total chlorophylls (SPAD) in leaves of eggplant after 70 days after transplanting as affected by organic, chemical fertilizer levels and plant stimulants treatments during 2019 and 2020 years.

Characters	N (%)		P (%)		K (%)		Proline (%)		Total chlorophylls (SPAD)	
Treatments	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
A- levels Organic,Chemical fertilizer:										
100%N,Pand K (control)	2.79	2.83	0.325	0.335	3.047	3.176	9.25	9.45	74.85	75.91
75%N,Pand K+25%FYM	2.58	2.62	0.316	0.320	2.990	3.040	9.73	9.88	74.55	74.64
50%N,P and K+50%FYM	2.54	2.61	0.317	0.319	2.880	2.793	9.51	9.66	74.23	73.99
25%N,P and K+75%FYM	2.34	2.41	0.299	0.306	2.735	2.801	10.05	10.26	73.78	73.81
100%FM	2.12	2.13	0.291	0.294	2.636	2.726	10.54	10.65	73.74	73.87
LSD at 5 %	0.63	0.53	0.64	0.70	0.76	0.89	0.62	0.79	0.52	0.63
B- Plant stimulants:										
Tap water (control)	2.25	2.33	0.296	0.301	2.706	2.813	10.07	10.16	73.88	73.81
Potassium silicate	2.45	2.56	0.312	0.315	2.935	2.970	9.71	9.66	74.38	74.42
Chicken manure tea	2.37	2.39	0.303	0.309	3.001	3.008	9.91	9.82	74.55	74.67
Yeast extract	2.62	2.71	0.325	0.333	3.070	3.110	9.20	9.36	74.98	75.06
LSD at 5 %	0.73	0.55	0.59	0.62	0.58	0.67	0.52	0.81	0.73	0.58
C- Interaction: A× B	*	*	*	*	*	*	*	*	*	*

Table 6. Nitrogen, phosphorus, potassium, proline percentages and Total chlorophylls (SPAD) in leaves of eggplant after 70days after transplanting as affected by the interact between organic, chemical fertilizer levels and plant stimulants treatments during 2019 and 2020 season.

Treatments		N%		P%		K%		Proline (%)		Total chlorophylls (SPAD)	
		19	20	19	20	19	20	19	20	19	20
100%N,P and K (control)	Tap water (control)	2.30	2.32	.301	.305	2.74	2.78	9.26	9.07	74.31	74.52
	Potassium silicate	2.68	2.72	.328	.332	3.14	3.19	8.71	8.62	75.18	75.20
	Chicken manure tea	2.35	2.39	.324	.329	3.09.	3.11	8.90	8.80	74.83	74.99
	Yeast extract	2.85	2.98	.334	.338	3.27	3.29	8.52	8.31	75.23	75.34
75%N,P and K+25%FYM	Tap water (control)	2.25	2.30	.296	.299	2.72	2.76	9.64	9.50	74.01	74.14
	Potassium silicate	2.38	2.40	.308	.310	2.91	2.97	9.19	9.15	74.36	74.39
	Chicken manure tea	2.45	2.49	.306	.307	2.82	2.07	9.32	9.23	74.28	74.24
	Yeast extract	2.43	2.48	.311	.313	3.01	3.04	9.13	9.04	74.40	74.57
50%N,P and K+ 50%FYM	Tap water (control)	2.20	2.25	.292	.295	2.68	2.72	10.11	10.03	73.82	73.88
	Potassium silicate	2.34	2.39	.301	.309	2.81	2.83	9.52	9.45	74.20	74.30
	Chicken manure tea	2.27	2.30	.297	.300	2.75	2.77	9.81	9.60	74.10	74.15
	Yeast extract	2.41	2.50	.310	.316	2.85	2.88	9.35	9.24	74.35	74.55
25%N,P and K+ 75%FYM	Tap water (control)	2.11	2.13	.289	.291	2.64	2.66	10.98	10.86	73.73	73.81
	Potassium silicate	2.28	2.29	.291	.292	2.76	2.78	10.23	10.15	73.87	73.91
	Chicken manure tea	2.15	2.19	.290	.291	2.70	2.72	10.57	10.48	73.82	73.85
	Yeast extract	2.31	2.34	.293	.297	2.80	2.83	10.10	10.01	74.01	74.04
100%FYM	Tap water (control)	2.02	2.00	.281	.283	2.62	2.66	11.09	11.20	73.41	73.48
	Potassium silicate	2.20	2.22	.286	.289	2.73	2.74	10.34	10.25	73.77	73.79
	Chicken manure tea	2.13	2.17	.284	.285	2.66	2,70	10.51	10.45	73.52	73.62
	Yeast extract	2,23	2.25	.291	.296	2.75	2.78	10.23	10.16	73.87	73.91
LSD at 5 %		0.50	0.71	0.62	1.05	0.51	1.09	0.67	0.75	0.63	0.55

B- Yield and its components:

1-: Effect of organic,chemical fertilization levels:

Data in Table 7, application of organic,chemical fertilization levels caused significant increases on yield and its components. The uppermost values of these growth traits were obtained by using 100%of N.P and K + 0% of FYM (control), 50%of N.P and K + 50% of FYM and75%of N.P and K+ 25% of FYM respectively in both years. There were insignificant differences between 100%of N.P and K + 0% of FYM (control) and 50%of N.P and K + 50% of FYM treatments in both years.

Table 7. Yield and its components of eggplant as affected by organic,chemical fertilizer levels and plant stimulants treatments during 2019 and 2020years.

Characters / Treatments	Early yield weight (t/fed)		Yield weight (t/fed)		Total yield (t/fed)		Fruit weight (g)		Fruit diameter (cm)		Fruit length (cm)	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
A- levels Organic,chemical fertilizer:												
100%N,Pand K (control)	2.105	2.290	4.490	4.673	6.595	6.963	39.97	41.07	3.15	3.12	10.56	10.35
75%N,P and K +25%FYM	1.907	2.020	3.837	4.025	5.744	6.045	34.21	36.96	2.91	2.90	9.83	9.91
50%N,P and K +50%FYM	2.002	2.100	4.237	4.423	6.239	6.523	37.54	38.72	2.96	3.00	10.01	9.95
25%N,P and K +75%FYM	1.710	1.800	3.424	3.634	5.134	5.434	33.23	32.65	2.71	2.82	9.32	9.51
100%FYM	1.506	1.613	3.117	3.360	4.623	4.973	29.25	30.99	2.67	2.71	8.95	9.03
LSD at 5 %	0.851	1.604	1.76	0.86	1.66	0.34	1.03	0.66	0.56	0.63	0.59	0.76
B- Plant stimulants:												
Tap water (control)	1.584	1.832	3.012	3.228	4.596	5.060	28.55	30.33	2.56	2.60	9.02	9.25
Potassium silicate	1.847	1.979	4.144	4.206	5.991	6.185	36.44	37.67	2.94	3.01	9.84	9.99
Chicken manure tea	1.686	1.759	3.521	3.772	5.207	5.531	34.33	32.66	2.71	2,78	9.34	9.53
Yeast extract	2.014	2.112	4.405	4.651	6.419	6.763	38.44	40.42	3.07	3.13	10.39	10.67
LSD at 5 %	0.70	1.52	0.67	1.65	0.93	1.32	0.71	1.33	0.65	0.97	1.08	0.76
C- Interaction: A× B	*	*	*	*	*	*	*	*	*	*	*	*

The enhancing effect of yield and components might be due to organic manure had positive impact on the growth, quantitative and qualitative attributes of eggplant (Agbo*et al*., 2012; Sarhan*et al*., 2011 and Christo *et al*., 2011). Also Appropriate amount of inorganic fertilizers containing Nitrogen, Phosphorus and Potassium are necessary for the plants vegetative and reproductive growth (Rao and Subramanian, 1994). Inadequate proportion of agro-chemicals including synthetic fertilizer adversely affected plants physiological process (Cooke, 1972) .

These results are in harmony with those of Sharma and Brar (2008) and Ismail (2013) on eggplant. .

2- Effect of plant stimulants treatments:

Data in Table 7,spraying of eggplant plants with potassium silicate ,chicken manure tea and yeast extract caused significant increases on fruit yield and its components *i.e.* early yield ton/fed, total yield ton/fed, average fruit weight, diameter and length of eggplant fruit in both growing years as shown from data in Table 7.Spraying of eggplant plants with yeast extract was produced the uppermost values of these traits of the yield and its components. While,spraying of eggplant plants with potassium silicate produced the best second value on yield and its components in both years. Conversely,chicken manure tea treatment resulted in the lowest means of yield and its components in both years .

These results may be due to yeast extract was 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.These results are in agreement with those

obtained by Barnett *et al.* (1990), El-Tohamy *et al.*(2008) on eggplant , Fathy *et al.* (2000) on tomatoes, Taha and Omar (2010) and Ahmed *et al.*(2011) on potato plants.Fouda and Abd-Elhamied *et al.*(2017).

The enhancing effect of potassium silicate may be due to using SiO could be attributed to the benefit effects of Si in the plant, as an improve of the architecture for showing more erect leaves, which intercept higher solar luminosity increasing the photosynthetic efficiency and higher chlorophyll content.These results are in the same line of those obtained by Braga *et al.*(2009), El-Hedek(2013) and Ismail *et al.(*2017).

3-Effect of the interact among organic,chemical fertilizer levels and plant stimulants treatments:

The interact among organic,chemical fertilizer levels and plant stimulants treatments had significant effect on most studied characters on fruit,yield and its components in addition its quality as shown from data in Table 8. The favourable interact treatment that produced the uppermost values of early yield weight (first 3 pickings), yield weight (from the fourth picking till end of harvesting) and total yield of early yield and yield weight and its components was using100%of N,P and K + 0% of FYM(control),50%of N,P and K + 50% of FYM and75%of N,P and K + 25% of FYM treatments with yeast extract spraying in both years respectively. On the other hand ,there were insignificant differences between 100%of N,P and K + 0% of FYM(control) and 50%of N,P and K + 50% of FYM treatments with foliar spraying eggplant plants with yeast extract in both years.

These results may be due to the role of Organic manures may increase soil fertility and thus the crop production potential possibly by changes in the soils physical and chemical properties including nutrient bioavailability, soil structure, water holding capacity, cation exchange capacity, reduce soil pH, microbial community and activity .Moreover,foliar spraying eggplant plants with yeast extracts Improving growth and productivity.It was 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.

Table 8. Yield and its components of eggplant as affected by the interact between organic, chemical levels fertilizer and plant stimulants treatments during 2019 and 2020years.

Treatments		Early yield weight (t/fed)		Yield weight t/fed		Total yield weight t/fed		Fruit weight (g)		Fruit diameter (cm)		Fruit length (cm)	
		19-20		19-20		19-20		19-20		19-20		19-20	
100%N,Pand K (control)	Tap water (control)	1.671	1.779	3.585	3.609	5.256	5.388	35.55	37.28	2.92	2.94	10.02	10.04
	Potassium silicate	1.941	2.150	4.545	4.629	6.486	6.779	40.65	42.26	3.14	3.17	10.70	10.79
	Chicken manure tea	1.789	1.889	4.367	4.503	6.156	6.392	37.56	38.34	3.10	3.12	10.44	10.53
	Yeast extract	2.327	2.442	4.862	4.936	7.189	7.378	42.63	44.15	3.22	3.25	11.28	11.49
75%N,P and K+ 25%FYM	Tap water (control)	1.596	1.663	3.314	3.453	4.910	5.116	33.46	33.89	2.82	2.84	9.75	9.73
	Potassium silicate	2.013	2.154	4.234	4.415	6.247	6.569	35.56	36.65	2.93	2.95	10.04	10.06
	Chicken manure tea	1.713	1.840	3.774	4.109	5.487	5.949	33.57	34.99	2.90	2.92	9.71	9.98
	Yeast extract	2.213	2.358	4.420	4.210	6.633	6.568	37.86	39.59	3.01	3.05	10.32	10.49
50%N,P and K+ 50%FYM	Tap water (control)	1.486	1.455	3.440	3.501	4.926	4.956	33.24	34.53	2.72	2.74	9.59	9.78
	Potassium silicte	1.654	1.764	4.423	4.567	6.077	6.331	35.67	37.03	2.85	2.88	10.04	10.08
	Chicken manure tea	1.568	1.616	4.210	4.380	5.778	5.996	33.77	34.97	2.77	2.81	9.67	9.86
	Yeast extract	1.843	1.937	4.604	4.507	6.447	6.444	38.44	40.07	2.93	2.95	10.33	10.53
25%N,P and K+ 75%FYM	Tap water (control)	1.217	1.274	2.754	2.832	3.971	4.106	28.56	29.71	2.61	2.63	8.75	8.77
	Potassium silicate	1.368	1.355	3.125	3.219	4.493	4.574	31.87	33.07	2.67	2.68	8.93	8.96
	Chicken manure tea	1.252	1.271	2.956	3.034	4.208	4.305	29.65	30.19	2.64	2.66	8.84	8.86
	Yeast extract	1.486	1.463	3.234	3.408	4.720	4.871	33.56	35.29	2.71	2.73	9.01	9.06
100%FYM	Tap water (control)	1.175	1.264	2.675	2.786	3.850	4.050	24.67	26.98	2.55	2.58	8.63	8.65
	Potassium silicate	1.286	1.291	2.834	2.843	4.120	4.134	28.34	29.78	2.60	2.62	8.75	8.78
	Chicken manure tea	1.255	1.199	2.795	2.819	4.050	4.018	26.87	27.89	2.57	2.59	8.71	8.75
	Yeast extract	1.387	1.321	2.975	2.859	4.362	4.180	30.01	31.67	2.68	2.73	8.82	8.85
LSD at 5%		0.699	1.220	0.953	0.778	1.061	0.646	1.051	0.882	0.76	0.83	0.689	0.850

C- Chemical constituents:

1- Effect of organic,chemical fertilization levels:

Chemical constituents of fruits taken from the fourth picking to determine (N, P , K, TSS percentages and total iron content) showed significant influences by application of organic,chemical fertilization levels in both years as shown in Table 9.The uppermost values of these growth traits were obtained by using 100%of N,P and K + 0% of FYM (control),50%of N,P and K + 50% of FYM and75%of N,P and K + 25% of FYM respectively in both years. Moreover, there were insignificant differences between 100%of N,P and K + 0% of FYM(control) and 50%of N,P and K + 50% of FYM treatments in both years.

The enhancing effect of application 50%of N,P and K+ 50% of FYM may be due to increase soil fertility and thus the crop production potential possibly by changes in the soils physical and chemical properties including nutrient bioavailability, soil structure, water holding capacity, cation exchange capacity, reduce soil pH, microbial community and activity. Also,. Although this practice have been described and condemned as inadequate, efforts to change it has not been successful . The obtained results are in accordance with those of Sharma and Brar (2008) and Ismail (2013) on eggplant.

2- Effect of plant stimulants treatments:

Chemical constituents of fruits taken from the fourth picking to determine (N, P, K, TSS percentages and total iron content) showed significant influences by spraying of eggplant plants with potassium silicate ,chicken manure tea and yeast extract in both years as shown in Table 9. Spraying of eggplant plants with yeast extract produced the uppermost values of chemical constituents of fruits. While, spraying of eggplant plants with potassium silicate was produced the best second value of chemical constituents on fuits in both years. Chicken manure tea treatment resulted in the lowest means of chemical

constituents of fruits taken from the fourth picking in both years.

These results may be due to the effect of yeast extract on plant growth may refer to that 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 . These results are in agreement with those obtained by Ahmed *et al.* (2011) on potato plants and Fouda and Abd-Elhamied *et al*. (2017) on eggplant .

Table 9. Chemical constituents in eggplant fruits at harvesting time as affected by organic,chemical fertilizer levels and plant stimulants treatments during 2019 and 2020 years.

Characters	N (%)		P (%)		K (%)		TSS (%)		Fe (ppm)	
Treatments	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
A- levels Organic, Chemical fertilizer:										
100%N,P and K (control)	2.46	2.44	0.262	0.265	2.65	2.68	4.55	4.60	30.61	31.09
75%N,P and K +25%FYM	2.38	2.35	0.249	0.253	2.50	2.54	4.49	4.51	28.43	29.52
50%N,P and K +50%FYM	2.39	2.42	0.251	0.256	2.53	2.59	4.52	4.54	30.16	30.44
25%N,P and K +75%FYM	2.28	2.32	0.244	0.247	2.49	2.51	4.35	4.40	28.03	28..36
100%FYM	2.09	2.11	0.223	0.236	2.46	2.49	4.25	4.28	27.04	27.64
LSD at 5 %	0.82	1.32	0.661	1.071	0.75	1.06	0.90	1.12	0.77	1.09
B- Plant stimulants:										
Tap water (control)	2.12	2.14	0.227	0.231	2.45	2.48	4.26	4.29	28.01	28.05
Potassium silicate	2.26	2.29	0.251	0.256	2.56	2.59	4.47	4.50	30.38	30.77
Chicken manure tea	2.20	2.22	0.243	0.246	2.50	2.52	4.33	4.39	29.12	29.45
Yeast extract	2.37	2.41	0.261	0.265	2.64	2.67	4.53	4.58	31.13	31.55
LSD at 5 %	0.69	1.03	0.741	1.066	1.04	1.06	0.83	1.13	0.691	1.082
C- Interaction: A× B	*	*	*	*	*	*	*	*	*	*

3-Effect of the interaction between organic, chemical fertilizer levels and plant stimulants:

The interact between organic,chemical fertilizer levels and plant stimulants treatments had a significant effect on most studied characters of chemical contents(N, P , K, TSS percentages and total iron content) on fruits as shown in Table 10. The favourable interact treatments that produced the uppermost values of chemical contents was using100%of N,Pand K + 0% of FYM(control),50%of N,Pand K+ 50% of FYM and75%of N,Pand K+ 25% of FYM treatments respectively with spraying with yeast extract in both years. On the other hand ,there were no significant differences between 100%of N,Pand K+ 0% of FYM (control) and 50%of N,Pand K + 50% of FYM treatments with foliar spraying eggplant plants with yeast extracts in both years.

Table 10. Chemical constituents in eggplant fruits at harvesting time as affected by the interact between organic, chemical fertilizer levels and plant stimulants treatments during 2019 and 2020 years.

Treatments		N(%) 19-20		P(%) 19-20		K(%) 19-20		TSS(%) 19-20		Fe(ppm) 19-20	
100%N,P and K(control)	Tap water (control)	2.19	2.22	0.245	0.250	2.57	2.60	4.43	4.46	30.14	30.56
	Potassium silicate	2.49	2.53	0.273	0.279	2.65	2.67	4.64	4.67	31.35	31.79
	Chicken manure tea	2.05	2.10	0.260	0.266	2.61	2.64	4.57	4.60	30.76	30.95
	Yeast extract	2.60	2.64	0.288	0.291	2.70	2.74	4.70	4.75	32.24	32.76
75%N,P and K+ 25%FYM	Tap water (control)	2.13	2.16	0.239	0.243	2.53	2.55	4.40	4.42	29.59	29.99
	Potassium silicate	2.38	2.45	0.260	0.266	2.62	2.65	4.58	4.61	30.45	30.89
	Chicken manure tea	2.30	2.35	0.244	0.250	2.60	2.62	4.54	4.57	29.74	30.01
	Yeast extract	2.43	2.50	0.270	0.273	2.64	2.66	4.62	4.64	31.21	31.66
50%N,P and K+ 50%FYM	Tap water (control)	2.14	2.18	0.240	0.244	2.50	2.54	4.31	4.34	29.53	30.55
	Potassium silicate	2.40	2.49	0.271	0.277	2.62	2.64	4.60	4.63	31.05	31.37
	Chicken manure tea	2.31	2.37	0.255	0.261	2.55	2.56	4.55	4.58	30.11	30.35
	Yeast extract	2.45	2.57	0.280	0.285	2.65	2.67	4.64	4.67	31.53	31.69
25%N,P and K+ 75%FYM	Tap water (control)	2.06	2.09	0.220	0.224	2.44	2.48	4.23	4.26	26.56	27.99
	Potassium silicate	2.14	2.18	0.230	0.234	2.52	2.56	4.30	4.34	29.13	29.87
	Chicken manure tea	2.11	2.13	0.227	0.230	2.50	2.51	4.26	4.29	28.23	28.99
	Yeast extract	2.20	2.23	0.232	0.239	2.55	2.60	4.33	4.36	30.22	30.72
100% FYM	Tap water (control)	1.98	2.01	0.212	0.215	2.40	2.43	4.16	4.21	25.21	27.04
	Potassium silicate	2.04	2.06	0.228	0.232	2.46	2.49	4.24	4.26	28.21	30.01
	Chicken manure tea	2.02	2.03	0.220	0.224	2.44	2.47	4.19	4.22	26.43	27.89
	Yeast extract	2.07	2.09	0.230	0.234	2.49	2.52	4.25	4.28	29.32	30.45
LSD at 5 %		0.61	1.06	1.05	0.83	1.06	0.69	1.08	0.86	0.66	1.07

These results possibly will be due to the responsibility of inorganic fertilizers containing Nitrogen, Phosphorus and Potassium are necessary for the plants vegetative and reproductive growth. Inadequate proportion of agro-chemicals including synthetic fertilizer adversely affected plants physiological process.. Moreover, spraying of eggplant plants with yeast extract Improved growth and productivity. It has 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.

These results are in the same line of those obtained by Barnett *et al.* (1990) and Amer (2004).

D- Economic feasibility:

The economic feasibility of eggplant plants as affected by organic,chemical fertilization levels and plant stimulants treatments in addition their interact are presented in Table 11. The results showed that the uppermost net return(10066 LE/fed) over both years was obtained from

application of organic, chemical fertilization levels (50%of N,P and K + 50% of FYM) with spraying of eggplant plants with yeast extract , such treatment returns the uppermost benefit cost ratio (2.504) in comparison with the other treatments. Therefore, this treatment considered to be economical for eggplant production under soil salinity.

Table 11. Economic feasibility of eggplant production as affected as organic,chemical levels fertilizer and plant stimulants treatments in addition to their interact over both years.

Treatments		Total yield (t/fed)(1)	Gross return (LE/fed)(2)	Treatment cost (LE/fed)(3)	Total variable cost (LE/fed)(4)	Net return (LE/fed)(5)	Benefit cost ratio(6)	Order
100%N,P and K (control)	Tap water (control)	5.307	13798	1600	7170	6628	1.924	13
	Potassium silicate	6.632	17243	1725	7295	9948	2.363	6
	Chicken manure tea	6.274	16312	1690	7260	9052	2.246	8
	Yeast extract	7.283	18935	1621	7191	11744	2.633	1
75%N,P and K+ 25%FYM	Tap water (control)	5.013	13033	1350	6920	6113	2.132	9
	Potassium silicate	6.408	16660	1475	7045	9615	2.364	5
	Chicken manure tea	5.718	14866	1440	7010	7856	2.120	10
	Yeast extract	6.601	17162	1371	6941	10221	2.472	3
50%N,P and K+ 50%FYM	Tap water (control)	4.941	12846	1100	6670	6176	1.925	12
	Potassium silicate	6.204	16130	1225	6795	9335	2.373	4
	Chicken manure tea	5.887	15306	1190	6760	8546	2.264	7
	Yeast extract	6.445	16757	1121	6691	10066	2.504	2
25%N,P and K+ 75%FYM	Tap water (control)	4.038	10498	850	6420	4078	1.635	20
	Potassium silicate	4.533	11785	975	6545	5240	1.800	14
	Chicken manure tea	4.256	11065	940	6510	4555	1.699	17
	Yeast extract	4.795	12467	871	6441	6026	1.935	11
100% FYM	Tap water (control)	3.950	10270	600	6170	4100	1.664	19
	Potassium silicate	4.127	10730	725	6295	4435	1.704	16
	Chicken manure tea	4.034	10488	690	6260	4228	1.675	18
	Yeast extract	4.271	11104	621	6191	4913	1.793	15

1-Eggplant total yield as average over both years. (2) Gross return as total yield(ton fed) x2600 LE ton.(3)Treatment cost was calculated according to the following prices: Potassium silicate=50 LE/L;Yeast =5 LE/ 200 g; Black honey =2 LE/ 200 L;Chicken manure=30 LE/20Kg.(4) Total variable cost (LE Fed) include : Treatment cost plus land leasehold ,transplant,N,P and K Fertilizers, microelements ,pesticides,labors and other cultural practices which equal nearly 5570 LE Fed.(5) = (2) – (4) .(6) = (2) / (4) .

CONCLUSION

It could be recommended that spraying eggplant plants with yeast extract (1g/L)three times for the treatment with application 50%of N,P and K+ 50% of FYM (90 days old)to enhance vegetal growth characters, yield and its components and chemical constituents of eggplant fruits under soil salinity condition.

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تأثير التسميد العضوى والكيماوى والمنشطات النباتيه على النمو والمحصول والجودة للباذنجان تحت ظروف الارض الملحية

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أجريت تجربة حقلية بمزرعة خاصة في قرية الرواد بسهل الحسينية - محافظة الشرقية خلال موسمي2020/2019 لدراسة تأثير مستويات التسميد العضوى والكيماوى والرش ببعض المنشطات النباتيه على النمو الخضري، المحصول ومكوناته والمكونات الكيميائية للباذنجان صنف بلاك بيونى وكذلك العائد الاقتصادى. أجريت التجربة باستخدام تصميم القطع المنشقة بنظام القطاعات كاملة العشوائية في ثلاثة مكررات. تم تخصيص القطع الرئيسية لمستويات ا لتسميد العضوى والكيماوى (100% نيتروجين, فوسفور, بوتاسيوم-75% نيتروجين, فوسفور, بوتاسيوم +25% سماد ماشية-50% نيتروجين, فوسفور, بوتاسيوم+ 50% سماد ماشية-25% نيتروجين , فوسفور, بوتاسيوم+75 %سماد ماشية-100%سماد ماشية). في حين تم تخصيص القطع المنشقة لمعاملات الرش بالمنشطات (سليكات البوتاسيوم و شاى سماد الدواجن و مستخلص الخميرة ومعاملة الكنترول). ويمكن تلخيص أهم النتائج المتحصل عليها على النحو التالي: ادى الاضافة الارضية لمستويات التسمد العضوى و الكيماوى التاثير المعنوى على صفات النمو الخضري والمحصول ومكوناته والمكونات الكيميائية بالأوراق والثمار مقارنة بمعاملة الكنترول في كلا الموسمين .حيث كانت اعلى قيم من تلك الصفات عند المستوى 50%نيتروجين,فوسفور,بوتاسيوم+50%سماد ماشية(سماد ماشية متحلل لمدة 90 يوم) فى كلا الموسمين. أدى الرش الورقى لنباتات الباذنجان بسليكات البوتاسيوم وشاى سماد الدواجن و مستخلص الخميرةالتأثير المعنوى على صفات النمو الخضري، المحصول ومكوناته والمكونات الكيميائية بالأوراق والثمار مقارنة بمعاملة المقارنة في كلا الموسمين. حيث أعطت أعلى القيم من تلك الصفات من الرش بمستخلص الخميرة لعدد ثلاث رشات في كلا الموسمين. ولكن كانت افضل المعاملات المتحصل عليها لانتاج اعلى القيم سواء للنمو الخضرى و المحصول و مكوناتة ناتجة من التداخل بين الاضافة الارضيه 50%نيتروجين, فوسفور, بوتاسيوم+50%سماد ماشية مع الرش الورقى بمستخلص الخميرة لعدد ثلاث رشات في كلا الموسمين. وعلية توصى النتائج المتحصل عليها من هذه الدراسة بالاضافة الارضية 50% نيتروجين,فوسفور,بوتاسيوم+50%سماد ماشية متحلل لمدة 90 يوم مع الرش الورقى بمستخلص الخميرة لعدد ثلاث رشات لنباتات الباذنجان للحصول على احسن خصائص للنمو الخضرى والمحصول ومكوناته والمكونات الكيميائية لثمار الباذنجان تحت الظروف البيئية لهذا البحث.