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EFFECT OF HUMIC ACID, BIOAGENT FERTILIZERS SINGLY AND IN COMBINATION ON GROWTH AND PRODUCTIVITY OF EGGPLANT IN RELATON TO SUCKING PIERCING PESTS AT ELKALUOBIA GOVERNORATE

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ABSTRACT: *The present study was carried out in a clay soil in Qaha district, El-Kaluobia governorate, Egypt during two successive seasons of 2012 and 2013 to investigate the influence of certain biofertilizers i.e., : Saccharomyces cerevisae (Louis.) , Pseudomonas fluorescence (Mayer), Humic acid and their mixtures on the infestation of eggplants with thrips, Thrips tabaci Lind. and the two spotted spider mite, Tetranychus urticae Koch. as well as its effect on some growth and yield parameters of eggplant . The results proved that the addition of P. fluorescence + S. cerevisae + Humic acid (Ps. +Sc. +Ha.) as fertilizers to eggplant, caused significant reduction of T. tabaci infestation, where the percentage reduction reached (84.56 %) by (Ps. +Sc. + Ha.) treatments. While, the mixture of bacteria and humic acid treatment achieved the highest reduction number of T. urticae (90.35%) at the two studied seasons, compared with the average of control. While, the remaining treatments indicated that the percentage reduction of T. Tabaci numbers ranged from 50.0 to 67.44 at (Sc.+ Ps.) and Ha. Treatments as the average of two seasons, respectively. The percentage reduction in T. urticae population ranged from 61.43 to 79.51 at the treatments of Sc. and Ps. , respectively as the average of two seasons. The results indicated that all applications caused significant increasing in growth and productivity of eggplant. The combinations of Ps. +Sc. +Ha. caused the highest positive effect on eggplant vegetative growth characters, especially (stem thickness (cm), No. of Branches /plant, Leaf area (cm^2), Plant Fresh weight (g) , Plant dry weight (g) ,total dry and fresh weights during the two studied seasons. All applications were significantly and increased mineral contents of eggplant fruit as compared with control ,and improving in N,P,K and Fe contents of the fruit especially that obtained from the mixture of (Ps. +Sc. + Ha.).*

Key words: *Eggplant – Tetranychus urticae - Thrips tabaci –Pseudomonas – yeast – humic acid – vegetative growth – yield- sucking piercing.*

INTRODUCTION

Eggplant or oubergine, *Solanum melongera* L. is one of the top ten vegetables grown in all the world. Incidence of insect pests is one of the prime factors in reduction of yield. The major pests of eggplant Include, red spider mite and thrips. The damage started from early stage of the crop growth to harvest time, and causing high damage to eggplant leaves (Brian *et al.*, 2004). Sometimes resulting in shooty mold in the upper surface of the leaves (Arancon *et al.*, 2002) Plants grown in inorganic fertilizers are more prone to pest attack than those on organic fertilizers; Inorganic nitrogen fertilization improves the nutritional quality and palatability of the host plants. The bio-organic manures and composted organic waste are less susceptible to insects than conventionally grown application of recommended doses of mineral fertilizers plants, (Culinary and Pimentel 1986.Yardim and Edwards 2003,).

In traditional culture, adding chemical fertilizers is highly for plant since it is expensive and not economic as well as to its damages for human. From this new technique using bio and organic fertilizers represented by humic acid is one of the humus substance compounds produce from

organic matter analysis, Al-Niemi (1999).

In India the use of the beneficial micro – organisms as effective strain such as *pseudomonas fluorescence* Mayer. as foliar application, recorded the lowest mean of mealy bug population. Soil yeast *Saccharomyces cerevisae* Lus. tropical is one proponent of organic agriculture has asserted that plant pest's infestation, growth and productivity of potato grown with biological sources of nutrients, such as plants. (Gomaa *et al.* 2005).

Yeast , *S. cerevisae* is considered as type of bio - fertilizers which is usually added to soil or foliar application to vegetable crops (EL-Ghamriny *et al.*, 1999). Its content of many nutrient elements as well as its role in producing important substances like growth regulators such as gibberellins, auxins and its ability to produce a group of enzyme.

Yeast treatment was suggested to participate beneficial role in improving growth and fruiting of vegetable crops (Fathy and Dosouky 2000 and Omer,2003). The present study was carried out to evaluate and compare , the use of *S. cerevisae*, Humic acid and *P. fluorescence* and their mixture against *T. tabaci* and *T. urticae* infestation, and their effect on vegetative growth characters yield and chemical contents of mature fruits .

MATERIALS AND METHODS

I - Experimental procedure:

The present investigation was carried out at Qaha district in Kaluobia governorate in clay soil during 2012 and 2013 seasons to study the effect of plant growth promoting rhizobacteria and Humic acid substance as bio and oregano- fertilization on enhancement of eggplant crop growth and production under field conditions. Eggplant seeds of (Black beauty) variety. The physical and chemical properties of the soil are presented in Table (1). Seedlings were transplanted on 20th Apr. in 2012 and 2013 in randomized complete block design with four replicates / treatment. Each plot (42 m^2) consisted of six rows of seven meters each. All treatments received the recommended agricultural practices. Treatments were as follows:

1–Yeast: *Saccharomyces cerevisae* Louis (Sc.). Active dry yeast were dissolved in water followed by adding sugar at ratio 1 : 1 and kept overnight for activation and reproduction of yeast before the application of the assayed materials by using one liter spryer (10 liter) while, the humic fertilizer on the plants at the rate of 5.0 g^{-1} /liter of water.

2– *Bacteria: - Pseudomonas fluorescence* Mayer (Ps.) was grown in king's medium B (Atlas, 1995.) incubated at 28 C° for 3 days (on rotary Shaker. Bacteria was obtained from the Dept Agric water and Environ. Water and Environ. Res. Inst. (SWERI, Agric., Res. Center (ARC), Giza , and were applied in soil beside the plant at 10^9 viable ml^{-1}.

3– *P. fluorescence* +*S. cerevisae* (Ps.+ Sc.).

4– Humic acid (Ha.) Humic acid (potassium humates) black granules of potassium humate, 85% humate and 15% Potassium its origin from Spain were mixed and sprayed on the growing eggplant 2.0 g/L of water. Humic foliar spraying was conducted at vegetative stage (four weeks from transplanting).

5– Humic acid (Ha.)

6– *P. fluorescence* + Humic acid (Ps. + Ha.).

7– *S. cerevisae* + Humic acid (Sc. + Ha.).

8– *P. fluorescence* + *S. cerevisae* + Humic acid (Ps. +Sc. +Ha.).

9– Untreated treatment (control) Sprayed with water.

Only Humic acid treatment were *added* to the clay before sowing on the base of chicken manure as bio-fertilizer.

The tested combined promoting rhizobacteria *S. cerevisae* and *P. fluorescence* were applied by means of an atomizer sprayer 1 liters. While in case of the mixtures firstly, Humic acid was added to the clay then *P. fluorescence* and *S. cerevisae* as foliar spraying. This volume was adequate to wet plant of the plot thoroughly with excess of dripping solution. At the same time, untreated treatments were sprayed only with water. Irrigation and other culture practices were applied. The first spraying was carried out after four weeks from transplanting (the age of compound

leaf 4-stage) and the second spraying carried out after (two weeks) from the first one at this age, opening of the flower buds started.. Previous bio-fertilizers and their mixtures were sprayed three times. , the first spray was after 30 days of cultivation, the second was after 20 days of the first one and the third was applied after 20 days on the second one. The data were determined after one week intervals starting from the second half of December up to the end of February. Ten leaves were randomly collected from each treatment adults and larvae of thrips ,and adult and movbile of spider mite were counted and recorded.

II– Vegetative growth characters and yield:

Data were counted and recorded (after 65 days from transplanting) at the beginning of fruiting stage as follow:-

1- Number of branches / plant.
2- Leaf area, the 5th leaf from the top was measured by using a digital leaf area meter (L.I 300 portable according to Watson (1958).
3- Weight (g.) of fresh and dry Plant.

Table (1): Physical and chemical properties of clay soil in Qaha city Kaluobia governorate.

Properties	Analysis %
** Physical analysis:*	
Clay %	60.5
Silt %	17.6
Sand %	21.9
** Chemical analysis:*	
** Soluble cations (meq/L)*	
Na^+	4.05
Ca^+	11.36
Mg^+	6.25
K^+	0.16
** Soluble anions (meq/L)*	
Cl	2.9
HCO^-3	1.05
SO^-3	17.77
pH	7.73
** Available elements*	
N%	1.22
P%	0.18
Fe (ppm)	28.44

III- Chemical contents of the fruits at harvest time:

The elements of bio-fertilizer were evaluated as follow:-

1- Nitrogen content was determined in the digested solution as described by Plummer (1971).
2- Phosphorus content was determined calorimetrically according to the method of Jackson (1973).
3- Potassium content was measured using (flam – photometer) as described by Brown and Lillian (1964).
4- Iron was determined using Atomic absorption spectrophotometer Perkin Emmer 2280.

IV– The Yield:

1-Total yield was recorded as weight and number of the fruits of all picks during the whole harvesting period.
2-Fruit dry matter%.

V– CO_2 evolution and dehydrogenase activity:

At harvest samples of the rhizosphere soil were collected at the first and second seasons to determine CO_2 evolution (Shehata, 1972) and dehydrogenase activity (Alef, 1995)

VI -Statistical analysis:

The design of the experiments was established as complete randomized block design with three replicates and analysis of variance was calculated according to Gomez and Gomez (1984). Least significant difference (L.S.D.) at 5% was used to compare between means.

RESULTS AND DISCUSSION

1-Effect of different treatments on:

1-1- *Thrips tabaci* Lind:

Data in Table (2) show the effect of certain treatments and their mixtures on infestation of eggplant leaves with onion *thrips.* In 2012 season treatment of Sc.+Ha.+Ps. gave the lowest population of thrips amount 4.22 individuals /10 leaves which gave the highest reduction by 80.99%.The same trend was noticed in the second year. On the other hand Sc. treatment gave the highest mean of 13.22 individuals /10 leave and the lowest reduction by 40.27% in 2012 season. In 2013season treatment of Ps. gave the highest mean occupied 14.1 individuals /10 leave represented by 50% reduction. The average of the two seasons showed that treatment of Sc.+Ha.+Ps. gave the lowest average of thrips accounted for 3.78 individuals /10 leave represented by 48.14% reduction. Sc. and Ps. treatments gave the highest average of thrips by 12.23 individuals /10 leave and 51.08% reduction. All treatments reduced significantly the population of thrips compared to the control. These results are agreement with Gomaa *et al. (2005)* revealed that the foliar application of *Saccharomyces cerevisae* reduced the infestation numbers of white fly and thrips in comparison with the corresponding untreated treatments with yeast. The reduction percentages ranged from 33 to 64 regarding thrips. The combined application of organic fertilizers and yeast gave the highest reduction of thrips infestation.

1-2- The two spotted spider mite (*Tetranychus urticae*)(Koch) :

Data in Table (3) demonstrates the influence of various tested biofertilizers and their mixtures treatments on infestation of *T. urticae* on eggplant. Treatment of Sc.+ Ha. gave the lowest population of red spider mite amounted 6.8 individuals /10 leaves represented by 91.45%reduction in 2012 season and the same trend was noticed. In 2013 season .Paradoxically treatment of Sc.+ Ha. +Ps. gave the highest population occupied 30.2 individuals /10 leaves and the lowest reduction of 62.07% in the same season. In 2013 season treatment of Sc. gave the highest population of 35.8 individuals /10 leaves represented by 59.46% reduction. The average of the two seasons appeared that Sc.+ Ha. treatment gave the lowest population of red spider mite amounted 8.15 individuals /10 leaves which gave 90.35% reduction. On the other hand Sc treatment gave the highest population of red spider mite by 32.45 individuals /10 leaves represented by 61.43% reduction. All treatment significantly reduction the population of spider mite.

These results are similar with Gomaa *et al.* (2005) in Egypt they reported that the influence of certain composted agricultural residues i.e., egg-plant; okra, pepper and maize stalks and the foliar application of yeast culture (*Candida tropicalis*) on the infestation of potato plants with whitefly (*Bemisia tabaci*) and (*Thrips tabaci*) as well as its effect on some growth and yield parameters of potato. Organic fertilization of potato plants with egg-plant compost significantly reduced the infestation numbers of potato plants either with whitefly or thrips. For white fly infestation, the reduction percent reached 54% in comparison with the control and 24 when compared with the recommended doses of NPK treatment. Also foliar spray with *Pseudomonas fluorescence, Pseudomonas fluorescence* and Humic acid are suppressed the insect pest populations such as the spider mite *Tetranychus urticae* and aphid ,they found statistical significant suppression of plants Tomatoes and pepper, by Arancon *et al* (2007) .

Table (2): Effect of Humic acid and two bio-fertilizers and their mixture on *Thrips tabaci* Lind. Infesting eggplant in the field during 2012 and 2013 seasons in Kaluobia governorate

Treatment	Mean number of Thrips /10 leaves					
	2012		2013		Average	
	Mean	Reduction%	Mean	Reduction%	Mean	Reduction%
Sc.	13.22	40.27	11.26	60.07	12.23	51.08
Ps.	10.36	53.12	14.1	50.0	12.23	51.08
Sc.+ Ps.	10.22	53.84	11.33	59.93	10.78	50.0
Ha.	7.81	64.66	8.4	70.21	8.11	67.44
Ha. + Ps.	9.51	57.01	10.4	63.12	9.96	60.56
Sc. + Ha.	9.81	55.66	7.10	75.18	8.46	65.68
Sc.+Ha.+ Ps.	4.22	80.99	3.33	88.29	3.78	84.97
Control	22.12	0	28.2	0	25.16	0
L.S.D	1.32		1.44		1.38	

Sc. = *Saccharomyces cerevisae* (Yeast) Ha. = Humic acid
Ps. = *Pseudomonas fluorescence* (Bacteria)

Table (3): Effect of Humic acid and two bio-fertilizers and their mixture on *Tetranychus urticae* Koch Infesting eggplant in the field during 2012 and 2013 seasons in Kaluobia governorate

Treatment	Mean number of *Tetranychus urticae /10 leaves*					
	2012		2013		Average	
	Mean	Reduction%	Mean	Reduction%	Mean	Reduction%
Sc.	29.1	63.39	35.8	59.46	32.45	61.43
Ps.	15.3	80.75	19.2	78.26	17.25	79.51
Sc.+ Ps.	21.5	72.96	25.5	71.12	23.5	72.04
Ha.	22.3	71.95	24.1	72.71	23.2	72.33
Ha. + Ps.	19.5	75.47	17.5	80.18	18.5	77.3
Sc. + Ha.	6.8	91.45	9.5	89.24	8.15	90.35
Sc.+ Ha. +Ps.	30.2	62.07	29.4	66.70	29.8	64.36
Control	79.5	0.0	88.3	0.0	83.9	0.0
L.S.D. 5 %	4.11		4.25		4.31	

Sc.= Saccharomyces cerevisae (Yeast)
Ps. = *Pseudomonas fluorescence* (Bacteria)
Ha. = Humic acid

2-Horticultural characters:

2.1. Vegetative growth characters and yield :

Data in Table (4) showed that there significant differences between the all treatments Vegetative growth characters during the two studied seasons. Data indicated that spraying with mixture of (Ps. +Sc. +Ha.) caused (1.9, 9.1, 218.0 67.0 ,586.67,and178.59)followed mixture of (Ps. +Sc) had significantly increased the eggplant growth in terms of number of Branches, Leaf area , stem thickness, Fresh and dry weight per plant in compared with the other treatments. The lowest result was recorded control. These results were agreed with (Kloepper *et al.,* 2004), they found that the use of plant growth promoting rhizobacteria offers an attractive way to replaced chemical fertilizer, pesticides, and supplements , most of isolates results in a significant increase in plant height, root length, and dry matter production of shoot and root of plants.

2.2– Chemical content in fruits :

Data in Table (5) revealed that mixture of Ps. Sc. + Ha. applied to the plant was the most potent treatment for increasing NPK and Fe in fruits during the two tested season (3.63, 041, 3.33 and 92.67) followed by mixture of Ps. + Sc. (3.61, 0.39, 3.23 and 87.29) The increase of nitrogen, potassium, phosphorus and iron is due to the influence of plant growth promoting rhizobacteria in the rhizosphere. Plant growth promoting rhizobacteria enhanced nutrient uptake from soil solution at a faster rate .These results were agreed with Glick *et al.*2007 who observed that atmospheric nitrogen N fixation, solubilization of phosphorus P. and synthesis of siderophores ror iron sequestration making nutrients more available to plants.

Table (4): Effect of Humic acid and bio- fertilizers and their mixtures on vegetative growth and yield of eggplant during 2012 and 2013 seasons in Kaluobia governorate

Treatments	Stem thickness (cm)		No. of Branches/ plant		Leaf area (cm)		Plant fresh weight (g)		Plant dray weight (g)	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Sc.	1.6	1.2	7.2	8.8	202.32	210.32	321.24	330.1	92.13	82.21
Ha.	1.1	1.5	6.0	6.2	159.1	240.2	294.0	310.0	75.14	80.12
Ps.	1.5	1.3	7.5	6.5	204.17	203.17	340.3	311.1	82.1	85.1
Sc. + Ha.	1.8	1.2	7.2	9.8	207.5	208.5	398.5	441.5	110.5	99.3
Ps. + Sc.	1.5	1.9	7.03	11.03	225.1	195.3	469.2	480.8	152.25	160.21
Ps. + Ha.	1.4	1.6	8.08	8.0	220.3	194.36	365.3	380.7	89.54	94.40
Ps + Sc + Ha.	1.4	2.4	9.1	9.0	197.14	240.2	542.21	631.013	190.8	167.10
Untreated	1.3	1.1	4.0	8.09	195.4	184.6	214.35	252.31	52.24	60.22
L.S.D. 5%	0.16	0.14	1.58	1.1	0.66	1.07	14.97	15.10	5.17	3.79

Table (5): Effect of plant growth promoting rhizobacteria and humic substance on nutrient contents in eggplant fruits at harvest time during2012and2013 seasons in Kaluobia governorate.

Treatments	N%			P%			K%			Fe (ppm)		
	2012	2013	mean	2012	2013	mean	2012	2013	mean	2012	2013	Mean
Sc.	3.26	2.89	3.62	0.28	0.25	0.31	3.15	2.67	3.20	76.6	77.4	75.7
Ha.	2.97	2.66	3.28	0.29	0.25	0.32	2.85	2.59	3.11	55.3	55.7	54.9
Ps.	3.15	2.80	3.49	0.29	0.27	0.34	2.98	2.72	3.23	68.8	70.0	67.6
Sc. + Ha.	3.44	3.02	3.86	0.35	0.32	0.40	3.17	2.90	3.43	86.4	86.2	86.5
Ps.+ Sc	3.61	3.26	3.95	0.39	0.34	0.43	3.23	2.93	3.52	87.3	87.3	87.2
Ps. + Ha.	3.48	3.17	3.79	0.34	0.30	0.38	3.12	2.84	3.39	84.3	84.5	84.2
Ps.+Sc.+Ha.	3.63	3.28	3.97	0.41	0.36	0.45	3.33	3.05	3.61	92.7	92.8	92.6
Untreated	2.37	2.18	2.55	0.18	0.16	0.20	1.66	1.39	1.92	46.2	45.8	46.6
L.S.D. 5%	0.13	0.14		0.01	0.01		0.06	0.11		2.85	1.68	

3 -Yield and fruit characters:

Data in Table (6) revealed that an applied treatment as mixture was the most potent treatment on yield and yield components of eggplants plants during two studied seasons. Obtained results may be due to microbes action on releasing natural hormones beside vitamin B group which increase in root growth, consequently, increase the ability of plants to absorb more water and nutrient NPK from deep layers of soil (Bhagavantagoudra and Rokhade, 2001 and El-Afifi *et al.* 2002). Also, these results may be due to the role of bio-magic on increasing period of production, enhancing photosynthesis, and encourage absorbing of water and nutritional elements from soil (El Massiry, 2009 and Ibrahim, 2009). Dry matter was significantly increased by using mixture of Ps. Sc. + Ha. (188.34 and 14.4) plant growth promoting rhizobacteria result in a significant increase in dry matter production of plants.

These results are agreement with Muscolo *et al.* (1993) the effect of humic substances at low concentrations has been explained by various theories, the most convincing of which hypothesizes a " direct" action on the plants which is hormonal in nature, together with an " indirect action" on the metabolism of soil microorganisms, the dynamics of soil nutrients, and soil physical conditions.

4- CO_2 evolution and dehydrogenase activity in rhizosphere soil:

Data in Table (7) shows that the soil biological activity at eggplant harvesting, CO_2 evolution and dehydrogenase (DHA) activities as affected with *Pseudomonas fluorescence*, *Saccharomyces cerevisae* and/or humic acid either alone or combined together. All tested soil biological activity parameters under the effect of tested treatments with higher than those of the control treatment in the two tested seasons.

Table (6): Effect of plant growth promoting rhizobacteria and humic substances on yield of eggplant. During 2012and 2013 seasons in Kaluobia governorate

Treatment	Total yield					
	No. of fruits			Weight (kg)		
	2012	2013	Mean	2012	2013	Mean
Sc	8.2	8.7	8.4	1.74	1.83	1.79
Ha.	7.0	7.3	7.2	1.33	1.35	1.34
Ps.	7.3	8.3	7.8	1.44	1.61	1.52
Sc. + Ha.	11.8	11.7	11.75	3.02	2.83	2.92
Ps.+ Sc.	12.0	12.7	12.35	3.32	3.13	3.22
Ps. + Ha.	9.2	2.7	8.45	1.99	1.83	1.91
Ps. + Sc. + Ha.	14.5	14.3	14.4	4.04	3.83	3.94
Untreated	6.8	6.7	6.7	1.297	1.110	1.2
L.S.D. 5%	0.87	0.84		0.336	0.315	

Table (7): CO_2 evolution and dehydrogenase activity in rhizosphere soil at harvest time of eggplant in response to different applied treatments.

Treatments	First season		Second season	
	CO_2 (mg. 100 g soil^{-1})	DHA (µg TPF.100 g soil day $^{-1}$)	CO_2 (mg. 100 g soil^{-1})	DHA (µg TPF.100 g soil day $^{-1}$)
Saccharomyces (Sc.)	275.73	52.85	185.80	41.89
Humic acid (Ha.)	232.20	47.00	177.15	37.50
Pseudomonas (Ps.)	240.81	49.36	183.16	39.27
Sc. + Ha.	279.28	76.51	213.21	53.63
Ps. + Sc.	285.62	75.01	218.00	59.26
Ps. + Ha.	262.71	60.61	201.53	47.71
Ps. + Sc. + Ha.	320.23	79.80	244.00	63.60
Control	166.30	38.92	147.22	32.09

Data indicated that the highest values of both CO_2 evolution and dehydrogenises activity were obtained by the treatment inoculated with Ps. + Sc. In combination with humic acid. The corresponding high values were 244.0 & 320.33 mg CO_2 100g $soil^{-1}$ soil and 63.60 & 79.80 µg TPF. 100 g soil day^{-1} (dehydrogenises activity) at first and second season, respectively. Whereas the double inoculate, Yeast (Sc.) + Ps. was superior in its effect followed by yeast as a single inoculums and the lowest effect recorded with humic application treatments.

The obtained results may be due to produce plant growth regulators (indoleacetic acid, gibberellic acid, cytokinins and ethylene) (Glick, 1995), solubilization of mineral phosphates and other nutrients (De Freitas *et al.* 1997). Survival and competitiveness of these beneficial microorganisms (Bowen and Rovira 1999).

In conclusion, the application of different bio-fertilizers and Humic acid in addition to their combinations as an integrated system to reduce the infestation percent of onion thrips ,Red spider, and increasing growth yield of eggplant. The results of the present study indicate that the foliar application of Bacteria, *Pseudomonas fluorescence*, active dry yeast, *Saccharomyces cerevisae* and Humic substances as bio – and organo-fertilization can positively affect the eggplant to yield , growth, fruit characters and mineral contents.

REFERENCES

Alef, K. (1995). Estimation of microbial activities: dehydrogenase activity. In: Alef,K., Nannipieri, P..(Eds.),Methods in Applied Soil Microbiology and Biochemistry. Academic press, New York, pp.228-231.

Atlas, (1995). Hand book of media for environmental microbiology is a compilation of the formulations, methods of preparations for media used for the isolation and cultivation of microorganisms from environmental sources. Press, sep-18-1995 science 544 pages.

AL-Niemi, S.N.A. (1999). Effects of Humic Acid and Bread Yeast on Growth *and* Yield of Eggplant (*Solanum melongena* L.) Journal of Agricultural Science and Technology B 1 1091-1096

Arancon, N.Q., C.A. Edwards and A. lees (2002). Management of two spotted Spider mite *Tetranychus urticae* mealy bug, *Pseudomonas* sp. and aphid (*Myzus persicae*) populationsand damage crop port 12:29-39.

Arancon, N.Q., C.A. Edwards, E.N. Yardim, T.J. Oliver, R. J. Byrne and G. Keeney (2007). Suppression of spider mite , mealy bugs and aphids , populations and damage by vermicomposts; crop protection., 26: 29 39.

Barea, J.M., E. Navarro and E. Montana (1976). Production of plant growth regulators by rhizosphere phosphate solubilizing bacteria. JAPP Bacteriol 40:129-13.

Bhagavantagoudra, K.H. and A.K. Rokhade (2001). Effect of *Azospirillium* and nitrogen on growth and yield of cabbage. Karnataka Journal of Agricultural Sciences, Dharwad, India. 14(3):858-861.

Bowen, G.D. and A.D. Rovira (1999). The rhizosphere and its management to improve plant growth. Adv. Agron. 66: 1 – 102.

Brian, A.N. Taylor, A.G., Urwiler.,Rabaey, T. and W.D. Hutchison (2004). Neonicotinoid seed treatments for managing potato leafhopper infestations in snap bean. Crop Protection, 23: 147-154.

Brown, J.D. and M. Lilies (1964). Rapid determination of potassium and so cilium in plant material and soil extracts by flam-photometry, Proc. Amer. Soc. Hort. Sci., 48:341-346.

Culinary, T.W. and D. Pimentel (1986). Ecological effects of organic agricultural practices on insect populations. Agric. Ecosyst. Environ. 15: 253-256.

De Freitas, J.R., M.R. Banerjee and J.J. Germida (1997). Phosphate- solubilizing rhizobacteria enhance the growth and yield but not phosphorus uptake of canola (*Brassica napus* L.) Biol. Fertil. Soils 24: 358 – 364.

EL-Ghamriny, E.A., H.M.H. Arisha and K.A. Nour (1999). Studies in Tomato flowering, fruit, set, yield and quality in

summer season,1. Spraying with thiamine, ascorbic acid and yeast, Zagazig. J. Agric. Res. 26: 1345-1364.

EL-Afifi, S.T., M.M. Zaghloul and E.I. Ibrahim (2002). Effect of transplant age, nitrogen fertilizer level s and Biofertilization on cabbage. Inter Conf. Hort. Sci., 10-12 Sept. Kafr El-Sheikh, Tanta Univ., Egypt.

EL-Massriy, M.M.A. (2009). Production of lettuce using organic, bio- and mineral fertilization under saline conditions. PH.D. Thesis. Dep. of Hort., Fac., of Agr., Ain Shams University, Cairo, Egypt.

Fathy, E.S.L.S. and S.A. EL-Dosouky (2000). Induce cold tolerance of outdoor Tomato during early summer by using triphosphate (ATP),yeast, and there natural and chemical treatment to improve their fruiting and yield. J. Agric. Sci, Mansoura Univ. 25: 377-401.

Glick, B.R. (1995). The enhancement of plant growth by free living bacteria. Canad. J. Microbiolog, 41:109 – 117.

Glick, B.R., B. Todorovic, J. Czarny, Z. Cheng, J. Duan and B. Mc. Conkey (2007). Promotion of plant growth by bacterial ACC deaminase. Crit. Rev. Plant Sci. 26:227-242.

Gomaa, A.M., S.S. Moawad, I.M.A. Ebadah and H.A. Salim (2005). Application of bio-organic farming and its influence on certain pests infestation, growth and productivity of potato plants. Journal of applied Sciences Research, 1(2): 205-211.

Gomez, K.A. and A.A. Gomez (1984). Statistical procedures for agricultural research. Joho Wiley and Sons Inc. New York 68 p.

Ibrahim, T.M.A. (2009). Studies on the development and production of globe artichoke (*Cynara seolymus* L.) under Sinai conditions. M. Sc. Thesis. Of Agric. Al-Azhar Univ. Cairo, Egypt.

Jackson, M. L. (1973). Effect of foliar spraying with yeast solution on growth and yield of potato plant cv. Desiree. Html/ www.tropentage.de2007/ abstracts/ links/ khalaf.FPRAXY90.

Kloepper, J.W., C.M. Ryu and S. Zhang (2004). Induced systemic resistance and promotion of plant growth by *Bacillus* species. Phytopathology 94: 1259-1266.

Lugtenberg, B. J. J. and L.C. Dekkers (1999). What makes *Pseudomonas* bacteria rhizosphere competent. Environment Microbiol, (1 Suppl. 1):9-13.

Omer, A. Khalieda (2003). Effect of foliar spraying with yeast suspension on growth and yield of tomato plant cv. Early person, Iraq Journal of Agriculture Science 4: 23-28.

Plummer, D.T. (1971). An introduction to practical biochemistry. Mc. Grow Hill Book Company, UK., 278pp.

Sawyer, Heinemann, Beebe (1984). Chemistry Experiments for instrumental Methods (1984) pp. 242-253.

Skoog, M. (1996). Fundamentals of Analytical Chemistry. West, Holler pp. 611-636.

Shehata, S.M. (1972). Evaluation of some Biological Tests as parameters for Microbial Activities Related to soil Fertility. Ph.D. Thesis, Fac. Agric., Cairo., Univ., Egypt, p.173.

Watson, D.J. (1958). The dependence of net assimilation rate on leaf area index. Ann. Botany. N., 37-45.

Yardim, E.N. and C.A. Edwards (2003). Effects of organic and synthetic fertilizer sources on pest and preparatory insect associated with Tomatoes. Phytoparsitiea, 31:324-329.

تأثير حامض الهيوميك والاسمدة الحيوية منفردة او بالاشتراك على نمو وإنتاج نبات الباذنجان وعلاقة ذلك ببعض الافات الثاقبة الماصة فى محافظة القليوبية

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الملخص العربى

أجريت هذه التجربه تحت ظروف التربه الطميه بمحافظه القليوبيه – مصر خلال موسمى الزراعه ٢٠١٢ / ٢٠١٣ لبحث تأثير الرش باستخدام البكتريا المحفزه لنمو النبات (بسيدوموناس Ps) والخميره النشطه (ساكاروميسس Sc) وكذلك حامض الهيوميك Ha ، مضافا للتربه وخلائطهم المختلفه على الخواص المحصوليه والنمو لنبات الباذنجان وكذلك الاصابه بكلا من التربس والعنكبوت الاحمر.

وأثبتت النتائج ان معامله الخليط (الخميره والبكتريا والهيوميك اسيد) سبب نقصا معنويا للاصابه بحشره التربس، وصلت نسبه النقص الى ٨٤.٥٦% ، بينما معامله الخليط (البكتريا والهيوميك)حقق اعلى نقص فى تعداد العنكبوت الاحمر وصل االى ٩٠.٣٥% كمتوسط لعامى الدراسه مقارنه بمتوسط الكنترول ، بينما باقى المعاملات أشارت إلى أن كل المواد سببت نقصا فى تعداد التربس تراوحت من ٥٠ الى ٦٧.٤٤% نتيجه المعامله بخليط (البكتريا والخميره) ومركب الهيوميك على الترتيب كمتوسط لعامي الدراسة . بينما كانت النسبه المئويه للنقص فى الاصابه بالعنكبوت الاحمر تراوحت من٦١.٤٣ الى ٧٩.٥١ % نتيجه المعامله بالبكتريا منفرده وكذلك معامله الخميره منفرده على الترتيب كمتوسط عامى الدراسه.

كما أشارت النتائج الى أن كل المواد التى تم تطبيقها سببت زياده معنويه فى عوامل النمو الخضرى للباذنجان متمثلة فى الصفات (سمك الساق "سم" ، عدد الأفرع/ نبات، مساحة الورقة "سم" ، وزن النبات جاف وطازج ، المجموع الكلى للنبات طازج وجاف). حيث حقق الخليط (Ha + Sc + Ps) أعلى تأثير إيجابى ومعنوى. كما أوضحت النتائج أن كل المعاملات سببت زيادة معنوية فى محتويات ثمرة الباذنجان مقارنة بالكنترول ، كما تحسن خواص الثمار من حيث محتواها من كل من البوتاسيوم، الفوسفور، النيتروجين ، الحديد وخاصة تلك التى تم الحصول عليها بعد المعاملة بخليط (Ps + Sc + Ha) .