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EFFECT OF NATURAL FERTILIZERS, ENCIABEIN (SLOW RELEASE NITROGEN FERTILIZER) AND BIO FERTILIZERS ON TOMATO PRODUCTION UNDER PLASTIC HOUSE CONDITIONS

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ABSTRACT: ***Tomato seeds (F1 Agiad 7) were planted during two successive seasons of 2008\2009 and 2009\ 2010, respectively at Kaha Research Station , Kalubia governorate . The study effect of natural fertilizers , Enciabein (slow release fertilizer) and bio fertilizers on tomato production. Four natural fertilizers treatments at a rate of 2kg \ m^2 and bio fertilizers at rate of 4 letter \ fed. and one levels of Enciabein (80 unit N\ fed.), one levels of Effect Microorganisms (EM) at a rate of 4 letter \ fed.***

Four Mono Super Phosphate at a rate of 150kg\fed.+ Phosphorein at a rate of 4 letter\ fed. + one levels Enciabein (80 unit N\ fed.), one levels of Effect Microorganisms (EM) at a rate of 4 letter \ fed. and Chicken manure at a rate of (20m^3/ fed.) as control were used The results were as follows:-

1- ***Using Mono Super Phosphate at rate of 150kg\fed.+ Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \fed. enhanced vegetative growth (plant height, leaf area, leaf number , fresh and dry weights) .The lowest vegetative growth was noticed due to applying Rock Phosphate at rate of 2 kg\ m^2 +Phosphorein at a rate of 4 letter\ fed. +Effect Microorganisms at rate of 4 letter \ fed.***

2- ***Application of Rock Potassium at rate of 2 kg\ m^2 +Phosphorein at rate of 4 letter\ fed. + Enciabein at a rate of 80 unit N \ fed. gave the highest early , total yield(kg\ plant) ,average fruit weight and total yield ton per feddan) compared with other treatments and control.***

3- ***Using mono Super Phosphate at rate of 150kg\fed.+ Phosphorein at a rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \feddan increased content of N, P, K, Fe and Mn than the other treatments.***

Key Words:- ***Rock Phosphate , Rock Potassium, Phosphorein , Enciabein, Effect of Microorganisms (EM), Mono Super Phosphate, Chicken manure and tomato seeds***

INTRODUCTION

Increasing tomato production is a wide aim that can be attained throughout many pathways as favorable fertilizer requirements. Nitrogen and

phosphorus chemical fertilizers are commonly used, but with application of such fertilizers to the soil, some problems could be arise i.e. some nitrogen could be lost via nitrate reduction ,denitrification and\or ammonia volatilization .In addition some nitrogen can be evaporate from soil surface and leached through under groundwater causing environmental pollution . Furthermore, to Egyptian soil immobilization of phosphorus is the most important problem of phosphate fertilization.

Slow release fertilizers (enciabein) is evident from several new products marketed in recent years. The potential benefits claimed are increasing plant use efficiency by prolonged soil reduction and fewer fertilizer application, thus saving fertilizer and application costs *(El- Ailla and Abou- Seada 1996*) Also, urea formaldehyde is considered one of the world leading nitrogen fertilizer due to its high nitrogen content 46% low commercial .It has however, the major limitation of easy dissolution in water and rapid hydrolysis .

These condition causes high nitrogen losses through ammonia volatilization .Application of slow release fertilizers (enciabein) can eliminate the inefficiency of nitrogen application after planting and the risk of burning newly established with high pre- plant fertilizer application. *Lorenz et al (1974)* on potato plant found that slow release fertilizer (SCU)sulfur coated urea resulted in the greatest tuber yield than the other source (urea). Moreover, *Pew et al (1984)* stated that slow release fertilizers produced high yield and excellent quality of lettuce compared with soluble fertilizer. Also, *Abdel- Fattah et al (1987)* reported that compared with control, (UF) urea formaldehyde increased cucumber yield when applied at a rate of 35,75,125 and 150 g\m2 which gave 16$,18%,25% and 35% increase , respectively . Furthermore, *Zhao and Wang (1991*) found that applying of slow release urea increased soybean yield as compared with ordinary urea. However, *Hekal (1992)* reported that urea formaldehyde increased total yield of spinach plants. Also, *Hasanein and Kabeel (2006)* indicated that application of enciabein at a rate of 150 unite N per feddan gave the highest total potato yield.

Tomato fruit yield and its components responded significantly to biofertilizers application, *Shahaby (1981*), *Kumaraswany and Madalageri (1990*) recorded highest tomato fruit yield by inoculated tomato seedling with Azotobacter .*Shahaby et al (1993)* , *Vapin and Kapulnik (1994*), *Terry et al (1995)* and *Awad (1998)* obtained higher tomato fruit yield will best quality by using various bacterial fertilizers and Azotobacter.

Biofertilizers do not completely replace agro- chemical ,but may significantly reduce their rates of application *(Saber ,1994*) showed that bio fertilization of tomato plants with a multi strain biofertilizers in the presence of one third the basal dose of NPK increased plant growth, N-P contents and

fruit yield than un inoculated and received 100% from NPK recommendation . *Abdel Ati et al (1996)* on potato and *Awad (1996)* on tomato used 50% of NPK from the recommend usual rates came to similar results.

Application, of rock phosphate and rock potassium is very important for raising the production of vegetative crops. *Sheng and Huang (2002)* found that direct application of phosphate (rock phosphate) and potassium (feldspars enriched rock) material may be agronomical more useful and environmental more feasible than soluble P and K. Since rock phosphate in the long term improvement of their soil structure and increased productivity crops without negative effects on the environmental *Akintokum et al (2003)*. Moreover, *Akanda, et al (2005)* Reported that integrated rock phosphate with inoculation of PSB increased the availability of P and K in soil , The uptake of N, P and K by shoot and root , and the growth of pepper and cucumber. However, *Gweyi et al (2010)* indicated that rock phosphate play role on improved tomato yield .The application of rock phosphate in addition to acidifying nitrogenous with consideration to soil types has potential of improving crop production and phosphate capital of resources –poor farmers . Also, *Handawy et al (2010)* reported that rock phosphate at level 150 kg\ feddan were superior in most cases of growth characters , yield and its components compared with control treatments. Moreover, *Nadia Gad and Hala Kandil (2010)* indicated that rock phosphate (RP) treatment gave the higher values of tomato growth , yield , chemical constituents and mineral composition of tomato fruits.

The objective of this research was to study the influence of natural fertilizers and enciabein (slow release Nitrogen fertilizers) on tomato, plant growth, yield and fruit quality.

MATERIALS AND METHODS

This study was performed at Kaha Research Station ,Kalubia governorate during two successive seasons of 2008\2009 and 2009\2010 respectively, . Certified seeds tomato hybrid (Agiad 7) were used .The experimental design was a complete randomized block with four replicates, planting distance was 50cm apart .Each plots 40 plants of the used tomato hybrid. The used tomato was Agiad7 F1 hybrid. Seed sowing was conducted in the nursery on September22th in 2008 and on September 28th in 2009.Seedling transplanting was performed on November1th in 2008 and on November2th in 2009 seasons.

Treatments:-

The natural fertilizers , bio fertilizers and fertilization treatments of slow release Nitrogen fertilizers, and either in a single form or in combination were conducted as follows:-

1-Rock Phosphate at rate of 150 kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \ fed.(RP+P+E)

2-Rock Phosphate at rate of 150kg\fed. +Phosphorein at rate of 4 letter\ fed. +Effect Microorganisms at rate of 4 letter \ fed.(RP+P+EM)

3-Rock Potassium at rate of 150 kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \ fed. (RK+ P+ E)

4-Rock potassium at rate of 150kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Effect Microorganisms at rate of 4 letter \ fed.(RK+P+EM).

5-Mono Super Phosphate at rate of 150kg\fed.+ Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \fed.(MSP+P+E)

6-Mono Super Phosphate at rate of 150kg\fed.+ Phosphorein at rate of 4 letter\ fed. + Effect Microorganisms at rate of 4 letter \fed. (MSP+P+EM)

7-Mono Super Phosphate at rate of 150kg\fed.+ Enciabein at rate of 80 unit N \fed. (MSP+ E)

8-Mono Super Phosphate at rate of 150kg\fed.+ Effect Microorganisms at rate of 4 letter \fed.(MSP+ E M)

9-Chicken manure at rate of (20m^3/ fed.) as control (CH).

The trenches rows were filled with enciabein ,rock phosphate and rock potassium, mono super phosphate, and Phosphorein while effective microorganisms (EM) was added through drip irrigation. Black polyethylene mulch and drip irrigation system were implemented before planting . Irrigation and other cultural practices were applied as recommended by Ministry of Agriculture, samples of the experimental soil were carried out to the soil laboratory, Agriculture Research Center (ARC) .Physical and chemical analysis of the soil are presented in Table (1)

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

2008\2009													
Practical size distribution			Texture	PH	EC ds\m	OM %	$CaCO_3$ %	mg\kg soil					
Sand	Silt	Clay						N	P	K	Fe	Zn	Mn
13.5	18.8	67.7	Clay	8.4	3.52	21.4	2.53	11.2	13.7	29.1	2.32	1.37	1.28
2009\2010													
13.7	17.9	68.4	Clay	8.2	3.41	24.6	2.81	12.4	14.1	31.7	2.53	1.44	1.36

A random sample of five plants from each plot were taken after 90 days from transplanting to transplanting to record the following characters;-

1-Vegetative growth characteristics

- **Plant height (cm).**
- **Leaf area : the average leaf area (cm^2) was measured for the 5^{th} true leaf by using laser leaf area meter**

- Number of leaves per plant.
- Fresh weight (g) per plant.
- Dry weight (g) per plant

2- Chemical composition:

Sample of the fourth top leaves were dried at 70 ^{0}C till constant weight and wet digested to determine N,P and K contents as follows:-

- Total nitrogen (%) in leaves was determined by using the microkjeldahl by *A.O.A.C.(1990)*
- Phosphorus (%) was determined calorimetrically at 550 mm as described by *Ranganna (1979).*
- Potassium (%) was determined by flame photometer as described by *Ranganna (1979).*
- Micro nutrients Fe and Mn contents were determined for the above ground dried vegetative parts by using atomic absorption spectrophotometer according to *Chapman and pratt (1981)* .
- Total Soluble Solid (TSS) of fruit was measured by hand refract meter.
- Total Acidity (TA) was determined as mg\100ml juice by using NaOH with phenolphthalein as indicator is mentioned by *A.O.A.C. (1975).*
- Vitamin C content (ascorbic acid) was determined as mg\100 ml juice (mg\100g f.w.) by using the 2,6 dichloro phenol indophenols method (*A.O.A.C. 1975*).
- Chlorophyll contents were determined according as mg\ g d.w. and measured for the 5th true leaf *(A,O.A.C.1991).*

3- Fruit physical characteristics :

- Fruit length (cm) and fruit diameter (cm)
- Shape index (L\D).
- Flesh thickness (cm).

4- Yield and its components :-

- Early yield (kg per plant).
- Total yield (kg per plant).
- total yield (ton per feddan).
- Average fruit weight (g)
- Number of fruit per plant .

Statistical analysis:

All obtained data were subjected to statistical analysis for variance by using complete randomized block design method as mentioned by *Gomez and Gomez (1984)* for calculating the least significant differences between treatments.

RESULTS AND DISCUSSION

1- Vegetative growth

Data in Table (2) illustrate the effect of natural fertilizers , Enciabein (slow release Nitrogen fertilizers) and bio fertilizers on different parameters i.e.

plant height, leaf area , leaf number ,fresh and dry weight of tomato. Mono Super Phosphate at a rate of 150kg\fed.+ Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \feddan significantly increased plant height, leaf area , leaf number ,fresh and dry weight per plant comparing with other treatments in both seasons. In such vegetative growth had increased significantly compared with other treatments and control.

Table (2): Effect of natural fertilizers, Enciabein (slow release Nitrogen fertilizers) and bio fertilizers on vegetative growth of tomato plants grown under plastic house conditions.

Treatments	2008 season					2009 season				
	Plant Height (cm)	Leaf Area (cm^2)\ plant	No. of Leaves Per plant	fresh weight (g)\ plant	Dry weight (g) \ Plant	Plant Height cm	Leaf Area (cm^2)\ plant	No. of Leaves Per plant	Fresh weight (g)\ Plant	Dry weight (g)\ Plant
RP+P+E	178.7	160.5	88.5	376.5	87.7	179.8	161.7	90.6	381.9	88.6
RP+P+EM	165.1	150.0	74.7	350.3	66.6	166.0	151.4	77.3	355.6	69.9
RK+P+E	183.1	165.6	93.1	391.4	94.6	186.4	167.5	94.0	402.5	97.2
RK+P+EM	171.6	154.8	80.6	360.8	74.3	172.6	155.1	81.7	364.8	78.8
MSP+P+E	188.4	167.1	96.4	396.7	98.2	190.5	170.0	97.6	407.1	101.1
MSP+P+EM	180.5	162.3	91.2	383.4	91.2	183.3	163.9	93.2	394.1	92.5
MSP+E	175.9	157.9	84.9	370.1	82.3	177.7	159.2	87.1	377.7	84.7
MSP+EM	168.8	152.7	78.5	356.4	70.8	169.2	153.6	80.4	359.3	73.4
CH (Control)	173.3	156.2	82.3	365.9	79.9	174.1	157.8	83.9	370.0	81.3
L.S.D at 0.05	3.05	1.18	2.57	13.29	8.83	2.25	3.27	6.46	11.79	5.27

1- RP+P+E=Rock Phosphate at rate of 150kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \ fed.
2- RP+P+EM=Rock Phosphate at rate of 150 kg\ fed. +Phosphorein at rate of 4 letter\ fed. +Effect Microorganisms at rate of 4 letter \ fed.
3- Rk+ P+ E=Rock Potassium at rate of 150 kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \ fed.
4- RK+P+E=Rock Phosphate at rate of 150kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Effect Microorganisms at rate of 4 letter \ fed.
5- MSP+P+E= Mono Super Phosphate at rate of 150kg\fed.+ Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \fed.
6- MSP+P+EM= Mono Super Phosphate at rate of 150kg\fed.+ Phosphorein at rate of 4 letter\ fed. + Effect Microorganisms at rate of 4 letter \fed.
7- MSP+ E= Mono Super Phosphate at rate of 150kg\fed.+ Enciabein at rate of 80 unit N \fed.
8- MSP+ EM= Mono Super Phosphate at rate of 150kg\fed.+ Effect Microorganisms at rate of4 letter \fed.
9- Control = Chicken manure at rate of ($20m^3$/ fed.)

These results might be attributed to the simulative effect of nitrogen on the meristmatic activity of plant tissues since nitrogen is a constituent of proteins nucleic acid and many other important substances of plant cell

(*Al- Ailla and Abou- Seeda (1996)*) . These results were in agreement with those of *Lorenz et al, (1974)* 0n potato and *Saber (1994)* 0n tomato.

2-NPK contents.

Results presented in Table (3) showed that, mono super phosphate at rate of 150 kg\ feddan + phosphorine at a rate of 4 letters \ feddan + Enciabein at rate of 80 unite N \ feddan significantly increased N and P contents of tomato leaves compared with the other used treatments or control. On the other hand, no significant differences were observed between the other treatments and control. While , rock potassium at the rate of 150kg\ fed.+ phosphorein at the rate of 4L.\ feddan + Enciabein at the rate of 80 unite N \ feddan had significantly increased K% content more than the other treatments in tomato leaves during two seasons of the study.

Table (3): Effect of natural fertilizers, Enciabein (slow release Nitrogen fertilizers) and bio fertilizers on macro and micro nutrients of tomato plants grown under plastic house conditions.

Treatments	2008 season					2009				
	N %	P %	K %	Fe ppm	Mn Ppm	N %	P %	K %	Fe Ppm	Mn ppm
RP+P+E	3.71	0.48	5.26	321	36	3.69	0.46	5.15	333	38
RP+P+EM	3.39	0.59	5.51	284	26	3.27	0.55	5.38	292	27
RK+P+E	3.30	0.38	5.84	270	22	3.17	0.30	5.74	281	24
RK+P+EM	3.23	0.35	5.77	259	19	3.05	0.26	5.65	268	20
MSP+P+E	3.89	0.56	5.43	342	41	3.81	0.51	5.29	347	45
MSP+P+EM	3.55	0.41	5.70	306	31	3.49	0.36	5.57	317	32
MSP+E	3.76	0.51	5.35	335	39	3.76	0.48	5.22	339	42
MSP+EM	3.44	0.44	5.62	297	29	3.33	0.33	5.53	305	30
CH(Control)	3.62	0.41	5.58	313	34	3.58	0.39	5.37	326	35
L.S.D at 0.05	0.03	N.S	0.02	14.4	1.7	0.01	N.S	0.04	12.8	1.5

1- RP+P+E=Rock Phosphate at rate of 150kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \ fed.
2- RP+P+EM=Rock Phosphate at rate of 150 kg\ fed. +Phosphorein at rate of 4 letter\ fed. +Effect Microorganisms at rate of 4 letter \ fed.
3- Rk+ P+ E=Rock Potassium at rate of 150 kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \ fed.
4- RK+P+E=Rock Phosphate at rate of 150kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Effect Microorganisms at rate of 4 letter \ fed.
5- MSP+P+E= Mono Super Phosphate at rate of 150kg\fed.+ Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \fed.
6- MSP+P+EM= Mono Super Phosphate at rate of 150kg\fed.+ Phosphorein at rate of 4 letter\ fed. + Effect Microorganisms at rate of 4 letter \fed.
7- MSP+ E= Mono Super Phosphate at rate of 150kg\fed.+ Enciabein at rate of 80 unit N \fed.
8- MSP+ EM= Mono Super Phosphate at rate of 150kg\fed.+ Effect Microorganisms at rate of4 letter \fed.
9- Control = Chicken manure at rate of ($20m^3$/ fed.)

Iron and manganese contents were higher by adding (MSP+P +E) compared with the other rates of natural fertilizers and slow release fertilizers. These result were true during the two studied seasons. Application natural fertilizers or slow release fertilizers in this case enciabein can eliminate the inefficiency of nitrogen application after planting and the risk of burning newly established plants with high pre- plant fertilizer application .These results were in agreement with those of *Saber (1994)* , *Abdel- Ati et al (1996)* and *Awad (1996)* they working on tomato plants.

3- Physical characters.

Data in Table (4) showed that using (RK+ P+ E) had significantly increased fruit length and fruit diameter of tomato fruits than the other treatments and control.

Table (4): Effect of natural fertilizers Enciabein (slow release Nitrogen fertilizers) and bio fertilizers on physical characteristics of tomato plants grown under plastic house conditions

Treatments	2008 season					2009 season				
	Fruit length cm	Fruit diameter (cm)	Shape index	Flesh thickness cm	Lecoules number	Fruit length cm	Fruit diameter cm	Shape index	Flesh Thickness cm	Lecoules number
RP+P+E	6.0	6.5	0.923	0.6	4.0	5.5	6.3	0.873	0.6	4.0
RP+P+EM	5.5	6.0	0.917	0.6	4.0	5.0	5.8	0.862	0.5	4.0
RK+P+E	6.9	7.3	0.945	0.8	4.0	6.4	7.0	0.914	0.7	4.0
RK+P+EM	6.3	6.8	0.927	0.7	4.0	5.9	6.5	0.908	0.6	4.0
MSP+P+E	4.8	5.1	0.941	0.5	5.0	4.3	5.0	0.860	0.5	5.0
MSP+P+EM	6.5	7.0	0.929	0.8	4.0	6.1	6.8	0.897	0.6	4.0
MSP+E	5.3	5.7	0.929	0.5	3.0	4.8	5.5	0.873	0.5	3.0
MSP+EM	5.5	5.5	0.909	0.5	4.0	4.5	5.2	0.865	0.5	4.0
CH(Control)	5.8	6.2	0.935	0.6	4.0	5.3	6.0	0.883	0.5	4.0
L.S.D at0.05	0.2	0.4	0.09	N.S	N.S	0.3	0.3	0.024	N.S	N.S

1-RP+P+E=Rock Phosphate at rate of 150kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \ fed.

2- RP+P+EM=Rock Phosphate at rate of 150 kg\ fed. +Phosphorein at rate of 4 letter\ fed. +Effect Microorganisms at rate of 4 letter \ fed.

3- Rk+ P+ E=Rock Potassium at rate of 150 kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \ fed.

4- RK+P+E=Rock Phosphate at rate of 150kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Effect Microorganisms at rate of 4 letter \ fed.

5- MSP+P+E= Mono Super Phosphate at rate of 150kg\fed.+ Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \fed.

6- MSP+P+EM= Mono Super Phosphate at rate of 150kg\fed.+ Phosphorein at rate of 4 letter\ fed. + Effect Microorganisms at rate of 4 letter \fed.

7- MSP+ E= Mono Super Phosphate at rate of 150kg\fed.+ Enciabein at rate of 80 unit N \fed.

8- MSP+ EM= Mono Super Phosphate at rate of 150kg\fed.+ Effect Microorganisms at rate of4 letter \fed.

9- Control = Chicken manure at rate of (20m^3/ fed.)

On the other hand, flesh thickness and lecoules numbers had no significant differences were observed between the rates of natural fertilizers, slow release fertilizers and control . These results were in agreement with those of *Hasanein and Kabeel (2006).*

4- Chemical compositions:-

Ascorbic acid, total acidity, chlorophyll and TSS % as well as the dry matter % than using the other treatments and control was significant deference between natural fertilizers, effect of microorganisms and Enciabein (slow release fertilizer) to tomato plants, are presented in Table (5) , showed that using mono Super Phosphate at rate of 150kg\fed.+ Phosphorein at a rate of 4 letter\ fed. + Enciabein at rate of 80 unit nitrogen per feddan increased ascorbic acid, total acidity, chlorophyll and TSS % or mono Super Phosphate at rate of 150kg\fed.+ Enciabein at rate of 80 unit nitrogen per feddan increased ascorbic acid, total acidity, chlorophyll and TSS% than that of using the other treatments and control with significant differences .

Table (5): Effect of natural fertilizers , Enciabein (slow release Nitrogen fertilizers) and bio fertilizers on chemical characteristics of tomato plants grown under plastic house conditions

Treatments	2008 season					2009 season				
	Ascorbic acid (mg\100g f.w.)	total acidity mg\ 100 g juice	chlorophyll mg\g dry weight	Dry matter %	TSS %	Ascorbic acid (mg\100g f.w.)	Total acidity mg\ 100 g juice	Chlorophyll mg\ g dry weight	Dry matter %	TSS %
RP+P+E	17.81	4.39	44.44	20.77	4.01	17.33	4,5	41.93	21.18	4.19
RP+P+EM	10.74	3.18	37.72	14.05	3.33	10.64	3.87	35.42	15.00	3.45
RK+P+E	14.36	3.72	41.88	18.42	3.74	14.96	4.32	39.64	19.47	3.91
RK+P+EM	12.82	3.44	39.15	16.83	3.50	12.72	4.09	37.26	17.62	3.70
MSP+P+E	19.49	5.03	47.22	22.56	4.36	19.18	4.73	44.05	23.29	4.48
MSP+P+EM	15.63	3.95	42.59	19.24	3.85	16.67	4.38	40.77	20.37	4.07
MSP+E	18.77	4.71	45.31	21.39	4.12	18.43	4.61	43.00	22.25	4.33
MSP+EM	11.92	3.32	38.63	15.18	3.41	11.80	3.96	36.31	16.04	3.64
CH(Control)	13.55	3.56	40.67	17.61	3.63	13.51	4.24	38.18	18.51	3.82
L.S.D at0.05	1.1	0.03	2.38	0.94	0.25	1.3	0.07	2.51	0.73	0.47

1- RP+P+E=Rock Phosphate at rate of 150kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \ fed.

2- RP+P+EM=Rock Phosphate at rate of 150 kg\ fed. +Phosphorein at rate of 4 letter\ fed. +Effect Microorganisms at rate of 4 letter \ fed.

3- Rk+ P+ E=Rock Potassium at rate of 150 kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \ fed.

4- RK+P+E=Rock Phosphate at rate of 150kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Effect Microorganisms at rate of 4 letter \ fed.

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8- MSP+ EM= Mono Super Phosphate at rate of 150kg\fed.+ Effect Microorganisms at rate of4 letter \fed.

9- Control = Chicken manure at rate of ($20m^3$/ fed.)

The lowest amount of chemical compositions were detected at rock Phosphate at a rate of 150 kg\ fed. +Phosphorein at rate of 4 letter\ fed. +effect microorganisms at rate of 4 letter \ fed.

5- Yield and its components.

Data of effect of different natural fertilizers , microorganisms and Enciabein on yield and its components (early, total yields per plant, average fruit weight and total yield per fed. were presented in Table (6) .The data showed significant differences between treatments in the two studied seasons .Application of rock potassium at rate of 150 kg\ fed. +phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \ feddan gave significantly greater early and total yield per plant (average fruit weight and number of fruits per plant) compared with the other treatments. These results were agreement with those of Hasanein, and Kabeel (2006) on potato plants.

Table (6): Effect of natural fertilizers and Enciabein (slow release Nitrogen fertilizers) on yield and its components of tomato plants grown under plastic house conditions

Treatments	season 2008					Season 2009				
	Early yield kg\plant	Total yield kg\plant	No. of fruit \plant	Average fruit weight (g)	Total yield ton\fed.	Early yield kg\plant	Total yield kg\plant	No. of fruit \plant	Average fruit weight (g)	Total yield ton\fed.
RP+P+E	1.41	9.37	60.9	149.2	38.89	1.38	9.44	65.3	144.6	39.18
RP+P+EM	1.31	8.94	55.8	140.0	37.10	1.27	7.54	58.7	128.5	31.29
RK+P+E	1.63	11.57	71.2	162.5	48.02	1.55	12.51	74.5	167.9	51.92
RK+P+EM	1.49	9.52	64.5	152.4	39.51	1.46	10.15	67.2	151.1	42.12
MSP+P+E	1.14	8.48	48.7	125.6	35.19	1.11	5.55	50.6	109.7	23.03
MSP+P+EM	1.54	9.65	67.0	157.1	40.05	1.22	11.1	70.1	158.3	46.07
MSP+E	1.26	8.70	53.2	136.9	36.11	1.22	6.77	55.4	122.2	28.10
MSP+EM	1.20	8.59	50.4	131.8	35.65	1.18	6.39	53.8	118.2	26.52
CH(Control)	1.37	9.19	58.1	144.7	38.14	1.32	8.38	61.9	135.4	34.78
L.S.D at0.05	N.S	0.24	2.7	6.2	2.03	N.S	0.31	1.9	4.7	1.18

1- RP+P+E=Rock Phosphate at rate of 150kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \ fed.
2- RP+P+EM=Rock Phosphate at rate of 150 kg\ fed. +Phosphorein at rate of 4 letter\ fed. +Effect Microorganisms at rate of 4 letter \ fed.
3- Rk+ P+ E=Rock Potassium at rate of 150 kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \ fed.
4- RK+P+E=Rock Phosphate at rate of 150kg\ fed. +Phosphorein at rate of 4 letter\ fed. + Effect Microorganisms at rate of 4 letter \ fed.
5- MSP+P+E= Mono Super Phosphate at rate of 150kg\fed.+ Phosphorein at rate of 4 letter\ fed. + Enciabein at rate of 80 unit N \fed.
6- MSP+P+EM= Mono Super Phosphate at rate of 150kg\fed.+ Phosphorein at rate of 4 letter\ fed. + Effect Microorganisms at rate of 4 letter \fed.
7- MSP+E=Mono Super Phosphate at rate of 150kg\fed.+Enciabein at rate of 80 unit N \fed.
8- MSP+ EM= Mono Super Phosphate at rate of 150kg\fed.+ Effect Microorganisms at rate of4 letter \fed.
9- Control = Chicken manure at rate of ($20m^3$/ fed.)

So, applying natural fertilizers , microorganisms and enciabein increased yield and its components of tomato crop .These increments were perhaps due to the low requirements of tomato plants to the soil nitrogen throughout the growth period. and the increase of the nutrient elements in the soil .This increase can encourage the plant growth, which increases the photosynthetic rates. Since rock phosphate in the long term improvement of their soil structure and increased productivity crops without negative effects on the environmental (*Akintokum et al (2003)* . Direct application of phosphate (rock phosphate) and potassium (feldspars enriched rock) material may be agronomical more useful and environmental more feasible than soluble P and K *Sheng and Huang (2002)* . Similar results have been found by,*Shahaby (1981), Kumaraswany and Madalageri (1990), Shahaby et al (1993) ,Vapin and Kapulink (1994) Terry et al (1995)* , *Awad (1998) Gweyi et al (2010)*and *Nadia Gad and Hala Kandil (2010)* they working on tomato plants.

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تاثير الأسمدة الطبيعية والانسيابين (سماد نتروجينى بطئ التحلل) والمخصبات الحيوية على إنتاج الطماطم تحت ظروف الصوب.

نظير محمد حسنين

قسم بحوث الزراعات المحمية (بحوث الخضر) – معهد بحوث البساتين–

مركز البحوث الزراعية– الجيزة.

الملخص العربي

أجريت هذه الدراسة فى عامي ٢٠٠٨/٢٠٠٩ و ٢٠٠٩/٢٠١٠ فى محطة بحوث الخضر بقها محافظة القليوبية لدراسة زيادة إنتاجية محصول الطماطم من خلال الأسمدة الطبيعية والاسمدة بطيئة التحلل باستخدام السماد النتروجينى بطئ التحلل الأنسيابين والمعلق البكتيري EM بالإضافة الى الكنترول (سماد الدواجن بمعدل ٢٠ م^{٣} للفدان) وكانت المعاملات هي

١- صخر الفوسفات بمعدل ١٥٠ كجم للفدان+ فوسفورين بمعدل ٤ لتر لكل فدان + انسيابين بمعدل ٨٠ وحدة نتروجين لكل فدان.

٢- صخر الفوسفات بمعدل١٥٠ كجم للفدان + فوسفورين بمعدل ٤ لتر لكل فدان + المعلق البكتيري E M بمعدل ٤ لتر لكل فدان .

٣- صخر البوتاسيوم بمعدل١٥٠ كجم للفدان + فوسفورين بمعدل ٤ لتر لكل فدان + انسيابين بمعدل ٨٠ وحدة نتروجين لكل فدان.

٤- صخر البوتاسيوم بمعدل١٥٠ كجم للفدان + فوسفورين بمعدل ٤ لتر لكل فدان + المعلق البكتيري E M بمعدل ٤ لتر لكل فدان .

٥- مونو سوبر فوسفات بمعدل ١٥٠ كجم لكل فدان + فوسفورين بمعدل ٤ لتر لكل فدان + انسيابين بمعدل ٨٠ وحدة نتروجين لكل فدان.

٦- مونو سوبر فوسفات بمعدل ١٥٠ كجم لكل فدان + فوسفورين بمعدل ٤ لتر لكل فدان + المعلق البكتيري E M بمعدل ٤ لتر لكل فدان.

٧- مونو سوبر فوسفات بمعدل ١٥٠ كجم لكل فدان + انسيابين بمعدل ٨٠ وحدة نتروجين لكل فدان.

٨- مونو سوبر فوسفات بمعدل ١٥٠ كجم لكل فدان + المعلق البكتيري E M بمعدل ٤ لتر لكل فدان.

٩- سماد الدواجن بمعدل ٢٠ م^{٣} للفدان (كنترول).

واهم النتائج المتحصل عليها :-

١- استعمال مونو سوبر فوسفات بمعدل ١٥٠ كجم للفدان + فوسفورين بمعدل ٤ لتر للفدان + انسيابين بمعدل ٨٠ وحدة نتروجين للفدان. أعطى أعلى نمو خضرى (طول النبات - مساحة الورقة- عدد الاوراق والوزن الطازج والجاف لكل من الاوراق والسيقان) بينما استخدام صخر الفوسفات بمعدل ١٥٠ كجم للفدان + فوسفورين بمعدل ٤ لتر لكل فدان + المعلق البكتيري E M بمعدل ٤ لتر لكل فدان .اعطى اقل نمو خضرى لنباتات الطماطم.

٢- استخدام مونو سوبر فوسفات بمعدل ١٥٠ كجم للفدان + فوسفورين بمعدل ٤ لتر للفدان + انسيابين بمعدل ٨٠ وحدة نتروجين لكل فدان. أدى الى الحصول على أعلى تركيز من العناصر الكبرى NPK وبعض العناصر الصغرى مثل Fe ;Mn فى نباتات الطماطم.

٣- ادى استخدام صخر البوتاسيوم بمعدل١٥٠ كجم للفدان + فوسفورين بمعدل ٤ لتر للفدان + انسيابين بمعدل ٨٠ وحدة نتروجين للفدان. الى زيادة الصفات الطبيعية مثل طول وقطر الثمرة بينما ادى استخدام مونو سوبر فوسفات بمعدل ١٥٠ كجم لكل فدان + فوسفورين بمعدل ٤ لتر لكل فدان + انسيابين بمعدل ٨٠ وحدة نتروجين لكل فدان. الى زيادة الصفات الكيميائية مثل حمض الاسكوربيك والكلوروفيل والمادة الجافة والحموضة الكلية معنويا عن باقي المعاملات والكنترول.

٤- كان أعلى محصول كلى (١١.٥٧) كجم لكل نبات ومحصول مبكر(١.٦٣ كجم / نبات) ومتوسط وزن الثمرة ١٦٢.٥ جرام والمحصول الكلى (٤٨.٠٢ طن / فدان)عند إضافة صخر البوتاسيوم بمعدل ١٥٠ كجم للفدان + فوسفورين بمعدل ٤ لتر لكل فدان + انسيابين بمعدل ٨٠ وحدة نتروجين لكل فدان. وكان اقل محصول ومكوناته عندما تم إضافة مونو سوبر فوسفات بمعدل ١٥٠ كجم لكل فدان + فوسفورين بمعدل ٤ لتر لكل فدان + انسيابين بمعدل ٨٠ وحدة نتروجين لكل فدان.

تاثير الأسمدة الطبيعية والانسيابين (سماد نتروجينى بطئ التحلل) والمخصبات الحيوية على إنتاج الطماطم تحت ظروف الصوب.

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قسم بحوث الزراعات المحمية (بحوث الخضر) – معهد بحوث البساتين–

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أجريت هذه الدراسة فى عامي ٢٠٠٨/٢٠٠٩ و ٢٠٠٩/٢٠١٠ فى محطة بحوث الخضر بقها محافظة القليوبية لدراسة زيادة إنتاجية محصول الطماطم من خلال الأسمدة الطبيعية والاسمدة بطيئة التحلل باستخدام السماد النتروجينى بطئ التحلل الأنسيابين والمعلق البكتيري EM بالإضافة الى الكنترول (سماد الدواجن بمعدل ٢٠ م^{٣} للفدان) وكانت المعاملات هي

١٠–صخر الفوسفات بمعدل ١٥٠ كجم للفدان+ فوسفورين بمعدل ٤ لتر لكل فدان + انسيابين بمعدل ٨٠ وحدة نتروجين لكل فدان.

١١–صخر الفوسفات بمعدل١٥٠ كجم للفدان + فوسفورين بمعدل ٤ لتر لكل فدان + المعلق البكتيري E M بمعدل ٤ لتر لكل فدان .

١٢–صخر البوتاسيوم بمعدل١٥٠ كجم للفدان + فوسفورين بمعدل ٤ لتر لكل فدان + انسيابين بمعدل ٨٠ وحدة نتروجين لكل فدان.

١٣–صخر البوتاسيوم بمعدل١٥٠ كجم للفدان + فوسفورين بمعدل ٤ لتر لكل فدان + المعلق البكتيري E M بمعدل ٤ لتر لكل فدان .

١٤–مونو سوبر فوسفات بمعدل ١٥٠ كجم لكل فدان + فوسفورين بمعدل ٤ لتر لكل فدان + انسيابين بمعدل ٨٠ وحدة نتروجين لكل فدان.

١٥–مونو سوبر فوسفات بمعدل ١٥٠ كجم لكل فدان + فوسفورين بمعدل ٤ لتر لكل فدان + المعلق البكتيري E M بمعدل ٤ لتر لكل فدان.

١٦–مونو سوبر فوسفات بمعدل ١٥٠ كجم لكل فدان + انسيابين بمعدل ٨٠ وحدة نتروجين لكل فدان.

١٧-مونو سوبر فوسفات بمعدل ١٥٠ كجم لكل فدان + المعلق البكتيري E M بمعدل ٤ لتر لكل فدان.

١٨-سماد الدواجن بمعدل ٢٠ م^{٣} للفدان (كنترول).

واهم النتائج المتحصل عليها :-

٥- استعمال مونو سوبر فوسفات بمعدل ١٥٠ كجم للفدان + فوسفورين بمعدل ٤ لتر للفدان + انسيابين بمعدل ٨٠ وحدة نتروجين للفدان. أعطى أعلى نمو خضرى (طول النبات - مساحة الورقة- عدد الاوراق والوزن الطازج والجاف لكل من الاوراق والسيقان) بينما استخدام صخر الفوسفات بمعدل ١٥٠ كجم للفدان + فوسفورين بمعدل ٤ لتر لكل فدان + المعلق البكتيري E M بمعدل ٤ لتر لكل فدان .اعطى اقل نمو خضرى لنباتات الطماطم.

٦- استخدام مونو سوبر فوسفات بمعدل ١٥٠ كجم للفدان + فوسفورين بمعدل ٤ لتر للفدان + انسيابين بمعدل ٨٠ وحدة نتروجين لكل فدان. أدى الى الحصول على أعلى تركيز من العناصر الكبرى NPK وبعض العناصر الصغرى مثل Fe ;Mn فى نباتات الطماطم.

٧- ادى استخدام صخر البوتاسيوم بمعدل١٥٠ كجم للفدان + فوسفورين بمعدل ٤ لتر للفدان + انسيابين بمعدل ٨٠ وحدة نتروجين للفدان. الى زيادة الصفات الطبيعية مثل طول وقطر الثمرة بينما ادى استخدام مونو سوبر فوسفات بمعدل ١٥٠ كجم لكل فدان + فوسفورين بمعدل ٤ لتر لكل فدان + انسيابين بمعدل ٨٠ وحدة نتروجين لكل فدان. الى زيادة الصفات الكيميائية مثل حمض الاسكوربيك والكلوروفيل والمادة الجافة والحموضة الكلية معنويا عن باقي المعاملات والكنترول.

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