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EFFECT OF SULPHUR AND PHOSPHORUS ON SOME EGGPLANT CULTIVARS UNDER CALCAREOUS SOIL CONDITIONS

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ABSTRACT

This experiment was carried out in the summer of 1996 and 1997 in Maryout Experimental Station (D.R.C) . The study aimed to investigate the effect of sulphur and phosphorus on some eggplant cultivars under calcareous soil conditions.Sulphur was applied to the soil at the rates of 500 and 1000 Kg /fed., whereas orthophosphoric acid was applied as foliar spray with concentrations of 0.2% and 0.4% . The interaction between the previous treatments in addition to control treatment was also investigated . Growth characters, total yield, dry matter (%) and mineral content of some eggplant cultivars , *i.e.*, Rumy , Black Balady and White Balady were recorded .

Obtained results can be summarized as follows: The application of sulphur at rate of one ton/fed. in combination with 0.2% orthophosphoric acid treatment gave the best results in growth characters , total yield , dry matter (%) and mineral content(N,K and Fe) of eggplant. P content increased with treatments including orthophosphoric acid application alone or combined with sulphur addition. Regarding cultivar effect , Rumy produced the heaviest fruit weight and total yield/fed. , while Black Balady had the tallest main stem, the largest number of branches and fruits per plant as well as the highest dry matter and mineral content of fruits. White Balady cultivar matured earlier than the other two cultivars.

Key words: *calcareous soil, cultivars , eggplant, phosphorus, Sulphor.*

1. INTRODUCTION

Eggplant production on calcareous soils faces an important problem that may find solution. Such calcareous soils are high in pH and cause a decrease in availability of most nutrients to plants due to soil fixation (Hassan, 1984). Several investigators studied the importance of sulphur addition to such soils, which tranforms by soil micro organisms to sulphuric acid and reduces pH of soil and improves its properties as well as increases the availability of most nutrients and compounds to plants (Aulakh and Pasricha, 1986 and Hilal and Abd-El-Fattah, 1987). Sulphur addition was found also to improve productivity of plants (Anonymous, 1986) and increase uptake of sulphur and other nutrients like N,P,K, Fe,Mn and Zn by plants (Savvas and Lenz, 1995 and Hegde, 1997).

Phosphorus is very important to plants as a constituent of nucleic acids, phospholipids and ATP. Also phosphorus activates amino acids to synthesise protien (Devlin and Witham ,1972). Kazim *et al.,* (1978) showed that tomato grown on a calcareous soil was little affected by soil addition of Ca $(H_2PO_4)_2$. On the other hand, spraying plants with 0.25% P had a significant effect on seed yield/fed. of cowpea (Barsoum *et al.,* 1990). Hendrix (1967) and Mengel and Kirkby (1978) found that bean plants at soil pH 4 absorbed phosphate ten times higher than those at pH 8.7. Also Glass (1988) indicated that phosphate in plant occurs in inorganic form as orthophosphate.

Many investigators reported that growth and yield of field crops positively responded to foliar spray with nutrient solution (Herbert and Dougherty, 1978 and Neuman and Giskim, 1979).

The aim of this work was to study the effect of sulphur as soil addition as well as orthophosphoric acid as foliar spray on growth parameters, total yield ,dry matter (%) and mineral content of some cultivars of eggplant under calcareous soil conditions.

2. MATERIALS AND METHODS

Two field experiments were conducted at the Desert Research Center, Maryout Experimental Station, Alexandria Govern-

orate, during two successive seasons (1996 and 1997), to study the effect of sulphur application as soil addition at rates of 500 and 1000 Kg/fed. , orthophosphoric acid application as foliar spray with concentrations of 0.2% and 0.4% and combinations between soil addition and foliar spray treatments at the same previous rates in addition to control treatment on eggplant (*Solanum melongena var. esculenta*). The cultivars under study were : Rumy , Black Balady and White Balady.

The seeds were sown on Feb. 15 and 22 of the two growing seasons respectively and the seedlings were transplanted to the field 60 days after sowing. The experimental unit was 1/400 / fed. (10.5 m^2) divided into three ridges of one meter width and 3.5m. length. The seedlings were set 50cm apart. Agricultural sulphur treatments were added to the soil , for each season separately , two months before transplanting and covered with thin layer of soil and irrigated by flow irrigation. Orthophosphoric acid was foliary sprayed 3,6 and 9 weeks after transplanting. NPK were added to the field at the rate of 400:300:200 Kg./fed. as ammonium sulphate (20.5% N), calcium super phosphate (15.5% P_2O) and potassium sulphate (48% K_2O) respectively. The quantity of ammonium sulphate and potassium sulphate was divided into two equal parts and was added to the soil 3 and 6 weeks after transplanting , while calcium super phosphate was applied to the soil 15 days before transplanting.

The statistical design of the experiment was split-plot according to Snedecor (1966). Cultivars were randomly arranged in the main plots whereas the treatments were randomly distributed in sub-plots with four replicates for each treatment.

Mechanical and chemical analysis of the soil according to Piper (1950) and Jackson (1958) is shown below.

Organic manure was applied one month before transplanting to the soil at a rate 25 m^2 / fed.

Mechanical analysis

Particle size distribution (%)					Texture
Coarse sand	Fine sand	Silt	Clay	CaCO3	Calcareous sandy clay loam
2.6	38.7	33.5	25.5	32.7	

Chemical analysis

E.C	pH	C.E.C	O.M.	N Total	P Ex.	Zn T.	Zn Ex.	Mn T.	Mn Ex.
mmhos/cm		meq/100g.	%	ppm	ppm	ppm	ppm	ppm	ppm
7.6	8.6	18	0.6	70	15	1.5	78	70	0.15

Data were recorded on the following characters:

I- Growth characters after 60 days from transplanting.

1- Plant height (cm).

2- Number of branches / plant.

II- Plant productivity after three months from transplanting.

1- Number of fruits / plant.

2- Fresh weight of fruit (gm.).

III- Yield (ton / feddan): calculated after 2.5-4.5 months from transplanting.

IV- Fruit dry matter (%).

V- Fruit mineral content (were estimated in fruits after 3 months from transplanting using the wet ashing procedure for the dry powdered samples).

1- Total nitrogen determined according to the method described by Huphries (1965).

2- Phosphorus was determined by the method of Frie *et al.*, (1964).

3- Potassium was measured by the method of Brown and Lilliland (1964).

4-Ferrous was determined using Atomic Absorption Spectrophotometer "Pye Unicum sp, 1900".

3. RESULTS AND DISCUSSION

3.1 Plant height and the number of branches per plant

Data recorded in Table (1) show that plant height and the number of branches per plant of the three cultivars under study significantly differed. Black Balady cultivar proved to be the tallest and produced the largest number of branches than Rumy and White Balady cultivars. These results agree with Agwah and El-Sayed (1994).

Table (1) Effect of sulphur and phosphorus application on plant height (cm) and no. of branches/plant of eggplant cultivars under calcareous soil conditions.

Cultivar / Treat.	Plant height (cm)								No. of branches / plant							
	1996				*1997*				*1996*				*1997*			
	Rumy	Black Balady	White Balady	X̄	Rumy	Black Balady	White Balady	X̄	Rumy	Black Balady	White Balady	X̄	Rumy	Black Balady	White Balady	X̄
Cont.	64.2	69.3	60.0	**64.5**	64.8	**69.1**	59.0	**64.3**	6.8	7.1	6.4	**6.8**	6.6	7.0	6.4	**6.7**
S_1	68.7	72.1	65.7	**68.8**	68.7	**71.6**	66.6	**68.9**	7.0	7.4	6.8	**7.1**	7.0	7.3	6.9	**7.1**
S_2	70.5	76.2	67.3	**71.3**	71.9	**76.7**	68.9	**72.5**	7.2	7.6	7.0	**7.3**	7.3	7.8	7.1	**7.4**
P_1	64.5	68.3	60.7	**64.5**	65.7	**68.6**	61.3	**65.2**	6.9	7.0	6.3	**6.7**	6.7	6.9	6.4	**6.7**
P_2	68.2	69.2	63.9	**67.1**	68.2	**70.1**	62.1	**66.8**	7.0	7.1	6.8	**7.0**	6.8	7.1	6.8	**6.9**
S_1+ P_1	66.1	69.0	63.1	**66.1**	66.9	**70.0**	64.0	**66.9**	7.1	7.2	6.8	**7.0**	6.9	7.2	6.9	**7.0**
S_1+P_2	67.1	71.9	65.0	**68.0**	69.2	**72.6**	66.5	**69.4**	7.1	7.3	6.9	**7.1**	7.0	7.6	6.9	**7.2**
S_2+P_1	73.1	79.2	69.7	**74.0**	75.4	**80.7**	71.0	**75.7**	7.6	7.9	7.2	**7.6**	7.6	8.1	7.4	**7.7**
S_2+ P_2	68.6	77.3	65.5	**70.5**	70.2	**75.6**	68.4	**71.4**	7.3	7.5	7.1	**7.3**	7.2	7.7	7.1	**7.3**
Mean	**67.9**	**72.5**	**64.5**		**69.0**	**72.8**	**65.3**		**7.1**	**7.3**	**6.8**		**7.0**	7.4	**6.9**	
L. S. D at 0.05 for: cultivar			2.01			1.57				0.23				0.12		
treat.			2.01			2.33				0.27				0.21		
C. X T.			N. S			N. S				N. S				N. S		

S_1 , S_2 refer to sulphur application at 500 Kg and one ton / fed. ,respectively , and P_1 , P_2 refer to orthophosphoric acid at 0.2 and 0.4% foliar spray ,respectively.

Results also revealed that sulphur addition at the rate of one ton/fed. combined with 0.2% orthophosphoric acid followed by sulphur application treatment at the rate of one ton/fed. gave the tallest and the largest number of branches per plant in the two growing seasons. These results agree with those obtained by El-Leboudi *et al.*, (1984) on tomato crop. This may be due to the role of sulphur in reduction of soil pH and increased nutrients availability to plants and consequent increase in plant growth (Aulakh and Pasricha, 1986 and Hilal and Abd El-Fattah, (1987). Also, the effect of orthophosphoric acid application on plants agree with Barsoum *et al.*, (1990) who indicated that phosphorus, as foliar spray in concentration 0.25% activates growth of plants.

3.2. Number of fruits / plant and fruit weight

Data presented in Table (2) indicated that Black Balady cultivar gave significantly the highest number of fruits / plant , followed by White Balady , while Rumy cultivar surpassed significantly the other two cultivars in fruit weight. These results are true in the two growing seasons and agree with those obtained by Agamia (1972) and Agwah and El-Sayed (1994).

As regard to sulphur effect ,its application at the rate of one ton / fed. with or without 0.2% or 0.4% orthophosphoric acid gave the highest values of the number of fruits per plant and fruit weight (gm.). The interaction between cultivars and treatments showed that the previously mentioned treatments are the best treatments in the three cultivars under study (Rumy , Black Balady and White Balady). These results are in the same line with those obtained by Aulakh and Pasricha , 1986 ; Hilal and Abd El-Fattah, 1987 and Barsoum *et al.*, 1990. This may be due to the effect of sulphur on improving productivity of plants (Anonymous, 1986) , also phosphorus enhances growth and production of vegetables because it is a constituent of nucleic acids, phospholipids and ATP (Devlin and Witham, 1972).

3.3. Total yield and dry matter

It could be observed from Table (3) that Rumy cultivar significantly surpassed other cultivars in total yield / fed. in the two growing seasons. On the other hand, dry matter percentage of Black and White Balady fruits was significantly higher than Rumy cultivar.

Table (2):Effect of sulphur and phosphorus application on no. of fruits/plant and fruit weight (gm.) of eggplant cultivars under calcareous soil conditions.

Cultivar / Treat.	No. of fruits / plant								Fruit weight (gm.)							
	1996				*1997*				*1996*				*1997*			
	Rumy	Black Balady	White Balady	X̄	Rumy	Black Balady	White Balady	X̄	Rumy	Black Balady	White Balady	X̄	Rumy	Black Balady	White Balady	X̄
Cont.	4.0	7.3	6.3	**5.9**	4.1	7.1	6.5	**5.9**	160.7	072.8	063.8	**099.1**	171.5	075.4	069.0	**105.3**
S_1	4.5	7.8	6.7	**6.3**	4.4	8.4	6.9	**6.6**	200.9	082.1	084.7	**122.6**	192.6	103.4	093.1	**129.7**
S_2	4.7	8.6	6.9	**6.7**	4.6	8.9	7.1	**6.9**	219.2	104.9	101.2	**141.8**	224.2	118.5	113.3	**152.0**
P_1	4.1	7.3	6.4	**5.9**	4.0	7.2	6.6	**5.9**	170.1	075.2	068.4	**104.6**	175.3	088.1	070.1	**111.2**
P_2	4.2	7.5	6.6	**6.1**	4.2	7.5	6.8	**6.2**	176.0	078.8	073.6	**109.5**	184.9	094.7	079.0	**119.5**
S_1+P_1	4.5	7.5	6.6	**6.2**	4.3	8.1	6.9	**6.4**	195.0	088.4	081.7	**121.7**	187.3	094.5	089.7	**123.8**
S_1+P_2	4.5	8.1	6.7	**6.4**	4.4	8.6	7.0	**6.7**	199.4	090.3	085.8	**125.2**	194.4	102.5	094.5	**130.5**
S_2+P_1	4.8	9.1	7.0	**7.0**	4.8	9.1	7.4	**7.1**	231.2	121.0	113.7	**155.3**	230.2	122.3	115.1	**155.9**
S_2+P_2	4.6	8.8	6.9	**6.8**	4.6	8.7	7.1	**6.8**	218.1	115.5	105.5	**146.4**	224.0	113.7	111.4	**149.7**
Mean	**4.4**	**8.0**	**6.7**		**4.4**	**8.2**	**6.9**		**96.7**	**092.1**	**086.4**		**198.2**	**101.4**	**092.8**	

L. S. D at 0.05 for:	cultivar	0.22	0.18	9.04	8.59
	treat.	0.15	0.13	4.72	6.74
	C. X T.	0.67	0.68	13.21	N. S

S_1 , S_2 refer to sulphur application at 500 Kg and one ton / fed. ,respectively , and P_1 , P_2 refer to orthophosphoric acid at 0.2 and 0.4% foliar spray ,respectively.

Table (3) Effect of sulphur and phosphorus application on total yield (ton/ fed.) and fruit dry matter (%) of eggplant cultivars under calcareous soil conditions.

Cultivar / Treat.	Total yield (ton/ fed.)								Fruit dry matter (%)							
	1996				*1997*				*1996*				*1997*			
	Rumy	Black Balady	White Balady	X̄	Rumy	Black Balady	White Balady	X̄	Rumy	Black Balady	White Balady	X̄	Rumy	Black Balady	White Balady	X̄
Cont.	12.68	10.30	9.75	**10.10**	**13.31**	11.11	10.04	**11.49**	7.5	7.8	7.5	**7.6**	7.7	8.0	7.9	7.9
S1	13.40	13.20	12.27	**12.96**	14.55	12.80	12.96	**13.37**	7.9	8.1	7.8	**7.9**	8.1	8.5	8.6	**8.4**
S2	15.11	13.90	13.11	**14.03**	15.66	12.65	13.53	**14.28**	8.6	8.6	8.5	**8.6**	8.9	9.0	8.8	**8.9**
P1	12.79	10.50	10.16	**11.15**	13.94	11.18	11.09	**12.07**	7.6	7.7	7.6	**7.6**	7.5	8.0	8.1	7.9
P2	12.97	11.68	12.13	**12.26**	14.22	12.61	12.45	**13.09**	7.7	7.8	7.9	**7.8**	7.7	8.2	8.3	**8.1**
S1+ P1	13.07	13.16	12.11	**12.78**	15.31	12.51	12.80	**13.54**	7.8	8.2	7.8	**7.9**	8.1	8.5	8.5	**8.4**
S1+P2	13.61	13.06	12.31	**12.10**	15.33	12.73	13.00	**13.69**	8.1	8.3	8.4	**8.3**	8.1	8.4	8.5	**8.9**
S2+P1	15.59	13.86	13.27	**14.24**	16.00	14.11	13.66	**14.59**	8.6	8.8	8.7	**8.7**	8.9	9.2	8.9	**9.0**
S2+ P2	14.90	13.74	12.96	**13.87**	15.49	13.25	13.35	**14.03**	8.5	8.6	8.6	**8.6**	8.4	8.7	8.7	**8.5**
Mean	**13.79**	**12.60**	**12.07**		**14.87**	**12.66**	**12.52**		**8.0**	**8.2**	**8.1**		**8.2**	**8.5**	**8.5**	

L. S. D at 0.05 for:	cultivar	0.35	0.27	0.10	0.09
	treat.	0.40	0.36	0.13	0.15
	C. X T.	1.243	0.775	N.S	0.34

S_1 , S_2 refer to sulphur application at 500 Kg and one ton / fed. ,respectively , and P_1 , P_2 refer to orthophosphoric acid at 0.2 and 0.4% foliar spray ,respectively.

These results go along with those obtained by Agwah and El-Sayed (1994). Sulphur application at rate of one ton /fed. combined with 0.2% orthophosphoric acid followed by sulphur addition separately at rate of one ton/fed. gave the highest yield /fed. as well as fruits dry matter content (%).

The positive effect of the interaction between sulphur application at the rate of one ton/ fed. and phosphoric acid spray at concentration 0.2% may be due to the rate of sulphur and the role of phosphorus together in improving yield and the dry matter content of plants. This result agrees in the three cultivars under study. The role of sulphur was stressed by Anonymous (1986) who found that sulphur application improves productivity of plants. Also, Savvas and Lenz (1995) and Hegde (1997) showed that sulphur increases dry matter content by increaseing the uptake of nutrients as a result of decrease in soil pH by sulphur addition.

The role of phosphorus in improving yield and dry matter content of plants is as a constituent of ATP and activates growth of plant and activates amino acids to synthesise protein (Devlin and Witham, 1972). Also, the importance of phosphorus application as foliar spray agrees with Herbert and Dougherty (1978) who showed that yield of field crops positively responded to foliar spray with nutrients solution.

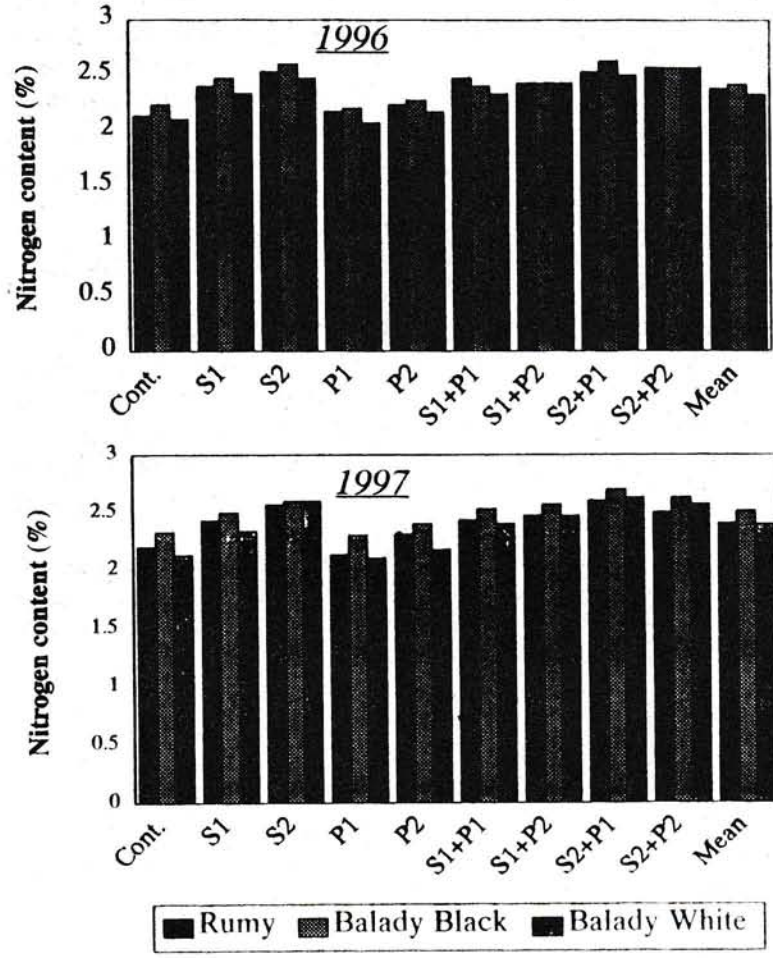
Kazim *et al.*, (1978) found that phosphate application as soil addition to calcareous soil had little effect on yield of tomato , while Barsoum *et al.*, (1990) showed that orthophosphoric acid spray in concentration 0.25% increased yield of cowpea.

The interaction treatment , sulphur (ton/ fed.) + phosphoric acid (0.2%) , surpassed the treatment sulphur (ton/ fed.) + phosphoric acid (0.4%) in yield and dry matter (%). These results agree with Barkas (1981) who reported that sulphur application increased yield and protein content of beans . Also, sulphur application with P at low concentration increases yield and protein content, but with increasing P concentration + S application decrease yield and protein content of bean.

3.4. Mineral content

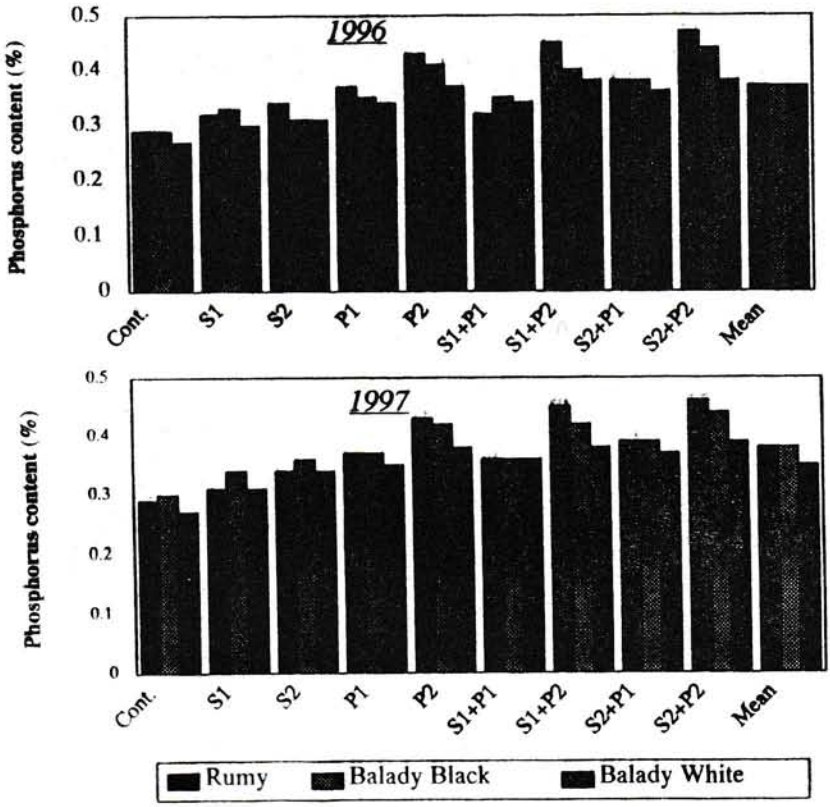
Data in (Figs 1-4) showed that the total nitrogen, phosphorus and ferrous content of eggplant fruits increased significantly in Black

Fig. (1) Effect of sulphur and phosphorus application on nitrogen content (%) in fruits of eggplant cultivars under calcareous soil conditions.



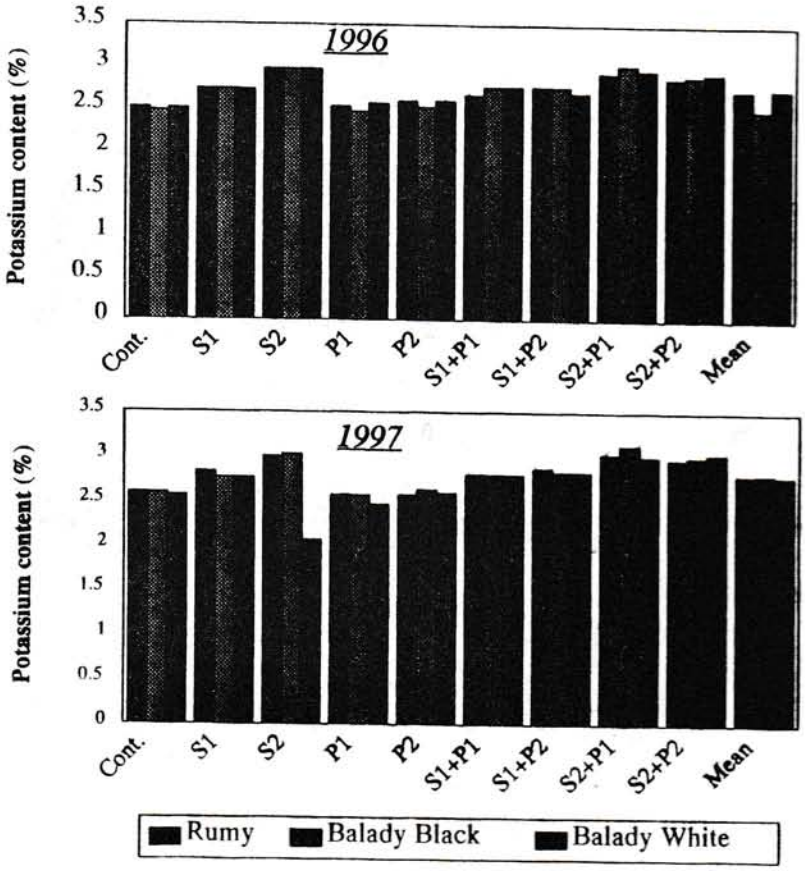
Season		1996	1997
L. S. D at 0.05 for:	cultivar	0.05	0.08
	treat.	0.08	0.07
	C. X T.	N.S	N.S

Fig. (2) Effect of sulphur and phosphorus application on phosphorus content (%) in fruits of eggplant cultivars under calcareous soil conditions.



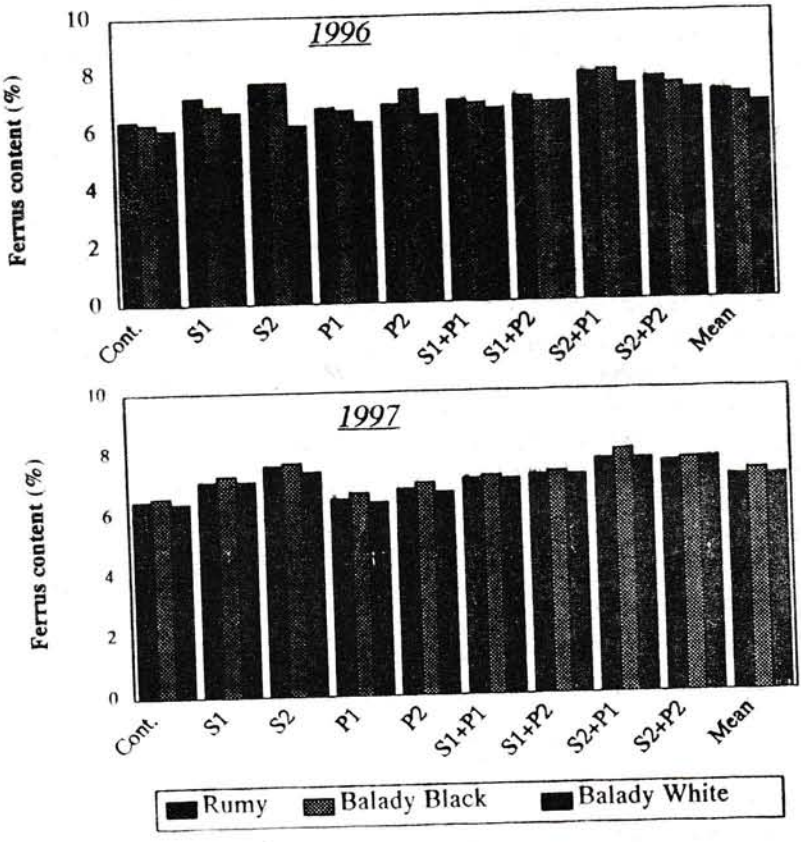
Season	1996	1997
L. S. D at 0.05 for: cultivar	0.011	0.013
treat.	0.014	0.010
C. X T.	3.960	2.086

Fig. (3) Effect of sulphur and phosphorus application on potassium content (%) in fruits of eggplant cultivars under calcareous soil conditions.



Season	1996	1997
L. S. D at 0.05 for: cultivar	N.S	N.S
treat.	0.076	0.088
C. X T.	N.S	N.S

Fig. (4) Effect of sulphur and phosphorus application on ferrus content (%) in fruits of eggplant cultivars under calcareous soil conditions.



Season	1996	1997
L. S. D at 0.05 for: cultivar	0.081	0.125
treat.	0.185	0.106
C. X T.	N.S	N.S

Baldy than the other two cultivars in the two growing seasons, while potassium content showed no significant differences between fruits of the cultivars under study.

Results also revealed significant differences between treatments under study. Sulphur application at the rate of one ton/fed. combined with or without 0.2% orthophosphoric acid spray gave the highest uptake and content of minerals in eggplant fruits. Also, orthophosphoric acid application as foliar spray increased phosphorus content in fruits.

These results agree with those obtained by Savvas and Lenz (1995) and Hegde (1997). They indicated that sulphur application increased nutrients uptake and content like N, P, K , Fe, Zn and Mn. The favourable effect of sulphur may be due to decreasing pH of soil and increasing nutrients uptake and availability to plants (Hendrix ,1967 and Mengel and Kirkby ,1978). Also El-Leboudi *et al.*,(1984) and Abd El-Fattah *et al.*, (1992) found that sulphur addition increased availability of nutrients and caused rapid conversion of nutrients into organic ulphur compounds. The effect of phosphorus application on mineral content of plants agrees with those obtained by Doikova (1979) , Barkas (1981) and Barsoum *et al.*, (1990). This may be due to the fact that phosphorus spray on plants enhances its content in plants and activates the uptake of Fe and activates amino acids to synthesize protein (Devlin and Witham, 1972).

The superiorty of interaction treatment between sulphur application at the rate ton/ fed. with orthophosphoric acid foliar spray at concentration 0.2% is due to the favourable effect of sulphur and phosphorus in nutrients uptake as mentioned before.

4. REFFERENCES

Abd El-Fattah M. A. , Taha E. M. , Abdel Salam A. S. and Fouad H. A. (1992). Effect of sulphur application on growth , mineral composition and yield of garlic plants grown under calcarious soil conditions. 17th International congress for Statistics, Computer Science. Scientific and Social Applications.

Agamia E. H. A. (1972). Studies on some characters in eggplant. M. Sc. Thesis , Fac. of Agric. Cairo Univ. 181 pp.

Agwah E. M. R. and El-Sayed F. (1994). Studies on productivity and quality of some eggplant hybrids. Fayoum J. Agric. Res. & Dev. Vol. 8 , No. 2.

Anonymous (1986). Potassium sulphate and vegetable production. International Fertilizer correspondent XXVII No. 4.

Aulakh M. S. and Pasricha N. S. (1986). Role of sulphur in the production of the grain legumes. Fertilizer News , 31 (9) :31-35.

Barkas Th. D. (1981). Interaction effects of sulphur and phosphorus on yield , qualitative condition and nutrient content of bean (*Phaseolus vulgaris* L.). Ponhellenic Congress of Geo technical Research 148.

Barsoum M. S. , Hassan H. Kh. , Abd El-Gawad M. A. and El-Gayar M. A. (1990). Response of cowpea to foliar application of some macro and micronutrients under calcareous soil. Proc. 4 th Conf. Agron., Cairo 15-16. 11 :313-323.

Brown J. D.and Lilliland O. (1964). Rapid determination of potassium and sodium in plant material and soil extracts by flame photometer. Proc. Amer. Soc. Hort. Sci., 48 :341-346.

Devlin R. M. and Witham F. H. (1972). Functions of essential mineral elements and symptoms of mineral deficiency. Wilard Grant Press, Boston P. 140 (577 pages).

Doikova M. (1979). Nutrient uptake by eggplants. Fiziologiya na Rasteniyata. 5 (3) 72-77 , Bulgaria (C. F. Hort. Abstr. 50, 7159, 1980).

El-Leboudi A. E. ,Foda M. S., Taha E. M. and Abd El-Mouti Z. (1984). Application of sulphur and hydratéd lime as a practice for improvement of nutrient status and yield for some vegetable crops. Ninth International Congress for Statistics, Computer Sci., Social Demographic Res., 31 March - 10 April , 10 :333-357.

Frie E., Payer K. and Schultz E.(1964). Determination of phosphorus by ascorbic acid method. Schw-Landwirtsch - Forschung. Heft. 3 :318-328.

Glass A. D. M. (1988). Plant nutrition. Jones and Bartlett Publishers, Boston / Portola Valley.

Hassan F. A. (1984). Factors affecting boron status under saline and calcareous soil conditions. Ph. D. Thesis, Fac. of Agric. Zagazig Univ.

Hegde D. M. (1997). Nutrient requirements of solanaceous vegetable crops. Food and Technology Center, Bulletin 441, P. 9 , 37 ref..

Hendrix J. E.(1967). The effect of pH on the uptake and accumulation of phosphate and sulphate ions by bean plants. Amer. J. Bot. 54 :560-564.

Herbert S. J.and Dougherty C. T.(1978). Influence of irrigation and foliar feeding of N, P, K and S during seed filling in two lupine species N. J. Exp. Agric. 6 :39-42.

Hilal M. H. and Abd-El Fattah A. (1987). Effect of $CaCO_3$ and clay content of alkaline soils on their response to added sulphur. Sulphur in Agric. 11 :15-19.

Huphries E. C. (1965). Mineral components and ash analysis. In Modern Methods of Plant Analysis , Edited by K. Paech and M. V. Tracey , Vol. I , Suringerverlag , Berlin , P. 468.

Jackson M. L. (1958). Soil chemical analysis. Prentice - Hall Inc. Engle wood Cliffs N. J. Library of Congress U. S. A..

Kazim A. A. , Al-Juburi K. D. and Rawi A. K. (1978). The effect of application of sulphur byproducts and of phosphorus on the growth , yield and quality of some tomato cultivars grown under Hamam Al-Alil conditions. Mesopotamia J. of Agric. 13 :85-92. (c. f Hort. Abstr. 49 :5906 , 1979).

Mengel K. and Kirkby E. A. (1978). Principals of plant nutrition. Inter. Potash Inst. P. O. Box. Ch-3048 Worblaufan - Bern Switzerland.

Neuman P. M. and Giskim M. (1979). Late season foliar fertilization of beans with NPKS. Soil Sci. Plant Anal. 10 :579-589.

Piper C. S. (1950). Soils and Plant Analysis. InterScience Publishers Inc., New York.

Savvas D and Lenz F. (1995). Nutrient uptake by eggplant (*Solanum melongena* L.). Institute for Obstbau and Gemusebau der Univ. Bonn , Auf dem Hugel 6, 53121, Germany.

Snedecor G. W. (1966). Statistical methods. The Iowa state Univ. Press, Ame ., Iowa, USA, 5 th ed. P :534

تأثير إضافة الكبريت و الفوسفور على بعض أصناف الباذنجان تحت ظروف الأرض الجيرية

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ملخص

تم إجراء هذه التجربة فى الموسم الصيفى لسنة 1996، 1997 بمحطة تجارب مريوط (مركز بحوث الصحراء). لدراسة تأثير الكبريت والفوسفور على بعض أصناف الباذنجان تحت ظروف الأراضى الجيرية . وقد تم فيها استعمال الكبريت كإضافة أرضية بمعدلات 500 ، 1000 كجم/فدان ، بينما تمت إضافة حمض الأرثوفوسفوريك كرش ورقى بتركيز 0.2 ، 0.4 %. و قد تم دراسة تأثير هذه المعاملات على صفات النمو والمحصول الكلى ومحتوى بعض العناصر في أصناف الباذنجان (رومي ، بلدي أسود ، بلدي أبيض). وقد درس أيضاً التفاعل بين المعاملات السابقة بالإضافة إلى معاملة المقارنة. وقد تلخصت النتائج كالآتي:

- إن إضافة الكبريت بمعدل طن/ فدان + 0.2% حمض أرثوفوسفوريك أعطى أفضل النتائج من حيث صفات النمو والمحصول ومحتوى النيتروجين ، البوتاسيوم، والحديد بالثمار، بينما زاد محتوى الفوسفور في المعاملات المحتوية علىحمض الارثوفوسفوريك منفردة أو مع إضافة الكبريت. تفوق الصنف الرومي شفى متوسط وزن الثمرة وكمية المحصول للفدان، بينما تفوق الصنف البلدي الأسود في طول النبات وعدد الفروع وعدد الثمار للنبات ومحتوى العناصر ونسبة المادة الجافة ، في حين تميز الصنف البلدي الأبيض بالإنتاج المبكر عن الصنفين الآخرين.

وقد اتضح من الدراسة أن تأثير التفاعل بين استخدام الكبريت كإضافة أرضية بمعدل طن للفدان والفوسفور كرش ورقى بالمعدل المنخفض 0.2% كحمض أرثوفوسفوريك أعطى أفضل النتائج بالنسبة لصفات النمو ومحصول ثمار الباذنجان ومحتواها من العناصر تحت ظروف الأراضي الجيرية.

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