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PEA YIELD QUALITY AND NUTRIENT UPTAKE AS AFFECTED BY USING SOME NATURAL MATERIALS

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ABSTRACT

A pot experiments was conducted at Dekrnis city, Dakahlia Governorate during the winter season of (2013/ 2014); to investigate the effect of some natural materials as a fertilizer and its effects on crops quality, yield and nutrients uptake of pea (Pisum sativum) variety of "master B".

Nine treatments were arranged in a complete randomized blocks, which were the simple possible combinations among four treatments of some natural materials and two rates of application as follows (phosphate rock (100 and 200 kg.fed^{-1}), mineral sulfur ore (100 and 200 kg.fed^{-1}), potassium rock (100 and 200 kg.fed^{-1}) and feldspar (100 and 200 kg.fed^{-1}).

Each treatment was replicated three times. Thus the total number of replicates were twenty seven included 3 replicates of control for the season.

The obtained results could be summarized as follows:

- The mean values of yield (g.plant^{-1}), weight of 100 seeds (g), N, P, K % and its uptakes (mg.plant^{-1}) after 45 and 75 days from planting, N, P and K% and its uptake (mg.plant$^{-1)}$ by seeds of pea after harvest and seed quality as reducing sugar%, non-reducing sugar%, total sugar %, V.C (mg.100g^{-1}) and protein % after harvesting were significantly increased with using these natural materials. After harvesting, the plants gave the highest values with adding sulfur ore.
- The highest values of the mentioned parameters were obtained from 200 kg.fed^{-1} compared to the 100 kg.fed^{-1} and it had significant effect.
- Under any level of fertilization with some natural materials, pea plants were superior with increasing the values of all aforementioned traits than those obtained from the untreated plants. The highest values of yield (g.plant^{-1}), weight of 100 seeds (g), N, P, K % and its uptakes (mg.plant^{-1}) after 45 and 75 days from planting, N, P and K% and its uptake (mg.plant $^{-1}$) by seeds of pea after harvest and seed quality as reducing sugar%, non-reducing sugar%, total sugar %, V.C (mg.100g^{-1}) and protein % after harvesting were connected with treatments receiving 200 kg.fed^{-1} sulfur ore.

Keywords: Phosphate rock, Potassium rock, sulfur ore, Feldspar and pea plant.

INTRODUCTION

Pea (Pisum sativum L.) is one of the most important and popular legume vegetable crops grown in Egypt and many countries all over the world. It has many nutritional values such as high content of protein, carbohydrates, phosphorus, iron, calcium and vitamins A and B (Hassan, 1997). Increasing the production of peas green pods and dry seeds with high quality is considered an important aim and this aim could be achieved through using some natural materials as phosphate rock, sulfur ore, potassium rock and feldspar. In addition to its nutritional value (Baloch, 1994), it is rich source of protein, good source of vitamins A, B and C, and also contains a high proportion of minerals. Pea is used as a fresh vegetable, frozen or canned. According to FAO, 2004 data, about 12.2 million tonnes of

pea production were achieved in 6.3 million ha agricultural lands of the world with an average yield of 1930 kg/ha.

Some nutrient such as (K, P, and S) found in natural materials which present as elemental bearing rocks in many parts in the world. In Egypt these rocks i.e.: phosphate rock, feldspar rock, elemental sulfur ore, and potassium rock are spreads in many site in western and eastern desert. These rock contain amounts of nutrients differ from little to huge amount also are cheaper than mineral fertilizers and have less pollution effect for land and water resources.(Star,2014).

Phosphorous is one of the most important nutrients needed by legumes in large quantity but their response to applied fertilizer is many a time uncertain and low. The P requirement is in the range of 0.3-0.5 per cent of dry weight during the vegetative stage of the plant growth. Plants obtain their P in soluble ionic forms (HPO_4^{--} and $H_2PO_4^{-}$). The deficiency of P to the plants is wide spread due to its fixation in soil. Nearly 80 percent of applied P to the crop is fixed in the soil irrespective of soil pH because of adsorption, precipitation or conversion to the organic form and only 20 percent is available to the crop in a growing season. The low availability of P in the black soil limits plant uptake. Thus phosphorous is one of the least available mineral nutrients to the plants in many cropping environments based on its contribution to the biomass as a macro nutrient (Goldstein et al., 1998). Sub-optimal levels of P can lead to yield losses to the tune of 5-15 per cent of the maximal yields and attempts at amelioration of this situation by additional P fertilizer is becoming increasingly economically and ecologically unsound practice, as the price of the water soluble phosphate fertilizer is very high because of using mineral acids and non-renewal source of energy for their manufacturing. Besides this, the efficiency of added fertilizer is as low as about 10 per cent only.

Potassium is one of the principle plant nutrients underpinning crop yield production and quality determination. While involved in many physiological processes, potassium's impact on water relations, photosynthesis, assimilate transport and enzyme activation can have direct consequences on crop productivity. Potassium deficiency can lead to a reduction in both the number of leaves produced and the size of individual leaves. Coupling this reduced amount of photosynthetic source material with a reduction in the photosynthetic rate per unit leaf area, and the result is an overall reduction in the amount of photosynthetic assimilates available for growth. The production of less photosynthetic assimilates and reduced assimilate transport out of the leaves to the developing fruit greatly contributes to the negative consequences that deficiencies of potassium have on yield and quality production. Goals aimed toward increasing crop productivity and improved quality dictate either increased potassium supply or more efficient use of potassium. Developing plants that more efficiently use potassium might be a worthwhile goal for geneticists (Pettigrew, 2008).

On the other hand, Rock in the long term improvement of their soil structure and increased productivity crops without negative effects on the environment. The highest growth, yield, yield components, protein, N and K plant and seeds contents of legumes crop were obtained by adding 360 kg

fed^{-1} natural rock potassium (Feldspar) and no significant increase with recommended treatments (Ezzat *et al.,* 2005).

Sulfur (S) is the fourth major plant nutrient after nitrogen (N), phosphorus (P) and potassium (K). It is essential for synthesis of the amino acids like cystine, cysteine and methionine, a component of vitamin A and activates certain enzyme systems in plants (Havlin *et al.,* 2004). Sulphur (S) is one of the elements known to be essential for the legume-rhizobium system with specific physiological and biochemical roles. The S demand of legume crops is higher than that of cereal crops. Studies on different legumes have shown that the concentration of the S-containing amino acids was markedly declined with decreasing S supply. Sulphur fertilization was also found to increase N accumulation and yield of legumes on S-deficient soils.

This study aimed at investigate the possible effect resulting from using some natural sources of phosphate rock, potassium rock, sulfur ore, feldspar as fertilizers on quality, yield and its components, nutrient uptake by pea plants.

MATERIALS AND METHODS

A pot experiment was conducted at Dekrnis city, Dakahlia Governorate during the winter season of (2013/ 2014); to investigate the effect of some natural materials as a fertilizer and its effect on crop quality, yield and nutrients uptake of pea (Pisum sativum) variety of "master B".

Nine treatments were arranged in a complete randomized blocks, which were the simple possible combinations among four treatments of some natural materials and two rates of application as follow,: (phosphate rock (100 and 200 $kg.fed^{-1}$), elemental sulfur ore (100 and 200 $kg.fed^{-1}$), potassium rock (100 and 200 $kg.fed^{-1}$) and feldspar (100 and 200 $kg.fed^{-1}$).phophate rock contains (Ca20%,Mg8.4%andP10%),elemental sulphar(100%s),feldspar (14%k)and potassim rock (12%k).

Each treatment was replicated three times. Thus the total number of replicates were twenty seven included 3 replicates of control for the season.

Twenty seven plastic pots; 25 cm diameter and 35 cm height were used in each cultivation. Each pot was filled with 10 kg air dried soil taken from the surface layer (0-30cm) of private farm near El-Mansoura city and analysed for some physical and chemical properties as shown in Table 1.

The soil of pots was mixed with compost at rate of 20 ton/fed.; (240g per pot) in the surface layer of each pot (0-15 cm) and left after irrigation for 10 days before cultivation.

Ten seeds of peas were sown on 27 November 2013 at equal distance and depth. After 21 days from planting (4 true leaves) peas plants were thinned to the sex uniform plants per pot.

The nitrogen fertilizer was added to soil of pots cultivated with peas plants as recommended by the Ministry of Agriculture and Soil Reclamation,

150 kg.fed^{-1} N as ammonium sulphate (20.5% N). N fertilizer was added in two doses; after 15 days from planting and 15 days later.

Natural materials as phosphate rock, elemental sulfur ore, potassium rock and feldspar were added before two weeks from planting at rate of 100 and 200 kg.fed^{-1} for each one.

Table 1: Some physical and chemical properties of the experimental soil before cultivations.

Soil characters		**Values**
Particals size distribution (%)	Coarse sand	2.8
	Fine sand	18.7
	Silt	35.6
	Clay	42.9
	Texture class	clay
E.C dS.m^{-1} (Sat.Bast.Ext.)		1.93
pH (1:2.5 soil water suspension)		7.84
S.P %		69.5
F.C%		36.4
O.M. %		1.73
$CaCO_3$%		2.96
soluble ions, meq.100g^{-1} soil	Ca^{++}	0.94
	Mg^{++}	0.72
	Na^{+}	2.89
	K^{+}	0.21
	CO_3^{--}	-
	HCO_3^{-}	1.05
	Cl^{-}	2.64
	SO_4^{--}	1.07
Available form (mg.kg^{-1})	N	48.6
	P	7.91
	K	295

After 45days (Vegetative growth stage), 75 days (flowering stage) and 90 days (harvest stage) from sowing of peas seeds, respectively, 2 plants were randomly taken then weighted and oven dried at 70^{o}C till constant weight. Then, dry matter was calculated in g.plant^{-1} and the dried plants materials were thoroughly ground and stored for chemical analysis. The following data were recorded.

Chemical analysis of leaves: Plant samples from 45 and 75 stages were oven dried at 70^{0}c tell constant weight was reached, and then dry weight in g per plant was calculated. The dried plant samples were thoroughly mixed ground and stored for chemical analysis in leaves for N, P and K% then its uptakes were calculated in (mg/plant).

Yield and its components: Weight of 100 seeds (g) and yield (g.plant^{-1}) were recorded.

Quality characteristics of pods: Representative samples of pea pods after 90 days from planting were randomly taken from each treatment and at harvest stage to determine the quality parameters of peas pods and were

expressed as follows: N, P and K (%) and its uptake (mg.plant^{-1}), vitamin C (mg.100g^{-1}), reducing sugar (%), non-redusing sugar (%), total sugar (%) and crude protein (%).

Soil analysis:

- Soil samples were analyzied for chemical properties according to Jackson(1967).
- The electrical conductivity of soil paste extract was measured by EC meter according to the method of US Salinity Lab, (1954).
- Soil reaction (pH) was measured in 1:2.5 soil water suspension as described by Jackson, (1967).
- Soil partical size distribution was determined following the international pipette method (Piper,1950).
- Saturation Percentage (Sp%) and field capacity (Fc%) were determined according to (Klute,1986).

♦ **Determination of nutrients in plant samples:**

The oven dried material of plant was ground and wet digested by a sulfuric-perchloric acids mixture as described by Peterburgski, (1968). The total N, P and K were determined using the following methods.

- Total nitrogen (%) was determined according to the methods described by Jakson, (1967), using micro-Kjeldahl.
- Total phosphorus (%) was determined colorimetrically using the chlorostannus reduce molybdo phosphoric blue colour method in sulphoric system as described by Jackson, (1967).
- Potassium (%) was determined using a flame photometer according to Black, (1965).

♦ **Determination ofpea quality parameters:-**

- Ascorbic acid (vitamin C) in pea seeds was determined by titration with 2.6 diclorophenol indophenol blue dye solution according to the method reported in (A.O.A.C.; 1975).
- Total soluble sugar, was determined according to the method described by Sadasivam and Manickam, (1996).
- Reducing sugar was estimated by Nelson-Somogy method as described by Naguib, (1964).
- Crude protein percentage was calculated by determination of N% and was multipied in 6.25 according to (A.O.A.C.; 1975).

All data were statistically analyzed according to the technique of analysis variance (ANOVA) and the least significant difference (L.S.D) method was used to compare the difference between the means of treatment values according to the methods described by Gomez and Gomez, (1984). All statistical analyses were performed using analysis of variance technique by means of CoSTATE Computer Software.

RESULTS AND DISCUSSION

Effect of using some natural materials on yield and its components:-

Referring the effects of using some natural materials as fertilizers (phosphate rock, sulfur ore, potassium rock and feldspar), its levels(100 and 200 kg.fed^{-1})as well as their interactions a long with control on yield (g.plant^{-1}) and weight of 100 seeds (g) after harvesting are shown in Table 2.

Regarding the with application of some natural materials as fertilizers (phosphate rock, sulfur ore, potassium rock and feldspar) on yield and weight of 100 seeds after harvesting; data in Table 2 show that the mean values of the previous parameters were significantly increased with using these natural materials. After harvesting, the plants gave the highest values with adding sulfur ore, which recorded as 37.09(g.plant$^{-1)}$ and 46.46 g for yield and weight of 100 seeds, respectively.

Concerning the effect of using two levels of studied natural materials as fertilizers on yield (g.plant^{-1}) and weight of 100 seeds (g) after harvesting; results in Table 2 indicate that the highest values were obtained from the second level compared to the first level and it has significant effect.

The comparisons among the means of the various combined treatments of some natural materials as fertilizers and its levels are shown in Table 3 reflecting a significant differences between the average values of yield (g.plant^{-1}) and weight of 100 seeds (g) after harvesting. Data illustrate that under any level of fertilization with some natural materials pea plants were superior for increasing the values of all aforementioned traits than those obtained from the untreated plants. The highest values of yield and its components were connected with treatments receiving 200 kg.fed^{-1} sulfur ore.

Table 2: Effect of using some natural materials on yield of pea plant.

Treatments		yield (g/plant)	weight of 100 seeds (g)
Source of fertilization			
Phosphate rock		35.67	45.67
Potassium rock		36.28	45.91
Sulfur ore		37.09	46.46
Feldspar		36.67	46.10
L.S.D $_{at\ 5\%}$		0.13	0.24
Level of fertilization			
100 kg.fed.		35.37	45.54
200 kg.fed.		37.48	46.53
L.S.D $_{at\ 5\%}$		0.07	0.02
Control		34.15	44.87
Phosphate rock	100 kg.fed.	34.63	45.14
	200 kg.fed.	36.72	46.19
Potassium rock	100 kg.fed.	35.11	45.42
	200 kg.fed.	37.44	46.40
Sulfur ore	100 kg.fed.	36.16	45.97
	200 kg.fed.	38.03	46.96
Feldspar	100 kg.fed.	35.58	45.64
	200 kg.fed.	37.75	46.56
L.S.D $_{at\ 5\%}$		0.14	0.04

This might be due to increasing the levels of sulfur ore application and its enhanced effect on availability of nutrients to the crop. Similar observation was noticed by Choudhary *et al.,* (2006), Yadav, (2011), Jamir and Gohain, (2012) who found that pods number and 100 grain weight also were increased significantly with increasing levels of phosphorous and sulfur in both two years. Grain yield (t/ha) and straw yield (t/ha) also increased with increasing levels of P and S.

Effect of using some natural materials on seed content:-

N, P, K % and its uptakes after 45 and 75 days from planting:-

Data in Tables 3 and 4 show the effect of using some natural materials as fertilizers (phosphate rock, sulfur ore, potassium rock and feldspar), its levels (100 and 200 kg.fed^{-1}) as well as their interactions on N, P, K % and its uptakes (mg.plant^{-1}) after 45 and 75 days from planting.

Table 3: Effect of using some natural materials on N, P and K% of pea seeds after 45 and 75 days from planting.

Treatments		N%		P%		K%	
		45 days	75 days	45 days	75 days	45 days	75 days
Source of fertilization							
Phosphate rock		2.98	3.24	0.274	0.292	3.13	3.35
Potassium rock		3.09	3.38	0.287	0.304	3.22	3.47
Sulfur ore		3.26	3.63	0.304	0.323	3.42	3.57
Feldspar		3.23	3.49	0.295	0.314	3.27	3.50
L.S.D at 5%		0.12	0.04	0.007	0.005	0.14	0.04
Level of fertilization							
100 kg.fed.		2.92	3.16	0.271	0.290	3.17	3.35
200 kg.fed.		3.36	3.70	0.308	0.326	3.36	3.60
L.S.D at 5%		0.12	0.04	0.004	0.003	0.10	0.06
Control		2.65	2.93	0.248	0.273	2.94	3.13
Phosphate rock	100 kg.fed.	2.72	3.03	0.252	0.277	3.02	3.22
	200 kg.fed.	3.23	3.44	0.296	0.306	3.24	3.49
Potassium rock	100 kg.fed.	2.88	3.09	0.270	0.283	3.11	3.38
	200 kg.fed.	3.30	3.66	0.304	0.325	3.33	3.55
Sulfur ore	100 kg.fed.	3.09	3.34	0.287	0.303	3.38	3.43
	200 kg.fed.	3.42	3.92	0.320	0.342	3.47	3.71
Feldspar	100 kg.fed.	2.97	3.19	0.277	0.297	3.15	3.37
	200 kg.fed.	3.49	3.78	0.312	0.330	3.39	3.63
L.S.D at 5%		0.24	0.09	0.008	0.006	0.20	0.12

It is clear from the data in Tables 3 and 4 that the mean values of N, P, K % and its uptake (mg.plant^{-1}) in seeds after 45 and 75 days from planting increased significantly by using some natural materials as fertilizers (phosphate rock, sulfur ore, potassium rock and feldspar). The highest values of N, P, K % and its uptake (mg.plant^{-1}) were recorded with using sulfur ore during both stages.

Based on the data presented in Tables 3 and 4, the average values of N, P, K % and its uptake (mg.plant^{-1}) in seeds after 45 and 75 days from planting were significantly affected due to using the two levels of natural

materials fertilizers. Generally, it was noticed that application of 200 kg.fed^{-1} significantly increased N, P and K content and its uptake as compared to application of 100 kg.fed^{-1}.

Moreover, data recorded in these Tables indicated that, the interactive effect between using some natural materials as fertilizers (phosphate rock, sulfur ore, potassium rock and feldspar) and its levels (100 and 200 kg.fed^{-1}) increased the mean values of N, P, K % and its uptake (mg.plant^{-1}) after 45 and 75 days of pea at any level of fertilizing with each studied natural material. The highest values were recorded by using 200 kg.fed^{-1} sulfur ore during both stages of the plant growth.

Table 4: Effect of using some natural materials on N, P and K-uptake (mg/plant) of pea plant after 45 and 75 days.

Treatments		N-uptake mg/plant		P-uptake mg/plant		K-uptake mg/plant	
		45 days	75 days	45 days	75 days	45 days	75 days
Source of fertilization							
Phosphate rock		30.85	33.43	2.83	3.01	32.27	34.58
Potassium rock		34.01	37.27	3.16	3.34	35.34	37.60
Sulfur ore		40.80	44.27	3.69	3.92	40.41	43.34
Feldspar		37.03	39.96	3.37	3.58	37.27	39.94
L.S.D $_{at\ 5\%}$		1.20	1.20	0.12	0.10	0.70	1.11
Level of fertilization							
100 kg.fed.		28.89	31.34	2.69	2.87	30.85	32.96
200 kg.fed.		42.46	46.13	3.84	4.06	41.80	44.77
L.S.D $_{at\ 5\%}$		0.79	0.93	0.07	0.06	0.82	1.01
Control		23.20	25.66	2.17	2.39	25.80	27.47
Phosphate rock	100 kg.fed.	25.05	27.88	2.32	2.54	27.78	29.60
	200 kg.fed.	36.65	38.99	3.35	3.47	36.76	39.56
Potassium rock	100 kg.fed.	27.90	30.01	2.62	2.74	30.17	32.01
	200 kg.fed.	40.12	44.52	3.70	3.94	40.51	43.19
Sulfur ore	100 kg.fed.	33.00	35.63	3.06	3.23	34.02	36.59
	200 kg.fed.	48.60	52.92	4.33	4.61	46.80	50.09
Feldspar	100 kg.fed.	29.60	31.83	2.76	2.95	31.43	33.62
	200 kg.fed.	44.46	48.09	3.98	4.21	43.12	46.26
L.S.D $_{at\ 5\%}$		1.58	1.85	0.13	0.13	1.64	2.02

N, P and K% and its uptake (mg/plant) of pea seeds after harvesting:-

N, P and K% and its uptake (mg.plant^{-1}) by seeds of pea as influenced by using some natural materials as fertilizers (phosphate rock, sulfur ore, potassium rock and feldspar), its levels (100 and 200 kg.fed^{-1}) as well as their interactions are presented in Table 5.

Obtained data in Table 5 indicated that the average of all the above mentioned nutrients were significantly increased due to using some natural materials as fertilizers (phosphate rock, sulfur ore, potassium rock and feldspar). The highest values recorded with using sulfur ore after harvesting.

With respect to the effect of two fertilization levels, it can be noticed from the data in Table 5 that application of 100 and 200 kg.fed^{-1} of natural materials to soil significantly affected N, P and K% and its uptake (mg.plant^{-1}) by seeds of pea. The highest values of N, P and K% and its uptake(mg.plant^{-1}) by seeds of pea were recorded with adding 200 kg.fed^{-1} compared to 100 kg.fed^{-1}.

Concerning the effect of the interaction, data in Table 5 indicated that N, P and K% and its uptake (mg.plant^{-1}) by seeds of pea had a significant effects due to using some natural materials as fertilizers (phosphate rock, sulfur ore, potassium rock and feldspar) under two levels (100 and 200 kg.fed^{-1}). The highest vales were recorded with using 200 kg.fed^{-1} sulfur ore.

The increase in nitrogen content due to sulfur application could be attributed to the increase in the number and size of nodules, which in turn increase the nitrogen fixation by the plant and also due to utilization of carbohydrates for protein synthesis (Ganeshamurthy and Reddy, 2000). Increasing in phosphate content could be attributed to the favourable effect of sulfur fertilization on phosphate absorption, as sulphur mobilizes soil phosphate in available form for plant use due to the action of acid produced by the added sulfur (Singh et al., 2006) and thereby, increasing phosphate content and uptake. Sulfur fertilization improves nutritional environment both in the rhizosphere and plant system. The increased availability of the nutrients in the root zone coupled with increased metabolic activity which may increase the potassium content.

Table 5: Effect of using some natural materials on N, P, K and its uptake of pea seeds after harvesting.

Treatments		N%	P%	K%	N-uptake, g/plant	P-uptake, g/plant	K-uptake, g/plant
Source of fertilization							
Phosphate rock		3.07	0.289	3.32	1.10	0.103	1.19
Potassium rock		3.24	0.302	3.35	1.18	0.110	1.22
Sulfur ore		3.43	0.330	3.52	1.28	0.122	1.31
Feldspar		3.33	0.317	3.43	1.22	0.117	1.26
L.S.D $_{at\ 5\%}$		0.05	0.003	0.04	0.02	N.S	0.02
Level of fertilization							
100 kg.fed.		3.01	0.288	3.28	1.07	0.102	1.16
200 kg.fed.		3.52	0.331	3.53	1.32	0.124	1.32
L.S.D $_{at\ 5\%}$		0.04	0.007	0.03	0.01	0.002	0.02
Control		2.80	0.260	3.08	0.96	0.089	1.05
Phosphate rock	100 kg.fed.	2.84	0.267	3.13	0.98	0.092	1.08
	200 kg.fed.	3.30	0.312	3.50	1.21	0.115	1.29
Potassium rock	100 kg.fed.	2.95	0.279	3.18	1.04	0.098	1.12
	200 kg.fed.	3.52	0.324	3.52	1.32	0.121	1.32
Sulfur ore	100 kg.fed.	3.22	0.311	3.45	1.16	0.112	1.25
	200 kg.fed.	3.65	0.348	3.60	1.39	0.132	1.37
Feldspar	100 kg.fed.	3.03	0.293	3.33	1.08	0.104	1.19
	200 kg.fed.	3.63	0.341	3.52	1.37	0.129	1.33
L.S.D $_{at\ 5\%}$		0.08	0.013	0.08	0.03	0.005	0.03

Similar results were reported by Kumawat and Khangarot, (2002), Kumawat *et al.,* (2006), Patra and Maiti, (2007) and Ganie *et al.,* (2014) who showed that increase in application of sulphur led to an increase in their concentrations and in turn uptake of N, P, K, S in pods, seeds as well as stover up to 45 Kg/ha.

Seed quality after harvest:-

Data illustrated in Table 6 reflect the effect of using some natural materials as fertilizers (phosphate rock, sulfur ore, potassium rock and feldspar), its levels (100 and 200 kg.fed^{-1}) as well as their interactions on seeds quality such as reducing sugar%, non-reducing sugar%, total sugar %, V.C (mg.100g^{-1}) and protein % after harvesting.

Results in Table 6 show that, using some natural materials as fertilizers (phosphate rock, sulfur ore, potassium rock and feldspar) affected significantly the average values of reducing sugar%, non-reducing sugar%, total sugar %, V.C (mg.100g^{-1}) and protein % after harvesting.

Such data in the same Table also revealed that application of two levels of natural materials significantly increased reducing sugar%, non-reducing sugar%, total sugar %, V.C (mg.100g^{-1}) and protein % after harvesting. Comparing with the lowest fertilization level, the highest value of increase were recorded with adding 200 kg.fed^{-1} where the values were 3.12, 13.28, 16.41, 46.24 and 22.03 for reducing sugar%, non-reducing sugar%, total sugar %, V.C (mg.100g^{-1}) and protein %, respectively after harvesting.

Table 6: Effect of using some natural materials on seeds quality parameters of master pea seeds after harvesting.

Treatments		Reducing sugar%	Non-reducing sugar%	Total sugar %	V.C (mg/100g)	Protein %
Source of fertilization						
Phosphate rock		2.94	12.58	15.53	42.47	19.18
Potassium rock		3.05	12.76	15.81	43.50	20.22
Sulfur ore		3.07	13.24	16.31	45.80	21.46
Feldspar		3.04	12.93	15.98	44.33	20.82
L.S.D $_{at\ 5\%}$		0.04	0.09	0.05	0.63	0.33
Level of fertilization						
100 kg.fed.		2.93	12.47	15.41	41.81	18.81
200 kg.fed.		3.12	13.28	16.41	46.24	22.03
L.S.D $_{at\ 5\%}$		0.06	0.05	0.03	0.81	0.26
Control		2.84	11.96	14.80	39.23	17.50
Phosphate rock	100 kg.fed.	2.81	12.13	14.95	39.77	17.75
	200 kg.fed.	3.06	13.02	16.11	45.17	20.60
Potassium rock	100 kg.fed.	2.95	12.36	15.31	41.00	18.46
	200 kg.fed.	3.16	13.15	16.31	46.00	21.98
Sulfur ore	100 kg.fed.	2.99	12.84	15.82	44.23	20.10
	200 kg.fed.	3.16	13.64	16.80	47.37	22.81
Feldspar	100 kg.fed.	2.99	12.54	15.54	42.23	18.94
	200 kg.fed.	3.09	13.32	16.42	46.43	22.71
L.S.D $_{at\ 5\%}$		0.07	0.09	0.06	1.62	0.52

It has been demonstrated from the data in Table 6 that the effects of interaction among using some natural materials and its levels on reducing sugar%, non-reducing sugar%, total sugar %, V.C (mg.100g^{-1}) and protein % were significantly affected. The highest value was recorded with 200kg.fed^{-1} sulfur ore.

Increasing the doses of sulfur application resulted in a significant increase in protein content of pea. The positive response to added sulfur is assigned to low status of available S of soil or due to stimulating effect of

applied sulfur in the synthesis of chloroplast protein resulting in greater photosynthetic efficiency which in turn translated in term of increased yield. Dwividi and Bapat (1998) reported significant increase in the protein content of soybean with application of P and S up to 50 kg ha over control.

CONCLUSION

Under the same conditions of this investigation it could be recommended that; the most suitable natural material treatment from all (phosphate rock, sulfur ore, potassium rock and feldspar) was sulfur ore at rate of 200 kg.fed^{-1}. This treatment gave a good quality, yield and yield components of pea plant.

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محصول البسله و جودته وإمتصاص العناصر و تأثرهم بإستخدام خامات طبيعيه

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اجريت تجربه اصص بمدينه دكرنس - محافظه الدقهليه الموسم الشتوى ٢٠١٣/٢٠١٤ لدراسه تاثير بعض الخامات الطبيعيه على محصول وجوده والعناصر الممتصه لنبات البسله صنف ماستر بى.
اشتملت التجربه على ٩ معاملات فى تصميم قطاعات كامله والتى كانت كالتالى (صخر الفوسفات، صخر الكبريت، صخر البوتاسيوم، الفلسبار) عند مستويين من التسميد (١٠٠، ٢٠٠ كجم/ف). مقارنه بالكنترول و احتوت كل معامله على ٣ مكررات واصبح المجموع الاجمالى للمعاملات ٢٧ معامله.

اظهرت نتائج التجربه التالى:-

- متوسطات كل من المحصول ، ١٠٠ حبه، النسبه المئويه للنيتروجين ، الفوسفور، البوتاسيوم وصور امتصاصهم فى النبات بعد ٤٥ و ٧٥ يوم من الزراعه كذلك النسبه المئويه للنيتروجين ، الفوسفور، البوتاسيوم وصور امتصاصهم فى البذور بعد الحصاد بالاضافه الى صفات الجوده والتى تشمل النسبه المئويه لكل من السكريات المختزله، و الغير مختزله ، السكريات الكليه ، فيتامين سى و البروتين بعد الحصاد جميعها زادت و تاثرت بصوره معنويه نتيجه لاضافه محسنات التربه الطبيعيه واعطت النباتات افضل النتائج عند استخدام صخر الكبريت.
- ظهرت اعلى القيم للصفات السابقه عند اضافه المعدل العالى ٢٠٠ كجم/ف من المحسنات المضافه مقارنه بالمعدل الاقل ١٠٠ كجم/ف الذى سجل اقل القيم.
- بالنسبه للتاثير المشترك لجميع معدلات التسميد المضافه من صور الخامات المختلفه ادت الى زياده قيم الصفات المذكوره مقارنه بالنباتات الغير معامله (الكنترول) اعلى القيم لكل من المحصول ، ١٠٠ حبه، النسبه المئويه للنيتروجين ، الفوسفور، البوتاسيوم وصور امتصاصهم فى النبات بعد ٤٥ و ٧٥ يوم من الزراعه كذلك النسبه المئويه للنيتروجين ، الفوسفور، البوتاسيوم وصور امتصاصهم فى البذور بعد الحصاد بالاضافه الى صفات الجوده والتى تشمل النسبه المئويه لكل من السكريات المختزله، و الغير مختزله ، السكريات الكليه ، فيتامين سى و البروتين بعد الحصاد سجلت عند اضافه صخر الكبريت بمعدل ٢٠٠ كجم/ف.