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Effect of Organic manure and Phosphorus Fertilizers on Growth, Yield and Quality of Lentil Plants in Sandy Soil

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Abstract: Two field experiments were carried out during the two winter seasons of 2003/ 2004 and 2004/2005 at the Experimental Farm of the National Research Centre at Nubariato study the effect of organic manure at 0,10 and 20 m3/ fed. And four phosphorus levels of 0,30,45 and 60 Kg P 2O5/ fed. on growth, yield and quality of lentil grown in sandy soil. Results indicated that plant height, number of branches/ plant, number of pods/plant,1000 seed weight, seed yield/plant, seed yield/fed and straw yield ton/fed. were significantly affected by organic manure application. Increasing rates of applied organic manure from 0 to 20 m3 /fed markedly increased all studded characters. Results also show that plots received 20m3 /fed gave the highest values of protein, P,K,% and Fe, Mn and Zn in(ppm) respectively compared to the control. Increasing phosphorus levels from0 to 60 kg/fed increased plant height, number of branches/ plant number of pods /plant,1000 seed Weight, seed yield/plant, seed yield/fed and straw yield/fed of lentil plant. Phosphorus levels caused increased in protein, P, K,(%) andFe, Mnand Zn in (ppm)contents in seeds of lentil plant. 60 kg P2 O5 /fed gave the highest levels of protein, P, K, Fe, Mn and Zn contents in seeds compared with O,30 and 45 kg /fed

Keywords: Organic manure, Phosphorus fertilizers lentil plant

INTRODUCTION

Lentil (lens culinaries, medic) is one of the most important leguminous crop grown in Egypt Seeds contain 28.6% protein, 63.1% carbohydrate, 3.1%ash, 0.45% phosphorus, 1.16 % potassium,10.0% magnesium and0.07% calcium, science lentil plants grow do well in sandy soils which are valuable forfuture expansion,great attention should be taken with respect to nutritional status of these soil. early experiments showed that seed and straw yields of lentil were significantly increasedwith increasing phosphorus up to 10, 20 and 30 ppm P 2O5 on low, medium and high phosphorus respectively the critical level of available phosphorus for lentil was 15 kg /ha.Singh *et al.,*[19]. On sandy soils, El-Awady *et al.,*[8] revealed that phosphorus addition at 0,30,45and 60 kg significantly increased seed and straw yields / fed as well as seed protein content. Recently Krishnar and Ahlawat[13] concluded that application of 17.2 kg/ha P2O5 markedly increased number of pods / plant, seed number/pod and seed yield /ha also Okaz *et al.,*[16] showed that phosphorous application induced significant increases in seed and straw yields, yield components they also found that seed contents of K were significantly increased by Kapplication. Akhter *et al.,* found that Appling of 15, 30 and 45 kg / ha each ofNand K indifferent combinations increased yield and protein contents of lentil seeds.

The use of farm- yard manures and other forms of organic matter can also change plant-available micronutrients by changing both physical and biological characteristics of the soil. In many circumstances these changes improve soil physical structure and water holding capacity, resulting in more extensive root development and chemical soil micro flora and enhanced soil micro flora soil and fauna activity all of which can affect available micronutrients levels in soil to plant[22,23] farmyard manures have bean shown to improve the solubility and up take of P from sparingly soluble P compounds in soil and enhance the utilization of P from for fertilizers, Organic compounds released during the decomposition of manures increase the availability of P from soil or fertilizers[10,18] found that supply of P fertilizers along with cattle manure under a wheat- soybean cropping system over 5 years greatly improved wheat and soybean yield. indicated that phosphorus levels caused increase in protein, P, K, Fe, Mnand Zn contents in seeds of lentil plant. 60 kg P2 O5 /fed gave the highest levels of protein, P, K, Fe, Mn and Zn contents in seeds compared with O,30 and 45 kg /fed. Mosali *et al.,*[14] The most essential function of P is storage and transfer of energy in the form of adenosine triphosphate (ATP),a denosinediphosphate (ADP) and it is also important structural component of nucleic acids,coenzymes, phospholipids and nucleotides.

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MATERIALS AND METHODS

Two field experiments were carried out during the two winter seasons at 2003/ 2004 and 2004/2005 at the Experimental Farm of the National Research Centre at Nubariato study the effect of organic manure and phosphorus fertilizers on lentil growth, yield and quality. The experiments included 12 treatments which were the combinations of three levels of organic manure, i. e. o, 10 and 20 m2 / fed and four levels of phosphorus, i.e.o, 30, 45 and 60 kg P2O5/fed. Phosphorus as calcium super phosphate 15.5% P2 O5 were added at one dose at sowing toall plots except control,.and30 Kg N as (nitrate ammoniumsulphate (21.6%N)and 24Kg K2O as sulphate potassium 48%/fed. were added at 30 days after sowing to all treatments.Chemical analysis of the experimental soil and organic manure are shown in Table (1).

Table 1: Analysis of the experimental soil and organic manure used.According to Jackson, (1971) :

Property	Soil	Organic manure
Coarse Sand%	58.62	
Fine Sand	34.97	
Silt%	3.88	
Clay %	2.53	
Texture	Sandy	
Organic matter %	0.8	32.86
pH	7.58	6.83
Ecmmhos/cm3	1.3	
Ca Co3 %	2.3	
Available N. ppm	9.1	850
Available P ppm	2.23	395
Available K ppm	53.9	853

Seeds of lentil Variety Giza 9 were inoculated prior planting with pure culture of specific rhizobia and sown at the rate of 50 kg/ fed.The plot size was 10.5 m2 which contained 15 rows, 20 cm apart and 3.5 long. Randomized complete block design in factorial arrangement with four replication was used.Nitrogen fertilizer was added after 15 days after sowing to all plots at the level of 30 kg/fed as ammonium sulphate (20.6% N)

Chemical Analysis: Seed content of N P K was determined as follows N % was determined by improved Kjeldahl methods of A.O.A.C.,[1], P was determined according A. O.A.C,[2] and K% was determined by using Flam photometer.Seed protein was calculated by multiplying (N%) by 6.25.Fe,Mn and Zn contents in seeds were estimated by using atomic absorption spectrophotometer. All data were statistically analyzed according to Snedecor and Cochran[20]. The combined analysis was conducted, for all data of the two seasons according to[21] The least significant differences (LSD) were used to compare between means.

RESULTS AND DISCUSSIONS

Effect of Organic Manure: Data presented in Table (2) indicated that plant height, number of branches/ plant, number of pods/plant, 1000 seed weight, seed yield/plant, seed yield/fed and straw yield ton/fed. Were significantly affected by organic manure application. Increasing rates of applied organic manure from 0 to 20 m3 /fed markedly increased all studded characters. Results show that plots received 20m3 /fed gave the highest values which gave (32,8,72,15,79,54 and 70 %) increase in plant height, number of branches, plant, number of pods/ plant, 1000 seed weight, seed yield plant, seed yield/fed and straw yield compared with control respectively. The stimulating influence of organic amendments on lentil grown in sandy soils might be attributed to the improved microbial activity in soil which probably improves the availability of the nutrient[6,9,10] shown that soil microbial biomass is increased by added manure and the greatereffectiveness of the organic manure may be attributed to higher rates of decomposability and mineralization of organic mater and increasing total organic C and total N which improved nutrient uptake[24] found that 100- grain weight, grain yield/plant and biological yield/fed of wheat increased by added organic manure.

Results in Table (3) indicated that organic manure had a significant effects on protein., P, K, Fe, Mn and Zn contents in seeds of lentil plants.Results indicated that increasing rate of organic manure from 0 t0 20 m3/fed markedly increased nutrient contents in seeds.Plots received 20m3 organic manure/ fed gave 14,24,29,50,and96 % higher than control in protein, P,K,% and Fe, Mn and Zn in ppm respectively This increase may be due to farmyard manure containing potassium,magnesium and phosphate in an inorganic form also, the reduction in some traits of lentil seeds in plots received zero organic manure (control)may be due to the leaching of the nutrients with the mass flow of water deep in the soil, nutrients can be lost from the rooting zone, especially in sandy soils. these results are in agreement with[22,23,24,25].

Effect of Phosphorus: Data presented in Table (4) revealed that increasing phosphorus levels from0 to 60 kg/fed increased plant height, number of branches/ plant number of pods /plant,1000 seed weight, seed yield/plant, seed yield/fed and straw yield/fed of lentil plant, where phosphorus is an essential element for photosynthesis, root development and seed formation as well as nitrogen uptake. Data show that plots received 60 kg P2 O5 /fed exceeded control plots by 24, 69, 77, 14, 97, 44 and 14% respectively in plant height, number of branches, number of pods /plant, 1000 seed

Table 2: Growth and yield of lentil plant as affected by organic manure (means of tow seasons) :

Organic Manurem 3/fed	Plant Height (cm)	Numberof branches/plant	Numberof pods/plant	1000 Seed weight (g)	Seed Yield Plant (g)	Seed yield /fed (Ardab)	Straw(Yield /Fed (ton)
0	27.2	2.5	12.4	26.09	0.339	1.91	0.88
10	31.6	4.0	14.7	29.12	0.508	2.06	1.23
20	36.0	4.5	21.4	30.10	0.603	2.98	1.50
LSD(0.05)	3.4	0.4	1.3	1.20	0.087	0.38	0.29

Table 3: Effect of organic manure on protrin,P,K Fe,Mn and Zn in seeds of lentil plant(means of two seasons)

Organicmanurem3/fed	Protein (%)	P (%)	K (%)	Fe Mg/100g	Mn Mg/100g	Zn Mg/100g
0	24.2	0.272	1.3	8.50	2.23	3.28
10	26.9	0.335	1.58	11.70	3.35	5.38
20	27.6	0.338	1.68	12.83	3.63	6.43
LSD(0.05)	1.9	0.031	0.18	2.27	0.03	2.07

Table 4: Effect of phosphorus levels on growth andyieldof lentil plant (means of two seasons)

P Kg /fed	Plant Height (cm)	No of branches Plant	Number of podsPlant	1000 seed Weight (g)	Seed yield Plant	Seed yield fed/(ardab)	Straw yield Ton/fed
0	29.1	2.3	14.7	25.4	0.257	2.1	0.77
30	31.94	2.7	17.8	27.49	0.378	2.45	1.33
45	32.9	3.6	24.0	28.59	0.472	3.11	1.44
60		3.9	26.0	29.01	0.508	3.04	1.86
LSD(0.05)	1.4	0.5	3.9	1.06	0.10	0.43	0.19

Table 5: Effect of phosphorusrates on protein, P,K,Fe,Mn and Zn in seeds of lentil plant (means of two seasons)

P Levels Kg/fed	Protein (%)	P (%)	K (%)	Fe (mg/100g)	Mn (mg/100g)	Zn (mg/100g)
0	24.9	0.27	1.2	8.23	2.25	3.38
30	26.7	0.32	1.4	11.63	3.38	6.63
45	27.8	0.32	1.5	12.38	3.53	3.75
60	27.9	0.38	1.7	12.63	3.73	5.65
LSD	0.7	0.03	o.15	1.51	1.04	2.30

Table 6: Effect of interaction between phosphorus and organic manure on growth,yield and nutrient content of lentil seeds (means of two seasons)

Organic m^3/fedd	P_2O_5 / kg fed	Number of branches/plant	Number of pods/ plant	Seed yield Ardab/fed	K (%)	Fe (mg./100 g)
0	0	2.0	10.6	1.12	1.18	6.33
	30	3.0	15.0	1.93	1.37	8.00
	45	3.6	19.5	2.02	1.52	8.00
	60	4.1	19.7	2.43	1.60	10.67
10	0	3.0	10.3	1.36	1.34	7.00
	30	3.4	14.5	2.05	1.40	8.00
	45	3.5	12.4	2.20	1.46	10.33
	60	4.1	14.1	2.25	1.48	12.33
20	0	3.3	9	1.28	1…42	7.17
	30	3.5		2.11	1.48	8.50
	45	3.7	15.0.0	2.22	1.46	9.44
	60	4.6	19.9	2.69	1.53	11.78
LSD(0.05)		0.5	4.0	0.23	0.14	1.49

weight, seed yield /plant, seed yield /fed and straw yield /fed. The increase in seed yield by application of 60 kg P2 O5 / fed might be associated with high number of pods /plant, 1000 seed weight and seed yield /plant similar results were reported by[15,19,3] found that phosphorus fertilization at 50 kg /P2 O5 /h increased seed yield as compared with control. Batten[5] reported that net CO2 assimilation, N concentration, and Chlorophyll content decreased when wheat leaf P concentration falls below a critical level. Chandra[7] reported that increasing phosphorus fertilization increased seed yield[17] pointed out that increased phosphorus levels from 0, 20, 40 and 60 kg P2 O5 /ha significantly increased pods / plant, seed yield / plant, seed yield and straw yield /ha,[8] revealed that phosphorus addition at 60 kg P2 O5/ fed significantlyincreased seed and straw yields /fed. The positive response of lentil plants to phosphorus fertilization may be due to (1) the meristemic activity caused by P application (2) phosphorus caused an increase in the amounts of metabolites by plants as dry matter weight of different parts of the plant become great (3) phosphorus caused an increase in number of flowers and fruit setting percentage/plant[14].

Table (5) indicated that phosphorus levels caused increasein protein, P, K, Fe, Mnand Zn contents in seeds of lentil plant. 60 kg P2 O5 /fed gave the highest levels of protein, P, K, Fe, Mn and Zn contents in seeds compared with O,30 and 45 kg /fed. These increase might be due to that phosphorus might have improved and developed good root system of lentil plants and the capacity of root to absorb more N, P and K accordingly their contents increased by phosphorus application. These results agreed with those obtained by[16,5].

Interaction: Datareported in Table (5) shows that number of branches/ plant, number of pods/ plant, seed yield/ fed,K% and Fecontent in seeds of lentil plant were significantly affected by the interaction between organic manure and phosphorus levels. Data shows that the highest values of numberof branches/ plant,number of pods/ plant and seed yield ardab / fed. Were significant obtained when lentil plant fertilized with 60 Kg P2O5and 20 m3 / fed. Organic manure.While,60 Kg P2O5/ fed. with zero organic manure gave the highest values of K% in seeds also, the highest values of Fe in seeds were obtained when lentil fertilized by 60Kg P2O5/fed. and 20m3 organic manure/fed.

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Organic manures and NPK fertilizer increased the soil organic matter (OM), N, P, K, Ca and Mg (NPK fertilizer did not increase OM, Ca and Mg significantly), growth, yield, minerals, protein, ash, carbohydrate and mucilage contents of okra fruit as compared with control. Organic manures improved okra yield compared with NPK fertilizer.Â Their results revealed that poultry manure promotes higher growth and yield of okra compared with cow and sheep manure.Â Table 4 shows the result of the effect of different organic amendments and NPK fertilizer on soil chemical properties.Â Soil bulk density in both years was significantly reduced in organic manure soils compared with the control and NPK fertilizer which has similar values. Keywords. organic manure, mineral fertilizer, apple yield, quality, soil fertility.Â Liu X Y, Ren G X, Shi Y. The effect of organic manure and chemical fertilizer on growth and development of Stevia rebaudiana Bertoni. Energy Procedia, 2011; 5, 1200â€“1204. Liang B, Yang X Y, He X H, Daniel V Murphy, Zhou J B. Long-term combined application of manure and NPK fertilizers influenced nitrogen retention and stabilization of organic C in Loess soil.Â Effect of organic manure and fertilizer on soil water and crop yields in newly-built terraces with loess soils in a semiarid environment. Agricultural Water Management, 2013; 117, 123â€“132. Pekke M A, Pan Z L, Atungulu G G, Smith G, Thompson J F. Drying characteristics and quality of bananas under infrared radiation heating. Plant growth and yield estimations. Seven-week-old bean plants (n = 9) were carefully removed from each experimental plot and dipped in a bucket of water. Plants were shaken gently to remove all adhering soil particles and the lengths of their shoots and roots were measured using a meter scale. The number of leaves plantâˆ’1 was counted and their area was measured manually using a graph sheet, where the squares covered by the leaf were counted. The plants were then placed in an oven at 70 Â°C until constant weight to record DW.Â Table 2 Effect of OMF compost as a partial substitution of NPK on the growth traits of Phaseolus vulgaris plants grown under soil salinity. Full size table. Leaf photosynthetic pigments, free proline, and TS sugars. Effect of Organic Manures and Bio-fertilizers on Growth, Yield and Quality of Okra [Abelmoschus esculentus (L.) Moench] (SKNAU). Thesis, 2017. [74]. Effect of INM on Soil Carbon Pools, Soil Quality and Sustainability in Rice-Brown Sarson Cropping System of Kashmir Valley. Int. J. Curr.Â Effect of combined application of organic and mineral nitrogen and phosphorus fertilizer on soil physico-chemical properties and grain yield of food barley (Hordeum vulgare L.) in Kaffa Zone, South-western Ethiopia. Momona Ethiopian Journal of Science, 2017. [78]. Effect of Long Term Application of Fertilizer and Manure on Soil Organic Carbon Fractions under Maize-Wheat Cropping Sequence in Haplustepts. Thesis, 2017. [79]. The positive effects of organic fertilizers on growth and productivity of plants could be attributed to the effect of. different organic fertilizers groups which increase the levels of extractable N, P, K, Fe, Zn and Mn as stated by. El-Karamany et al., (2000).Â information is available on the conjunctive use of organic manures and inorganic fertilizers for improving soil. fertility and crop yields (Meena et al., (2007). Singh and Kushwah (2006) reported that the effect of organic.Â fertilizers on the growth, mineral composition and soil fertility of radish plants grown in sandy soil. The soil used for the pot experiment was collected from one of the experimental sites of Western Coast. soils of Egypt (118 Km region), from the surface layer depth (0 to 15 cm).