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EFFECT OF SOME NUTRIENT TREATMENTS ON LUPIN (*LUPINUS TERMIS* L.) IN SANDY SOILS

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Abstract

The objective of this research is to study the effect of phosphorus (30,45,60 and 75Kg P205/fed.) and potassium (48 and 72 Kg K20/fed.) applications as a single or in combinations, on lupin yield and some growth characters as well as seed nutrient content of Giza 2 variety. The obtained results showed that P application at 60Kg P205/fed. alone or in combination with 48kg K20/fed. gave significant increases in plant height and number of branches and pods/plant, whereas its combination with 72Kg K20/fed. significantly increased 100- seed weight and straw and seed yeild /fed. as compared to control. Increasing P level up to 60Kg P205/fed. increased seed contents of protein, P and K. K application at 72Kg K20/fed. decreased seed protein and increased P and K percentages in seeds. All combination treatments. except for the combination of 45Kg P205 with 48 or 72 Kg K20/fed ., significantly increased seed contents of protein , P and K. It could be concluded that 60Kg P205/fed. can be recommended for lupin fertilization in sandy soils.

INTRODUCTION

Sandy soils are mostly located outside the Nile Valley in Egypt and characterized by being well areated, low organic matter content and low fertility, and the exchangeable capacity is low. Thus crop gorwng on these soils have low harvest. Physical , chemical and biological characteristics shoud be improved through in-

creasing nutritive supply of organic matter and best seclection of crops which successfully grow in sandy soil . Consequently, lupin is selected as a leguminous crop to be grown in these soils since it has a high capacity to improve their fertility and it has a great economical value. Many investigators (Mikhailet's 1972,Bonari 1973, Karczmaczyk *et al.*1978, Abd El-Hadi 1987) had clarified the response of lupin plants to P and K fertilization under sandy soil conditions and demonstrated that seed yield and other growth characters as well as seed mineral content were increased due to P and K fertilization. However, other reseaches (Ivanov 1979 and Gataulind and Mishkina 1972) showed that PK did not affect white lupin seed yield, yield components and crude protein. Altunin *et al.* (1978) found that the application of 30Kg P205 +60Kg K120/ha on yellow lupin increased dry matter accumulation up to the pod filling stage and plant N content. Sheveleva (1978) showed that appliation of NPK (45kg N+ 60Kg P205 + 120kg K20/ha) increased N and K contents of lupin, but has no significant effect on P content. The present investigation was carried out to study the effect of some nutrient treatments on yield. yield components, and chemical conents of lupin seeds under sandy soil conditions.

MATERIALS AND METHODS

Two successive field experiments were carried out in 1985/86 and 1986/87 growing seasons at Ismailia Agricultural Research Station to study the effect of phosphorus at the rates of 30,45,60 and 75Kg P205/fed . and potassium at the rates of 48 and 72Kg K20/fed. and their combinations on yield, yield components and chemical contents of lupin seed under sandy soil condition. The chemical and mechanical analysis of the soil under investigation were performed (Table 1).

Table 1. Chemical and mechanical analysis of the experimental soil during the growing seasons.

Season	Available			pH 1(soil): 2.5 (water)	T.S.S.	CaCO3	O.M.	Coarse samd	Fine sand	Silt	Clay
	N	P	K								
	1% K-sulph ext	Olsane	Amm. acetate ext.								
	p.p.m.	p.p.m.	p.p.m.		%	%	%	%	%	%	%
1985/1986	25	8	45	7.9	0.08	1.3	0.12	51.2	38.6	1.7	1.0
1986/1987	10	8	50	8.2	0.07	1.7	0.15	62.3	33.0	1.5	1.0

Phosphrus in the from of Ca-super phosphate 15% P205 and potassium in the form of postassium sulphate 48% K20 were applied in two equal doses, preplanting and 21 days after sowing. Nitrogen fertilizer (Amm. sulphate 20.5% N) was added 21 days after sowing to all experimental plots at the rate of 15Kg N/fed. Randomized complete block design was used with four replicates. Seeds of Egyptian lupin variety Giza (2) were sown at the rate of 50Kg/fed. The size of each plot was $10.5m^2$ (3x3.5m) with six rows, 50cm . width and 3.5m. long , the distance between hills was 20cm. Plants were thinned at 30days after sowing to two plants/ hill. At harvest, yield and its components (plant height, number of branches and pods/plant and 100 seed weight) were recorded. Seed samples were oven dried at 70C then finely grounded and wet digested to determine protein, phosphorus (P) and potassium (K) . N was determined by micro-Kjeldahl method as described by A.O.A.C (1970) then multiplied by 6.25 to obtain protein conten. Phosphorus (P) was determined colorimetrically (Jackson, 1968) wherease potassium (K) was determined by flamephotometer. Data were statistically analyzed according to Sendecor and Cochran (1967).

RESULTS AND DISCUSSION

1. Yield and yield components:

Values in Table 2 showed that increasing phosphorus level up to 60Kg P205/ fed. gave significant increase in plant hight, number of branches and pods/plant, 100-seed weight and yield of straw and seed in both seasons compared to control. The positive response of these characeters to P application might be brought by the favourable effects of this element on plant growth, as expressed by plant height and number of branches/plant, and the rate of photosynthesis due to the increased amounts of metabolites synthesized by plants which , in turn, increased the number of pods/plant, seed filling, 100-seed wieght and seed yield . These results are in agreement with Lin (1959), Moursi *et al.* (1976), Ozanne *et al.* (1976), Crosta and Tallarice (1983) ABd-El Hady (1987), and Amin (1987). The low rate of K fertilization (48Kg K20/fed.) signifcantly decreased number of branches and pods/plant and insignificantly decreased seed yield /fed but increased 100- seed weight compared

Table 2. Effect pf different fertilizer treatments on yield and yield compnents of lupin in 1985/ 1986 and 1986/1987 seasons.

Fertilizer Treatments /Fed	Plant height (cm)		Number of branch-es/plant		Number of pods/ plant		100-seed weight (gm)		Seed yield/ fed.(Ardab)		Straw yield/ fed .(ton)	
	85/86	86/87	85/86	86/87	85/86	86/87	85/86	86/87	85/86	86/87	85/86	86/87
Control (Without P and K)	56.9	40.2	14.2	12.6	11.1	10.5	25.06	24.06	5.21	5.04	0.85	0.78
30kg P205	63.1	44.5	16.5	15.2	12.4	11.7	26.16	25.15	6.21	6.12	0.94	0.85
45kg P205	64.8	45.4	17.5	15.6	13.2	12.3	26.31	25.33	6.43	6.17	1.07	1.00
60kg P205	68.3	48.1	19.3	17.8	15.7	13.7	27.46	26.84	6.99	6.75	1.08	1.01
75kg P205	61.4	43.4	15.0	14.0	13.2	12.1	26.79	25.87	5.64	5.38	0.94	0.87
48kg K20	57.1	70.7	12.7	11.4	8.5	8.1	27.69	26.77	5.05	4.93	0.85	0.78
72Kg K20	57.9	41.1	18.6	17.2	10.8	9.4	56.57	25.55	5.24	5.14	0.91	0.84
30 Kg P205+48 Kg K20	61.0	43.0	15.4	14.3	11.5	10.9	25.12	24.12	5.47	5.20	1.06	0.99
30 Kg P205+48 Kg K20	62.0	43.3	16.0	14.6	12.1	11.4	234.65	23.61	5.61	5.35	1.00	0.85
45 Kg P205+48 Kg K20	62.6	44.1	15.4	15.2	12.2	11.5	24.95	23.95	5.20	5.00	1.08	1.01
45 Kg P205+48 Kg K20	63.0	44.5	17.9	15.8	11.3	10.7	25.81	24.49	5.34	5.18	0.96	0.85
60 Kg P205+48 Kg K20	70.6	48.3	19.5	18.4	14.7	12.7	25.49	24.49	5.50	5.26	1.13	1.06
60 Kg P205+48 Kg K20	62.3	43.9	19.3	17.4	13.6	12.5	27.58	26.57	6.61	6.49	1.09	1.02
75 Kg P205+48 Kg K20	60.5	43.0	19.1	16.4	12.3	11.6	24.60	23.51	5.31	5.15	1.06	0.99
75 Kg P205+48 Kg K20	62.1	44.0	13.9	12.2	11.4	10.6	26.14	25.14	5.56	5.35	1.04	0.94
L.S.D. at 0.05	2.4	1.7	1.2	1.1	1.7	1.2	1.08	0.67	0.53	0.5	0.18	0.08

to control . However , the rate of 72Kg K20/fed. caused significant increase in number of branches / plant but insignificant increase in seed and straw yields/fed. In this connection, Chornyi (1983) found that addition of K increased the seed yield, on the other hand , Crost and Tallarico (1983) found that seed yield of white lupin decreased by increasing K levels. It was also observed from Table 2 that P application at 60Kg P205 in combination with 48 or 72Kg K20 fed. gave significant increases in number of branches and pods/ plant, wheresas the same level of P combined with 48 Kg K20/fed. significnatly increased plant height and straw yield /fed. On the other hand, 100-seed weight and straw yield/fed. were found to be significantly increased by the combination of 60 Kg P204 and 72Kg K20/fed . This may be due to that P counteracted the reduction effect of K when used alone. It could be concluded that phosphorus application at 60Kg P205/fed alone was the most favourable treatment for lupin fertilization.

2. Chemical contents of seed

Seed contents of protein, P and K showed significant increases due to P application up to 60 Kg P205/fed, as compared to control as shown in Table 3.

Table 3. Effect of different fertilizer treatments on protein, phosphorus and potassium percentage in lupin seeds during 1985/1986 and 1986/1987 seasons.

Fertilizer Treatments /Fed	Protein (%)		Phosphorus (%)		Potassium (%)	
	85/86	86/87	85/86	86/87	85/86	86/87
Control (Without P and K)	36.14	34.49	0.28	0.34	1.03	0.99
30kg P205	37.06	36.11	0.30	0.37	1.04	1.00
45kg P205	38.77	37.55	0.31	0.39	1.08	1.06
60kg P205	38.77	38.53	0.33	0.42	1.12	1.13
75kg P205	39.85	34.39	0.31	0.38	1.03	0.99
48kg K20	36.14	33.60	0.27	0.33	1.10	1.08
72Kg K20	35.80	29.06	0.30	0.37	1.11	1.09
30 Kg P205+48 Kg K20	31.20	27.70	0.30	0.37	1.11	1.09
30 Kg P205+48 Kg K20	28.52	28.72	0.30	0.41	1.12	1.06
45 Kg P205+48 Kg K20	29.80	32.36	0.33	0.35	1.08	1.10
45 Kg P205+48 Kg K20	35.79	33.53	0.29	0.35	1.10	1.08
60 Kg P205+48 Kg K20	35.85	30.86	0.32	0.39	1.10	1.08
60 Kg P205+48 Kg K20	33.21	28.05	0.30	0.37	1.12	1.10
75 Kg P205+48 Kg K20	29.30	29.82	0.31	0.38	1.12	1.10
75 Kg P205+48 Kg K20	34.43	29.05	0.32	0.39	1.10	1.08
L.S.D. at 0.05	31.25	2.46	0.02	0.03	0.04	0.06

Similar results were also obtained by Abd El-Hady (1987) and Amin (1987). Both rates of K fertilization decreased protein content and increased P and K contents of lupin seed during the both seasons espcially the higher rate (72Kg K20/fed.) which gave significant differences compared to control. All combination treatments induced significant increments in protein, P and K percentages in lupin seed over the control during the both seasons except for the combination of 45 Kg P205 /fed. with 48 or 72Kg K20/fed . These results are in agreement with Abd El-Hadi *et al.* (1984). Finially, it could be concluded that application at 60Kg P205/fed . alone was the best treatment for lupin growth in sandy soils.

REFERENCES

1 . Abd El-Hadi, A.H., H.H.Mohamed and A.F. Monsour . 1984. Effect of phosphorus and postassium fertilizers on some leguminous crops in Egyptian soils. The 2nd General conference of A.R.C. Giza, 9-11 April.

2 . Abd El-Hady, M.S. 1987. Response of growth and yield of lupin (Lupins termis, L.) to bacterial inoculation and phosphorus fertilization in Noba area. M.Sc. Thesis, FAc. Agric., Ain Shams Univ.

3 . Altunin, D.A., V.V. Buzmarkov and F.S. leontev. 1978. Biological peculiarities of development of abovrground mass of annual yellow lupin in relation to fertilizers. Referativnyl Zhurnal, 6:55-345. (c.f. Field crop Abst., 32(7) : 4692, 1979).

4 Amin, A.A.E. 1987. Effect of planting date and phosphatic fertilizer on growth and yield of (Lupinus termis L.) in Noba area. M.Sc. Thesis, Fac. Agric., Ain Shams Univ.

5 . A.O.A.C. 1970. Official methods of analyses. 12th . Edn, Association of Official Agricultural Chemists , Washington, D.C.

6 . Bonari, E. 1973. Yield of lupin (Lupinus albus, L.) and the advantage of its introduction into rations typically used on sandy soil Agricoltura Italiana, 78 (2) ; 77-84 . (c.f. Field Crop Abst., 27 (9) : 46606, 1974).

7 . Chronyi, D.L. 1983. Effect of magnesium and potassium fertilizers on yield and quality of fodder lupin. Khimiya V Sel's Kom Khozyaistve, 21 (2) :22-23 (c.f. Field Crop Abst., 37 (9) : 6867 , 1984).

8 . Crosta, G. and R. Tallarico 1983. . Influence of fertilizer on seed yields of white lupin. Informatore Agrario., 39(2) : 23893 - 23895., 23898 - 23899. (c.f. Field Crop Abst., 36 (9) :7641, 1983)

9 . Gataulina, G.G. and V.E. Mishkina. 1972. Mineral nutrition and N accumulation in white lupin . Izvestiya Timiryazevekoi Sel's Kokhozyaistvennoi Akademii,

4:73-85. (c.f. CAB. Q 07402080 : G 06122341 - Page135 Oct. 1984)

10 . Ivanov, I.A. 1979. Effect of nitrogen, phosphorus and potassium fertilizers on fresh fodder yield of white lupin grown in high regions of the central Rhodope mountains. Rasteniev" dni Nauki, 16 (2) 123 - 131. (c.f. CAB-G06122431 : S 3367002 Page134 Oct. 1984).

11 . Jackson, M.L. 1968. Soil chimical analysis , prentice Hall, of India Private limited, New Delhi pp. 251 - 280.

12 . Karczmarczyk, S., S. Laskowki. and B. Biniak. 1978. The effect of supplementary irrigation and mineral fertilization on yields of lupin and field bean grown on two types of soil, Part 1. Growth, development and yield of lupin and field bean. Zeszyty Naukowe Akademii Roiniczej W Szczecinie, Rolnictwo, 72:75-96 (c.f. Field Crop Abst., 35 (6) : 5349, 1982).

13 . Lin, C.F. 1959. Effect of phosphorus and potash on the growth , yield and mineral composition of yellow lupin (lupinus luteus L.) in connection with their residual effects (chinese). J. Agric. Assoc-China, 28-38. (c.f. CAB. G 06122431 Page 153 Oct. 1984).

14 . Mikhailet's V.I. 1972 Response of different yellow fodder cultivars to the application of fertilizers. Referativnyi Zhurnal, 10:55-499. (c.f. CAB. G 06122431 Page 153 Oct. 1984).

15 . Moursi, M.A., N.A. Nour El-din and M.A. Mansour . 1976. Capacity and abscission of flowers and pods of Egyptian lupin plants. 1-Effect f nitrogen and phosphorus. Egypt. J. Agron., 1(1) : 1-19.

16 . Ozanne, P.G., K.M.W. Howes and "Ann Petch. 1976. The comparative phosphate requirements of four Annual Pastures and Two Crops. Aust. J. Agric. Res., 27:479-488.

17 . Sheveleva, L.K. 1978. Chemical composition and nutrient uptake in yield of vetch Lupin, Soybean and phaseolus Vulgaris in relation to the mineral nutrtion level. Referativnyi Zhurnal, 2.55. 230. (c.f. CAB. Q 09906200 Page141 Oct. 1984).

18 . Snedecor, G.W. and W.G. Cochran. 1967. Statistical methods. Oxford and I-B-H Publishing G.6th ed. P.P. 299-310.

تأثير بعض المعاملات العادية علي الترمس في الأراضي الرملية

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أقيمت تجربتان حقليتان في محطة البحوث الزراعية بالاسماعلية خلال موسمي الزراعة ١٩٨٦/٨٥ ، ١٩٨٧/٨٦ لدراسة تأثير أربعة معدلات من التسميد (٣٠،٤٥،٦٠،٧٥ كجم فو ٢، ٥/فدان)

ومعدلين من التسميد البوتاسي (٤٨ ,٧٢ كمجم بو ١٢/فدان) والتوافق بينهما علي المحصول ومكوناته ومحتوي البذور من البروتين والفوسفور والبوتاسيوم في الترمس المصري (جيزة ٢) تحت ظروف الاراضي الرملية، وقد اضيفت هذه الاسمدة علي دفعتين متساويتين الاولي عند الزراعة والثانيه بعد ٢١ يوم من الزراعه ، وقد أضيفت هذه الأسمده علي دفعتين متساويتين الاولي عند الزراعه والثانية بعد ٢١ يوم من الزراعة ، وقد اضيف السماد الازوتي لجميع القطع التجريبية بمعدل ١٥ كجم أزوت/ فدان بعد ٢١ يوم من الزراعة . وقد أوضحت النتائج أن اضافة السماد الفوسفاتي بمعدل ٦٠ كجم فو ٢ ٥١/ فدان منفردا او مخلوطا مع ٤٨ كجم بو ١٢ / فدان أدي الي زيادة معنوية في طول النبات وعدد الافرع والقرون/ نبات بينما خلطة مع ٧٢. كجم بو ١٢ / فدان أدي الي زيادة معنوية في وزن ١٠٠ بذرة ومحصول القش والبذور /فدان ، كما اوضحت النتائج أن زيادة معدل التسميد الفوسفاتي الي ٦٠ كجم فو ٥١٢/ فدان أدي الزيادة محتوي البذور من البروتين والفوسفور والبوتاسيوم. وان اضافة السماد البوتاسي بمعدل ٧٢ كجم بو ١٢/ فدان ادي الي نقص محتوي البروتين في البذر وزيادة محتواها من الفوسفور والبوتاسيوم وكذلك اظهرت معاملات التوافق بين كلا السمادين زيادة محتوي البذور من البروتين والفوسفور والبوتاسيوم.

هذا ويمكن من خلال هذه النتائج التوصية باضافة السماد الفوسفاتي بمعدل ٦٠كجم فو ٥١٢ للفدان لنباتات الترمس المنزرع في الأراضي الرملية.