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Effect of Lime and Phosphorus Levels on Nutrient Uptake by Groundnut Genotypes in Acid Soils of Coastal Agro Eco System of Karnataka*

Availablity of Al, Fe and Mn increases in acid soils due to their higher dissolution and at times becomes toxic. Under acidic conditions, calcium and magnesium supply is reduced and plant growht sulfers. In addition to these, other beneficial nutrients such as nitrogen, phosphorus and sulphur are also in deficient concentration. The low yields of gorundnut are due to poor pod filling in acid soils, due to poor calcium supplying power of soils and restricted uptake of N, P, K, S and Mg. In view of the above facts, a field experiment was conducted at Mirjan village of Kumta taluk (Uttara Kannada dist.) to study the effect of lime and phosphorus levels on nutrient uptake by the groundnut genotypes, during rabi / summer, 2004. The soil sample of experimental site was acidic with pH 4.66, exchangeable acidity 27.00 cmol (+) /kg. Soils were low in available N (130kg/ha), P(7.42kg/ha) and K (40.00kg/ha) status. Based on the lime requirement (3.70t/ha), three levels of lime viz., zero, half and full dose of the lime requirement(LR) were tried along with three levels of phosphorus viz., 50, 100 and 150 per cent recommended dose of P (RDP). a basal dose of 25:25 kg per ha of N and K_2O was applied to the crop. Liming material ($CaCO_3$) was applied to the field three weeks before sowing. The crop was sown with a spacing of 30 x 10 cm and harvested at 105 days after sowing. Plant samples were collected after the harvest of the corp and analysed for N, P, K and Ca content by following standard analytical techniques. The nutrient uptake was worked out using the following equation.

$$\text{Nutrient uptake (kg/ha)} = \frac{\text{Nutrient content (\%) x Dry matter (kg ha}^{-1}\text{)}}{100}$$

There was a significant difference between two genotyeps with respect to dry matter production. Genotype GPBD4 recorded higher dry matter production than the genotype Dh86. Both the genotypes responded to the application of lime (Table 1). Increased dry matter yield of groundnut due to liming is attributed to the beneficial effect of ameliorating the soil, which increased the Ca - saturation and availability of major nutrients, especially nitrogen. Higher vegetative growth in GPBD4 must have caused efficient extraction of nutrients resulting in higher dry matter production as compared to Dh86.

There was a signficant difference between two genotypes with respect to nitrogen uptake. Nitrogen uptake by Dh86 was more than that of GPBD4. The total nitrogen uptake signficantly differed in relation to different levels of lime applicaiton. Application of 100% lime requirement recorded higher total nitrogen uptake (228.41 kg/ha) than other levels of lime. Addition of $CaCO_3$ increased soil pH and might have accelerated the process of mineralization of nitrogen which inturn promoted the uptake of nitrogen by groundnut. Furtehr, increase in nitrogen content and uptake may also be attributed to enhanced nitrogen fixation. Similar results were also reported by Doddamani (1975) and Patil and Ananthanaryana (1989) when acid soils were limed.

Table 1. Effect of lime and phosphorus levels on total dry matter (g/plant) Production of groundnut genotypes

Lime levels	Phosphorus level (kg/ha)			
	37.5 kg P_2O_5/ha	75 kg P_2O_5/ha	112.5 kg P_2O_5/ha	Mean
	Dh 86			
No lime	15.00	17.04	19.11	17.05
1.85	16.34	18.20	20.82	18.46
3.7	17.34	20.65	22.84	20.28
Mean	16.23	18.64	20.93	18.60
	GPBD4			
No lime	23.77	26.01	27.98	25.92
1.85	25.07	27.05	30.04	27.39
3.7	26.22	28.83	32.01	29.02
Mean	25.00	27.30	30.01	27.44
	Lime and phosphorus interaciton over genotypes			
No lime	19.39	51.53	23.55	21.49
1.85	20.71	22.64	25.43	22.92
3.7	21.78	24.74	27.43	24.65
Mean	20.63	22.97	25.47	23.02

For comparing means of

	SEm ±	CD at 5%
G	0.080	0.485
L	0.131	0.427
P	0.145	0.424
G x L	0.171	NS
G x P	0.206	NS
L x P	0.244	0.87
Gx L x P	1.130	NS

G - Genotyep (main factorL - Lime(sub-factor)P - Phosphorus (sub sub-factor)

The applicaiton of different levels of phosphorus also signficantly influenced the nitrogen uptake. The crop receiving 150% RDP recorded higher nitrogen uptake than other levels of phosphorus. Higher level of P application might have synergistic effect on N uptake by groundnut genotypes.

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Phosphorus uptake by groundnut genotypes was signficantly influenced by lime levels. Phosphorus uptake by Dh86 was more than that of GPBD4. Application of 100% LR recorded higher total phosphorus uptake (25.76 kg/ha) than other levels. The application of phosphorus influenced the phosphorus uptake signficantly. Phosphorus application at 150% RDP recorded maximum phosphorus uptake than other levels. The increase in P uptake due to liming may be due to the fact that it breaks the Al and Fe phosphates in soil, thereby making P available to plant. Besides, available P status increse may be due to increse in mineralization of organic P as affected by lime (Haynes, 1992). Increase in the uptake of phosphorus due to liming was also observed in groundnut by Bheemaiah and Anathanarayana (1984) and Patil and Ananthanarayana (1989) and in soybean by Prasad *et al*. (1985). There was a signficant differnece between the groundnut genotypes with respect to potassium uptake. Potassium uptake by Dh86 was more than that of GPBD4. The potassium uptake differed signficantly with different levels of lime. The total potassium uptake by groundnut was signfiantly influenced by differenet levels of lime. The lime applicaiton at 100% LR recorded higher total potassium uptake (46.11 kg/ha) than other lime levels. The antagonistic effect between Ca and K is evident at higher levels of lime addition to hte soil. This is not reflected in K uptake because of signfiant increse in dry matter. These results are in confirmity with those of Ananthanarayana and Perur (1972), Sudhir (1983) and Patil (1986). The applicaiton of different levels of phosphorus influenced the Potassium uptake signficantly. The 150% RDP recorded maximum potassium uptake than other levels of phosphorus. There was signficant influence of the genotyeps with respect to calcium uptake by groundnut. The total calcium uptake differed signficantly with respect to applicaiton of different levels of lime. Applicaiton of lime at 100% LR recorded highest total calcium uptake (118.42 kg/ha) compared to other lime levels. The application of differnet levles of phosphorus signficantly influenced the calcium uptake. Signficantly higher calcium uptake was observed with 150% RDP than the other

Table 2: Effect of lime and phosphorus levels on uptake of Nutrients (kg / ha) by groundnut genotypes

Lime levels (t/ha)	Nitrogen uptake 37.5 (kg P_2O_5/ha)	75	112.5	Mean	Phosphorus uptake 37.5 (kg P_2O_5/ha)	75	112.5	Mean	Potassium uptake 37.5 (kg P_2O_5/ha)	75	112.5	Mean	Calcium uptake 37.5 (kg P_2O_5/ha)	75	112.5	Mean
Dh86																
No lime	145.80	159.20	173.20	159.60	13.24	14.91	17.75	15.30	34.91	39.61	43.74	39.42	72.62	80.44	85.57	79.54
1.85 t/ha	186.01	199.20	215.12	200.11	16.69	20.99	23.59	20.42	39.38	43.88	48.85	44.03	88.76	96.84	105.58	97.06
3.7 t/ha	222.44	236.30	264.60	239.23	24.24	25.73	29.41	26.46	43.06	47.81	51.33	47.40	111.44	119.17	124.91	118.50
Mean	184.75	196.34	217.64	199.58	18.06	20.54	23.58	20.73	39.11	43.76	47.97	43.61	90.94	98.82	105.35	98.36
GPBD 4																
No lime	132.80	146.15	159.14	146.03	12.60	14.63	16.78	4.67	32.79	37.00	41.03	36.94	71.32	78.79	84.79	78.29
1.85 t/ha	166.20	178.48	189.25	177.98	17.10	19.77	22.00	19.62	36.78	41.61	44.81	41.06	89.22	91.19	101.89	96.10
3.7 t/ha	196.18	215.60	241.03	217.60	22.40	24.17	28.64	25.07	40.43	44.69	49.35	44.82	110.55	120.04	124.44	118.34
Mean	165.06	180.08	196.47	180.54	17.37	19.52	22.47	19.79	36.66	41.10	45.06	40.94	90.36	98.67	103.71	97.92
Lime and phosphorus interaction over genotypes																
No lime	139.30	152.67	166.17	152.72	12.92	14.77	17.26	14.98	33.85	38.30	42.38	38.18	71.96	79.62	85.18	78.92
1.85 t/ha	176.11	188.84	202.18	189.04	16.89	20.38	22.79	20.02	38.08	42.74	46.83	42.55	88.99	97.02	103.74	96.58
3.7 t/ha	209.3 1	223.12	252.82	228.41	23.32	24.95	29.03	25.76	41.74	46.25	50.34	46.11	110.99	119.60	124.67	118.42
Mean	174.91	188.21	207.06	190.06	17.71	20.03	23.02	20.26	37.89	42.43	46.52	42.28	90.65	98.75	104.53	97.97

For comparine: means of

	SEm+	CD at 5%	SEm+	CD at 5%	SEm+	CD at 5%	SEm+	CD at 5%
G	0.083	0.51	0.123	0.75	0.042	0.250	1.525	2.280
L	0.102	0.34	0.151	0.49	0.035	0.120	4.012	2.580
P	0.083	0.24	0.161	0.47	0.059	0.170	4.194	NS
GxL	0.144	NS	0.213	NS	0.058	NS	4.877	NS
GxP	0.118	NS	0.227	NS	0.084	NS	5.932	NS
LxP	0.156	0.55	0.273	0.97	0.091	NS	7.161	3.360
G x LxP	0.722	NS	1.285	NS	0.447	NS	12.530	NS

phosphorus levels. Groundnut corp is a heavy feeder of calcium, it responds well with the increase of calcium in solution. Solution concentration of calcium was enhanced appreciably with the addition of lime. So, the calcium content of the plant incresed sequentially. Increase in the calcium content and uptake was observed in groundnut due to liming by Bheemaiah and Ananthanrayana (1984), Prasad *et al*. (1983). Decrese in calcium uptake at higher doses of calcium addition to the soil is due to hte lesser yield and not due to lowering of calcium content. This is in confirmity with the findings of Grimme (1977). In the present study, the results indicated that with the applicaiton of lime alone or in combination with phosphatic fertilizer influenced the uptake of nutrients by the two groundnut genoyteps. Nutrients uptake by Dh86 was more than that of GPBD4 due to its higher pod yield inspite of high vegetative gorwth of GPBD4. The lime application along with phosphatic fertilizer favoured the utpake of N, Ca and P but restricted the K uptake under acidic soil condition.

Department of Soil Science and Agriculture Chemistry
University of Agricultural sciences, Dharwad - 580 005
Karnataka, India.

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R. RANJIT
G. S. DASOG
P. L. PATIL

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