

EFFECT OF CALCIUM, POTASSIUM AND MAGNESIUM ON GROWTH, YIELD AND SHELLING PERCENTAGE OF GROUNDNUT IN RED LOAM SOILS OF KERALA

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Red loam soils of Kerala have been found to be suitable for groundnut cultivation. These soils are generally poor in bases like calcium, magnesium and potassium. Nagarajan (1959), Chakraborty *et al* (1961), Panikker (1961) and Kothandaraman (1964) reported good response of groundnut to these nutrients in soils deficient in them. Preliminary studies conducted in red loam soil also indicated similar results. The present investigations were hence undertaken to study fully the effect of different levels of calcium, magnesium and potassium on the growth, yield and shelling percentage of groundnut under red loam soil conditions of Kerala.

Material and Methods

The studies were made by pot culture method for a period of three years during 1964-'65, 1965-'66 and 1966-'67 at the Agricultural College, Vellayani, using the groundnut variety TMV. 2, a bunch type with a duration of about 4 months. A basal dressing of 10 metric tons of farm yard manure, 10 kg of nitrogen and 4 kg of P_2O_5 per hectare were applied uniformly to all the pots. Nitrogen and phosphoric acid were applied as ammonium sulphate and super phosphate respectively. The experimental treatments consisted of 3 levels of lime viz , 0, 1000 and 2000 kg/ha;

3 levels of K_2O (as muriate of potash) viz , 0, 25 and 50 kg/ha and 3 levels of Mg (as magnesium carbonate) viz., 0, 20 and 40 kg/ha. There were 27 treatment combinations which were replicated twice in a randomised block design. Lime was given a fortnight before sowing while muriate of potash and magnesium carbonate were applied just before sowing. Three plants were maintained in each pot for the study.

Red loam soil with the following chemical analysis on oven dry basis was used for the experiments.

Moisture	1.50 Per cent.
Loss on ignition	8.35 „
Total nitrogen	0.09 „
Available nitrogen	0.04 „
Total phosphoric acid	0.17 „
Available phosphoric acid	Very low
Total potash	0.09 Per cent.
Calcium (CaO)	0.27 „
Magnesium (MgO)	0.08 „
pH	5.5 „

Results and Discussion

Yield of pods: The results presented in Table 1 show that the pod yield is significantly increased by application of lime, potash and magnesium. There is a progressive increase in the yield of pods corresponding to the level of these nutrients. The yield increases by 30 and 58 percent by the application of 1000 and

Table 1

Mean pod and haulm yields of groundnut under different manurial treatments
in different years.

Treatments	Pod yield gm/pot				Haulm yield gm/pot			
	'64—'65	'65—'66	'66—'67	Mean	'64—'65	'65—'66	'66—'67	Mean
Cao	38·39	53·58	47·69	46·55	100·20	137·18	125·30	120·89
Ca ₁	53·39	69·88	65·33	62·87	164·62	202·76	209·76	192·38
Ca ₂	64·60	87·06	69·52	73·73	235·96	295·32	252·59	261·29
F. test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
C. D. (0·05)	2·27	3·99	3·99	1·77	5·14	19·83	9·43	4·47
K ₀	45·19	60·25	50·07	51·84	139·79	178·05	150·71	156·19
K ₁	51·78	70·33	62·80	61·54	165·31	207·94	199·67	190·97
K ₂	59·42	79·93	69·97	69·77	195·68	249·27	237·28	227·41
F. Test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
C. D. (0·05)	2·27	3·99	3·99	1·77	5·14	19·83	9·43	4·47
Mg ₀	49·03	66·22	56·71	57·32	156·73	200·39	179·37	178·83
Mg ₁	52·19	70·08	61·30	61·19	167·56	211·16	195·68	191·47
Mg ₂	55·17	74·22	64·53	64·64	176·49	223·70	212·60	204·26
F. Test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
C. D. (0·05)	2·27	3·99	3·99	1·77	5·14	19·83	9·43	4·47

Table 2

Mean shelling percentage and number of root nodules of groundnut under different manurial treatments in different years

Treatments	Shelling percentage				Number of root nodules/plant			
	'64—'65	'65—'66	'66—'67	Mean	'64—'65	'65—'66	'66—'67	Mean
Ca ₀	73.10	76.81	80.02	76.65	63.27	69.16	86.94	73.12
Ca ₁	74.76	81.46	84.94	80.39	74.27	80.61	99.72	84.87
Ca ₂	75.76	84.84	89.57	83.39	85.16	93.72	107.94	95.61
F. Test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
C. D. (0.05)	2.27	3.99	3.99	1.77	5.14	19.83	9.43	4.47
K ₀	71.95	77.01	82.20	77.05	70.55	76.33	94.44	80.44
K ₁	74.90	81.38	85.07	80.45	74.27	81.50	98.50	84.76
K ₂	76.77	84.72	87.27	82.93	77.89	85.66	101.66	88.41
F. Test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
C. D. (0.05)	2.27	3.99	3.99	1.77	5.14	19.83	9.43	4.47
Mg ₀	74.47	80.93	83.83	79.75	73.77	80.28	97.44	83.83
Mg ₁	74.59	81.04	85.03	80.22	74.16	81.22	98.11	84.50
Mg ₂	74.57	81.14	85.68	80.46	74.77	82.00	99.05	85.28
F. Test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
C. D. (0.05)	2.27	3.99	3.99	1.77	5.14	19.83	9.43	4.47

2000 kg/ha respectively of lime. Potash at 25 and 50 kg/ha increases the yield by 24 and 38 per cent respectively, while the response to magnesium is 10 and 20 per cent increase at 20 and 40 kg/ha respectively. The analysis of variance shows that the interaction of calcium and potash is significant. Maximum pod yield is recorded by the treatment receiving the highest doses of these nutrients. Similar responses to these nutrients were reported earlier by Gilliar and Orgias (1952), Piggot (1960), Chakraborty *et al* (1961) and Panikker (1961). The response obtained to the application of calcium, magnesium and potash on pod yield can be attributed to the low content of these nutrients in the soil under study as is observed by Kothandaraman (1964).

Yield of haulms' The haulm yield as given in Table 1 shows a similar trend as that of the pod yield. Application of calcium, potash and magnesium has increased the haulm yield significantly at all levels. The* increases over the control are 60 and 11~ percent for the 2 levels of lime 22 and 45 per cent for the 2 levels of K_2O and 7.5 and 15 per cent for the 2 levels of Mg.

Root nodules: Table 2 shows that the number of bacterial nodules is significantly increased by the application of the nutrients under study eventhough the interaction effects of the treatments are not significant. Similar observations were previously reported by Mann (1935), Nagarajan (1959) and Steward (1963).

Shelling percentage: The data presented in Table 2 show that the shelling percentage is increased by calcium and potash.

Magnesium application has influenced this character only upto 20 kg/ha beyond which the increase is not significant. The Interaction between calcium and potash is also significant. Similar beneficial effect of these nutrients on shelling percentage was recorded by Colewell and Brady (1945) and Strabss and Grizzard (1948). It is also seen from the results that application of magnesium in combination with higher levels of calcium and potash does not exert any significant influence on this character, *presumbaly* because of the greater influence of nutrients like calcium and potash on shelling percentage as has been reported by Veera Raghavan (1964).

Summary

From pot culture experiments it was observed that application of calcium, potash and magnesium gave significant increases in the yield of pods, haulms, shelling percentage and root nodule formation in groundnut grown in the red soil of Kerala. Out of the different levels of the nutrients tried, the treatment receiving 2000 kg/ha of lime, 50 kg/ha of potash and 40 kg/ha of magnesium was found to be the best for *maximising* groundnut production.

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