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Influence of Calcium Application on Yield of Groundnut

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Tindivanam soil responded to application of calcium and increased the yield of groundnut shoot (haulm). Calcium addition has brought about increase in the number of matured pods and yield of kernels. Calcium carbonate at 150 kg/Ca/ha gave as much yield as that of calcium sulphate at 75 kg Ca/ha. Shelling percentage was appreciably increased due to calcium application compared to control.

As the consumption of high analysis fertilisers goes up, the deficiency of secondary nutrients becomes more evident because these fertilisers have comparatively low content of secondary nutrients like calcium. The problem is further aggravated when crops like groundnut are more exacting in their demand for not only macro nutrients but alsa secondary nutrients like calcium. Application of calcium as its carbonate and sulphate to groundnut has become a controversial issue in recent years due to lack of experimental evidence on the subject. Hence a study was undertaken to throw light on the influence of calcium on yield of groundnut.

MATERIALS AND METHODS

A pot experiment was conducted with groundnut on two red soils collected from Tindivanam and Pollachi. These two soils were analysed for various physical and chemical characteristics. The treatment combinations indicated in Table 1 were included in the study. Calcium was applied at three levels in the forms of calcium carbonate and calcium snlphate in combination with two levels each of phosphorus, potassium and magnesium which were applied as diammonium phosphate, muriate of potash and magnesium chloride respectively. Constant doses of nitrogen and boron were also applied in the forms of ammonium nitrate and borax respectively. To eight kg of soil taken in each pot calculated amount of fertilizers was added and mixed thoroughly. Calculated quantities of calcium carbonate and calcium sulphate were applied to supply 75 and 150 kg Ca/ha and they were thoroughly mixed with the soil. The experiment was replicated thrice. In all, there were 240 pots consisting of 40 treatment combinations, two soils and three replications. Groundnut seeds of TMV. 7. variety (bunch type) were sown at the rate of five seeds per pot which was thinned to three. The crop was harvested 110 days after sowing and the yield data of pods and shoot were recorded.

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RESULTS AND DISCUSSION

1. Number of matured pots (Table I)

The plants at the time of harvest contained matured, immature and tender pods. The soils did not vary as regards the number of matured pods per pot. Application of calcium has significantly increased the number of matured pods per pot over control. This was in conformity with the finding of Burkhart and Collins (1942) who pointed out that calcium was very beneficial and necessary in the fruiting medium for the production of good pods. At each of 75 kg as well as 150 kg level of calcium per hectare, calcium sulphate form has increased the number of matured pods per pot than calcium carbonate.

Application of 50 kg magnesium was found to increase the number of matured pods per pot over no magnesium in the matter of maturity and filling of pods.

2. Shelling percentage (Table II)

Application of calcium has significantly increased the shelling percentage of groundnut pods compared to no calcium treatment.

3. Yield of groundnut shoot (Table II)

Yield of shoot (haulm) was significantly higher in Tindivanam soil than in Pollachi soil. Application of calcium sulphate has resulted in strikingly higher yield of shoot compared to calcium carbonate and this might be due to increased supply of soluble calcium to the groundnut plant by calcium sulphate in the growth media. A significantly higher yield of haulm was found in the plants which received phosphorus application compared to no phosphorus treatment. Similar observation was made for potassium addition also, which indicated the beneficial effect of phosphorus and potassium in the matter of increasing shoot yield in groundnut.

4. Yield of groundnut kernel (Table II)

The yield of kernel, which was the most important economic part of the plant was increased due to application of calcium. Non-application of calcium has significantly reduced the yield of kernel. Mandal (1973) reported that increase in yield of groundnut was due to increased availability of calcium in soil on account of addition of calcic fertilisers.

The interaction between forms and doses of calcium was significant. Application of 150 kg Ca/ha in the form of calcium carbonate has given higher yield of kernel compared to 75 kg. But in the case of calcium sulphate, application of 75 kg C/ha has given as much yield as 150 kg Ca/ha in the form of $CaCO_3$. This showed that calcium sulphate was a more efficient source of calcium and it was able to release higher amount of soluble calcium even at lower level of application by virtue of its greater solubility.

The interaction of phosphorus and calcium was significant. At P_{α} level, application of calcium has significantly

TABLE I. Number of pods/pot

Treatment	Tindivanam soil				Pollachi soil			
	Matured	Immature	Tender	Total	Matured	Immature	Tender	Total
CaO $P_0K_0Mg_0$	4	2	6	12	10	3	8	21
CaO $P_0K_0Mg_1$	14	7	8	29	16	3	5	24
CaO $P_0K_1Mg_0$	11	10	8	29	15	13	3	31
CaO $P_0K_1Mg_1$	7	26	—	33	10	2	4	36
CaO $P_1K_0Mg_0$	5	5	5	15	19	—	1	20
CaO $P_1K_0Mg_1$	19	10	9	38	18	5	5	28
CaO $P_1K_1Mg_0$	18	19	2	39	8	6	6	20
CaO $P_1K_1Mg_1$	13	1	5	19	12	7	6	25
CaC_1 $P_8K_0Mg_0$	20	4	7	31	10	4	7	21
CaC_1 $P_0K_0Mg_1$	13	7	—	20	21	1	2	24
CaC_1 $P_0K_1Mg_0$	19	3	6	28	9	5	1	15
CaC_1 $P_0K_1Mg_1$	19	4	3	26	15	5	—	20
CaC_1 $P^1K_0Mg_0$	12	5	4	21	10	—	3	13
CaC_1 $P_1K_0Mg_1$	18	14	3	35	9	5	3	17
CaC_1 $P_1K_1Mg_0$	24	10	4	38	5	2	3	10
CaC_1 $P_1K_1Mg_1$	19	11	22	52	6	2	16	24
CaC_2 $P_0K_0Mg_0$	12	3	7	22	8	2	9	19
CaC_2 $P_0K_0Mg_1$	15	23	3	41	16	2	—	18
CaC_2 $P_0K_1Mg_0$	20	7	7	34	15	3	4	22
CaC_2 $P_1K_0Mg_1$	23	3	8	34	12	1	2	15
CaC_2 $P_1K_1Mg_0$	10	5	7	22	16	—	3	19
CaC_2 $P_1K_0Mg_1$	14	15	3	32	20	3	2	25
CaC_2 $P_1K_1Mg_0$	15	9	1	25	15	6	6	27
CaC_2 $P_1K_1Mg_1$	16	9	2	27	18	3	7	28
CaS_1 $P_0K_0Mg_0$	19	4	7	30	14	3	6	23
CaS_1 $P_0K_0Mg_1$	18	8	—	26	20	4	7	31
CaS_1 $P_0K_1Mg_0$	21	—	6	27	15	2	7	24
CaS_1 $P_0K_1Mg_1$	17	7	5	29	14	4	—	18
CaS_1 $P_1K_1Mg_0$	5	16	12	33	19	2	9	30
CaS_1 $P_1K_0Mg_0$	24	9	2	35	17	3	5	35
CaS_1 $P_1K_0Mg_0$	19	4	—	23	18	4	15	37
CaS_1 $P_1K_1Mg_0$	12	12	3	27	30	6	6	42
CaS_2 $P_7K_1Mg_1$	18	13	1	32	20	6	2	28
CaS_1 $P_0K_0Mg_0$	13	8	9	30	15	3	3	21
CaS_2 $P_0K_0Mg_1$	14	20	8	42	11	6	9	26
CaS_2 $P_0K_1Mg_1$	14	9	11	34	11	—	7	18
CaS_2 $P_0K_1Mg_1$	11	8	11	30	13	8	10	31
CaS_2 $p_1K_0Mg_1$	19	8	7	34	13	7	6	26
CaS_2 $P_1K_1Mg_0$	20	18	9	47	12	5	3	20
CaS_2 $P_1K_1Mg_1$	15	8	7	30	19	7	7	33

CaC = Calcium not applied (Control)
CaC_1 = Calcium carbonate, 75 Kg Ca/ha
CaC_2 = Calcium carbonate, 150 Kg Ca/ha
CaS_1 = Calcium sulphate, 75 Kg/ha
CaS_2 = Calcium sulphate, 150 Kg/ha

Levels of phosphorus

P_0 — No phosphorus
P_1 — 40 Kg P_2O_2/ha

Levels of potassium

K_0 — No potassium
K_1 — 60 kg K_2O/ha

Levels of magnesium

Mg_0 — No magnesium
Mg_1 — 50 kg Mg/ha

TABLE II. Yield of groundnut (g/pot)

Treatment @	Shoot		Kernel		Shell		Total dry		Shelling %	
	TVM	POL	TVM	POL	TVM	POL	TVM	POL	TVM	POL
1	18.87	14.53	1.89	5.16	0.90	2.31	21.66	22.00	68.0	69.1
2	24.47	17.59	6.94	7.56	2.87	3.55	34.28	28.70	70.7	68.1
3	21.84	21.43	5.32	8.63	2.56	3.44	29.72	32.50	65.5	71.3
4	24.96	19.01	6.44	5.65	4.14	2.10	35.54	26.76	60.7	73.0
5	23.83	19.80	3.27	10.92	1.20	3.25	28.30	34.27	73.0	76.9
6	26.83	20.45	12.03	9.87	4.29	3.79	43.15	34.11	73.8	72.0
7	27.64	21.69	8.33	4.42	4.74	2.47	47.01	28.58	63.6	64.2
8	29.76	21.88	7.48	8.52	2.33	3.61	39.57	35.99	76.2	70.4
9	23.32	16.86	10.87	7.96	3.43	2.73	38.62	27.55	76.0	74.4
10	23.45	17.71	8.97	10.51	2.88	3.49	35.30	31.71	75.4	75.0
11	24.54	21.95	11.12	6.41	3.27	2.49	38.93	30.85	77.0	72.0
12	22.10	18.23	10.21	8.89	3.12	2.64	35.43	38.28	76.8	77.4
13	26.76	22.64	8.01	6.28	3.40	2.67	38.17	31.59	70.3	73.4
14	18.76	28.24	4.89	5.26	1.86	1.42	25.60	34.92	72.5	78.7
15	25.37	25.00	10.93	3.31	3.69	1.24	39.99	29.55	74.8	72.7
16	28.88	24.59	9.13	2.63	5.40	1.97	43.41	29.19	64.3	57.0
17	23.74	20.33	7.04	5.94	2.31	2.22	33.09	28.49	75.3	72.8
18	21.13	14.68	10.17	8.85	5.66	2.76	35.98	26.29	64.5	76.3
19	30.96	22.11	12.47	6.70	3.75	2.79	47.18	31.60	77.0	70.5
20	22.99	19.60	11.42	7.02	3.53	2.13	37.82	28.75	76.6	76.7
21	25.02	20.26	6.20	10.36	2.34	2.97	33.56	33.59	72.6	77.8
22	20.71	23.02	7.95	11.27	3.75	3.01	32.40	37.30	68.0	78.8
23	26.89	19.19	10.58	9.39	3.14	3.26	40.61	31.84	77.3	74.5
24	27.43	20.22	6.45	10.00	2.51	2.69	36.39	32.91	72.1	78.0
25	23.40	17.76	9.48	8.30	3.30	3.12	36.18	29.18	74.1	72.8
26	22.53	22.16	10.97	11.75	2.74	3.76	36.24	37.67	80.0	76.1
27	22.63	21.80	10.66	9.75	3.66	2.99	36.95	34.54	74.5	76.7
28	23.82	13.92	8.22	7.34	3.38	2.26	35.42	23.52	70.9	76.4
29	28.32	25.18	4.34	12.46	3.89	4.31	36.37	41.95	53.0	74.0
30	27.05	22.70	7.55	9.27	3.70	3.20	38.30	35.17	62.0	74.0
31	19.79	26.90	9.63	10.57	3.54	3.91	32.96	41.40	73.0	72.9
32	23.14	27.03	7.56	14.17	3.06	4.80	33.77	46.00	71.4	74.9
33	21.97	22.62	11.70	11.98	3.64	4.03	27.31	38.63	76.4	74.9
34	23.27	17.45	9.77	4.26	3.18	3.18	36.06	30.40	68.1	7.57
35	21.32	22.46	7.83	2.58	4.04	2.77	33.59	27.81	65.8	75.0
36	24.39	14.38	9.38	7.12	3.32	2.01	37.09	23.51	73.8	77.6
37	29.35	20.34	6.54	8.40	2.87	3.83	38.76	32.57	69.5	68.8
38	25.86	22.43	11.71	7.25	4.23	2.73	41.80	32.41	73.6	72.6
39	23.72	26.98	11.09	6.19	4.39	2.67	39.20	35.36	71.5	70.0
40	29.65	23.54	10.52	7.25	3.77	3.50	44.94	34.29	73.5	67.0

TMV — Tindivanam soil. POL — Pollachi soil

@ The treatments are the same as in Table I.

increased the yield whereas at P_{40} level application of calcium and control were on a par. Piggot (1960) pointed out that increase in yield of groundnut obtained with superphosphate was due to its calcium content rather than phosphorus. This indicated that the effect of calcium in increasing yield of kernel was very well pronounced in the absence of phosphorus. But in the presence of phosphorus, perhaps, calcium was not able to influence yield. Calcicm might have been participated as calcium phosphate.

5. Yield of groundnut Shell (Table II)

Yields of hell was significantly higher in Tindivanam soil than Pollachi soil. Though Pollachi soil recorded low yield this soil contained high amounts of all available nutrients except calcium. Therefore the higher yield in Tindivanam soil may be attributed to higher content of available calcium. In that case, it can be stated that more than any other nutrient element calcium was the significant deciding factor in the matter of yield, the deficiency of which definitely reduced groundnut yield. This conclusion of the present study is strengthened by the observation of Bolhuis and Stubbs (1955) who have stated that calcium was the only element that had a favourable influence on fructification and the presence of calcium was absolutely essential than any other nutrient element.

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REFERENCES

BOLHUIS, G. G., and R.W. STUBBS. 1955. The influence of calcium and other elements on the fructification of the peanut in connection with absorption capacity of its gynophores. *Neth. J. agric. Sci.* 3 : 220-36.

BURKHART, L., and E. R. COLLINGS. 1942. Mineral nutrients in peanut plant growth. *Soil Scc. Amer. Proc.* 6 : 272-80.

MANDAL, S.C. 1973. Soil fertility, fertilizer use and amelioration of acid soils of India. *Symposium on acid sulphate and other acid soils of India*, Trivandrum.

PIGGOT, C.J. 1960. The effect of fertilizers on the yield and quality of groundnuts in Sierra Leone. *Emp. J. Exp. agric.* 28 : 59-64.