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Effect of Calcium and Sulphur application on the yield of dry matter, pod and kernel of POL. 2 groundnut grown in two soils collected from the major groundnut growing tracts of Tamil Nadu

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A pot culture experiment involving four levels of calcium (0,50,100 and 150 kg/ha), four levels of sulphur (0,40,80 and 120 kg/ha) and two types of soil representing Tindivanam and Pollachi tract was conducted. Application of Ca and S increased the root and shoot (Haulm) yield significantly. Pod and kernel yield of POL. 2 groundnut variety could be substantially increased by application of Ca and S at 150 kg Ca/ha and 120 kg S/ha for Tindivanam soil and 100 kg Ca/ha and 80 kg S/ha for Aliyarnager soil.

Groundnut (*Arachis hypogaea* Linn.) has been recognised to be the most important oilseed crop of our country. Though India is rated to be the country producing nearly one third of global production, still the per hectare yield (831 kg/ha) is far lower compared to the yield figuare, 1220 to 2300 kg/ha of groundnut obtainable in some of the countries like America, Brazil and China. Hence there exists an imperative need for increasing the crop yield and the overall production in India. Yield improvement through proper fertilization with the nutrients in adequate quantities required for the particular variety holds much promise and does not need any special emphasis. With reference to nutrition of groundnut, application of Calcium and Sulphur besides other major nutrients has been recognised to be of paramount Importance. There are numerous reports to show that groundnut reponds remarkably well to application of Calcium and Sulphur. But, most of the reports had confined themselves only to the individual merits of either Calcium or Sulphur and information on the interaction effects is generally lacking, particularly for Tamil Nadu soils. Hence a study was undertaken to obtain information about the influence of calcium and sulphur on dry-matter, pod and Kernel yield of POL.2 groundnut.

MATERIAL AND METHODS :

A pot culture experiment was conducted in factorial randomized block design, by employing the two red soils collected from Tindivanam and Aliyarnagar, representing Tindivanam and Pollachi tract which are the major groundnut growing tracts of Tamil Nadu. There were altogether 32 treatment combinatiyns constituted

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by four levels of calcium, four levels of sulphur and two types of soils. Details regarding the experiment and treatment combinations are as follows.

DETAILS OF THE EXPERIMENT

Crop : Groundnut (*Arachis hypogaea* L.)

Variety : POL. 2

Duration : 105 days

Factors:

Soil: Tindivanam Red Sandy Clay Loam - T
Aliyarnagar Red Sandy Loam - A

Levels of Calcium: Ca_0 : Calcium not applied
Ca_1 : Calcium at 50 kg/ha
Ca_2 : Calcium at 100 kg/ha
Ca_3 : Calcium at 150 kg/ha

Levels of Sulphur: S_0 : Sulphur not applied
S_1 : Sulphur at 40 kg/ha
S_2 : Sulphur at 80 kg/ha
S_3 : Sulphur at 120 kg/ha

Treatment combinations :

4 levels of Ca x 4 levels of S x 2 soil types = 32 treatment combinations

Stages of study :

D_1 : Vegetative stage (30th day after sowing)
D_2 : Reproductive stage (70th day after sowing)
D_3 : Post harvest stage (after harvest)

Uniform sized clean pots were taken and 8 kilogram of air dried soil passed through 2 mm sieve was transfered. Calculated quantities of Calcium in the form of ^{45}Ca tagged calcium chloride and sulphur in the form of ^{35}S tagged sulphuric acid were added as per the schedule of treatments given in Table 1. All the treatments received uniform doses of urea, orthophosphoric acid and potassium chloride to supply 10 kg N, 10 kg P and 40 kg K/ha respectively. The added fertilizers were mixed thoroughly and equilibrated for two days.

Bold seeds of POL. 2 bunch variety of groundnut were sown at the rate of 5 seeds per pot and thinned to three per pot after germination. Package of practices were common to all the treatment. Out of the four replications maintained two were used for stage analysis and the other two were used for recording yield of pod and kernel. The data on root, shoot, pod and kernel yield were subjected to statistical scrutiny and informations deduced.

RESULTS AND DISCUSSION :

Root weight :

The results on root weights determined at various stages of crop growth are presented in Table 2. Effect of soil type on root weight was conspicuously absent. Root weight was highest at post harvest stage and was significantly superior to other stages. Calcium application produced significant differences in root growth and this is in accordance with the findings of Haynes and Robbins (1948) and Sullivan *et al.*, (1974). The effect of S on the root growth was marked and significant. Different levels of Ca and S influened root growth favourably. Ca levels had strong interaction with soil types and stages. S levels had strong interaction with soil types and with Ca levels. This opened the possibility of manipulating Ca and S levels for the different soils for obtaining the desired results.

Shoot weight :

The data on shoot weight at different stages of crop growth are presented in Table 3. There was significant difference due to soil and Aliyarnagar soil proved to be superior to Tindivanam soil. This may be due to the initial fertility status of the Aliyarnagar soil. Dry matter production at stages differed, as could be expected. Shoot weight was maximum at post harvest stages followed by reproductive and vegetative stage. Effect of Ca and S was significant in relation to the shoot yield. But appreciable difference due to Ca application was not noticed. On the contrary S application had marked and significant effect. Among the two nutrients Ca and S, the effect of S was more pronounced and conspicuous. This established that both the nutrients would be required for higher dry matter production and the needs of S have to be particularly taken care of.

Pod and Kernel Yield :

The results on pod kernel yield (Table 4) showed significant differences due to soils' the pod yield was significantly greater in the crop grown in Aliyarnagar soil than in Tindivanam soil. It may be noted that Aliyarnagar soil had higher nutrient status in respect of S, P and K than Tindivanam soil. Apart from that the physical characteristies such as texture, porosity etc. at desirable conditions in Aliyarnagar soils adds reason for the increased yield. Habeebullah (1973) emphasized the importance of physical characteristics in the production of groundnut crop. There was significant difference in pod and kernel yield due to application of Ca at diffe-

rent levels though the differences were not quite marked and appreciable. The importance of Ca in improving the pod yield was reported by numerous workers (Puh, 1953). Intetaction of soil types with Ca was significant and so it was possible to fix up the dose of Ca for both the soils viz., 150 kg Ca/ha for Tindivanam soil and 100 kg Ca/ha for Aliyarnagar soil.

S application for groundnut was also considered to be important and response of groundnut to S application was reported by numerous workers. In the present study too groundnut responded to the application of S. But since there was interaction between S levels and soil types, a blanket recommendation of S at a constant dose for all soils would not be beneficial from the view point of crop production. The does of S required to be applied was variable as shown in the present study i.e., 120 kg S/ha for Tindivanam soil and 80 kg S/ha for Aliyarnagar soil.

From the discussion it is clear that pod and kernel yield of POL. 2 groundnut variety could be substantially increased by application of Ca and S at 150 kg Ca/ha and 120 kg S/ha for Tindivanam soil and 100 kg Ca ha and 80 kg S/ha for Aliyarnagar soil. Thus Tindivanam soils requires higher doses of Ca and S aompared to Aliyarnagar soil. The higher exchange capacity of Tindivanam soil may be the reason for the higher requirement of Ca and S. (Loganathan, 1973).

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REFERENCES

HABEEBULLAH, B. 1973. *Studies on the influence of potassium and calcium on nutrient availability, yield and chemical compcsition of groundnut*. M.Sc. (Ag.) dissertation, Tamil Nadu Agricultural University.

HAYNES J.L and W.R.ROBBINS. 1948. Calcium and boron as essential factors in the root environment. *J. Amer. Soc. Agron. 40*: 795-603.

LOGANATHAN, S. 1973. *Studies on certain aspects of calcium in the soiis of south India*. ph. D. dissertation. Tamil Nadu Agricultural University.

SULLIVAN, G.A., G.L. JONES and R.P. MOORE 1974. Effect of dolomitic lime stone. gypsum and potassium on yield and seed quality of peanuts. *Peanut Sci. 1*: 73-77.

Table 1. Effect of Calcium and Sulphur application on root weight (Root weight as g/pot)

Stages	Calcium kg/ha	Tindivanam soil					Aliyarnagar soil				
		Sulphur kg/ha					Sulphur kg/ha				
		0	40	80	120	Mean	0	40	80	120	Mean
D_1	0	0.65	0.90	0.68	0.70	0.73	0.55	0.90	0.95	0.75	0.79
	50	0.75	0.85	1.05	1.05	0.93	0.80	0.90	0.95	0.75	0.85
	100	0.75	0.80	1.05	0.80	0.85	0.75	0.95	0.90	0.90	0.88
	150	0.90	1.05	0.60	0.55	0.78	0.85	0.96	0.95	1.05	0.94
D_2	0	1.35	1.70	1.40	1.70	1.54	1.10	1.20	1.55	1.60	1.36
	50	1.50	1.80	1.75	1.80	1.71	2.10	2.10	1.60	1.95	1.94
	100	1.45	1.35	1.50	1.35	1.41	1.60	2.30	1.60	1.85	1.84
	150	1.85	1.95	2.10	1.30	1.80	1.80	2.15	1.70	1.20	1.71
D_3	0	1.79	2.02	1.96	2.08	1.96	1.96	1.87	1.86	2.03	1.84
	50	1.72	1.99	2.49	2.29	2.12	2.12	2.29	2.01	2.20	2.12
	100	1.92	2.00	2.14	22.5	2.08	2.08	2.08	2.29	2.02	2.12
	150	1.83	2.02	2.02	2.02	1.97	1.79	1.95	2.07	1.95	1.94
	Mean	1.37	1.54	1.56	1.49		1.42	1.63	1.54	1.52	

	S. E.	C. D.
Comparison of stages	0.0217	0.06
Compatison of Ca levels	0.025	0.07
Comparison of S levels	0.025	0.07
Stages × Ca levels	0.0433	0.12
Steges × S levels	0.0433	0.12
Soil types × Ca levels	0.0353	0.10
Ca levels × S levels	0.0433	0.12

TABLE 2 Effect of Calcium and Sulphur Application on shoot (Haulm) yield (Shoot yield as g/pot)

Stages	Calcium kg/ha	Tindivanam soil					Aliyarnagar soil				
		Sulphur kg/ha					Sulphur kg/ha				
		0	40	80	120	Mean	0	40	80	120	Mean
D_1	0	4.25	4.60	4 42	5.70	4.74	3.85	6.30	8.25	3.75	5.54
	50	5.85	4.70	7.25	7.35	6.29	6.10	7.40	8.30	7.80	7.40
	100	4.35	5.70	9.75	6.60	6.60	6.75	9.60	8.10	9.30	8.44
	150	6.00	6.15	4.70	3.95	5.20	9.30	7.80	9.60	7.85	8.64
D_2	0	13.55	15.55	14.45	18.90	15.61	19.10	20.10	19.50	21.90	20.15
	50	14.30	16.85	18.00	19.70	17.21	25.40	27.30	33.80	35.30	30.45
	100	16.95	16.50	16.20	18.30	16.99	17.80	18.10	20 30	21.10	19.33
	150	11.80	20.60	24.70	13.40	17.63	22.00	21.80	23.00	18.90	21.43
D_3	0	16.14	20.77	22.05	22.72	20.42	25.42	27.84	24.67	29.78	26.93
	50	12.20	19.09	25.96	24.51	20.44	23.83	28.01	23.28	27 41	25.63
	100	17.70	23.91	30.63	26.80	24.76	27.51	28.23	33.49	24 70	28.48
	150	18.56	20.29	23.14	25.59	21.90	22.47	23.64	32.25	25.91	26.14
	Mean	11.80	14.56	16.77	16.13	—	17.46	18.87	20.38	19.48	

	S.E.	C.D. (0.05 P.L)
Comparison of stages	0.4416	1.25
Comparison of soil types	0,3606	1.02
Comparison of Ca levels	0.5099	1.44
Comparison of S levels	0-5099	1.44
Stages x Soil types	0.6246	1.77
Stages x Ca levels	0.8833	2.50
Soil types x Ca levels	0.7212	2.04

TABLE 4 - Effect of Calcium and Sulphur Application on pod and kernel yield (yield as g/pot)

Calcium kg/ha	Tindivanam soil					Aliyarnagar soil				
	Sulphur kg/ha					Sulphur kg/ha				
	0	40	80	120	Mean	0	40	80	120	Mean
					Pod Yield					
0	14.84	10.43	9.70	11.81	11.69	10.34	12.36	14.19	15.40	13.07
50	8.14	11.11	11.93	15.68	11.71	14.11	15.77	14.58	13.80	14.56
100	12.70	13.15	13.93	13.32	13.27	16.42	17.47	18.07	14.93	16.72
150	13.48	12.75	13.62	18.52	14.59	12.69	13.54	16.94	11.42	13.64
Mean	12.29	11.86	12.29	14.83		13.39	14.78	15.94	13.89	
					Kernel Yield					
0	10.83	7.89	7.49	8.34	8.64	7.48	9.55	11.18	11.69	9.98
50	6.25	8.52	8.58	1.35	8.92	11.17	12.55	11.56	10.44	11.43
100	9.79	10.16	10.65	10.38	10.25	12.37	13.96	14.40	11.74	13.12
150	9.94	10.04	10.87	14.80	11.41	9.88	10.57	12.62	8.37	10.36
Mean	9.20	9.15	9.39	11.46		10.23	11.66	12.44	10.56	

	Pod yield		Kernel yield	
	S.E.	C.D. (0.05)	S.E.	C.D. (0.05)
Comparison of soil types	0.3661	1.06	0.2891	0.83
Comparison of Ca levels	0.5179	1.49	0.4089	1.18
Soil types x Ca levels	0.7325	2.11	0.5782	1.67
Soil types x S levels	0.7325	2.11	0.5782	1.67