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Uptake of Calcium by Groundnut Plant During Progressive Stages of Growth as Affected by Application of Various Farms and Doses of Calcium*

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A pot experiment was conducted with groundnut crop in two red soils collected from Tindivanam and Pollachi. They were treated with Calcium at 0.75 and 150 kg ca/ha in two forms namely calcium sulphate and carbonate along with two levels of each of phosphorus, potassium and magnesium and constant dosages of nitrogen and boron. The two soils were analysed for various physical and chemical characteristics. After the harvest of the crop, groundnut shoot, root, kernel and shell were analysed for calcium. Calcium uptake by groundnut shoot, root and kernel was significantly high in calcium treatment compared to control. Calcium sulphate application caused greater uptake of calcium than calcium carbonate. Potatssium showed inhibiting effect on calcium absorption by shoot.

Various degrees of secondary nutrient deficiencies exist in soil depending on the physical and chemical make up of the soil and soil management practices. The problem is further aggravated when crops like groundnut are grown which need on considerable amount of secondary nutrient like calcium. Hence an attempt was made to study the influence of calcium application on of uptake of calcium by groundnut.

MATERIALS AND METHODS

Two representative red soils were collected from Tindivanam and Pollachi which are groundnnt growing areas in Tamil Nadu. Calcium was applied at three levels 0,75 and 150 kg/ha in two forms as calcium carbonate and sulphate in combination with two levels in each of phosphorous, potassium and magnesium at O and 40 Kg P_2O_5/ha, O and 60 Kg K_2O/ha and O and 50 kg Mg/ha respectively. Phosphorus, potassium and magnesium 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 at the rate of 20 and 4 kg/ha respectively.

To eight Kg of soil taken in each pot, calculated amounts of the above

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fertilisers were added and mixed thoroughly. In all, three were 240 pots consisting of 40 treatment combinations replicated thrice in two soils. TMV 7 groundnut seeds (bunch type) were sown at the rate of five seeds per pot which was thinned to three plants after germination. The plant samples collected at vegetative stage, reproductive stage and after harvest were analysed for total calcium by versenate titration method using triple acid extract (Jackson, 1967).

RESULTS AND DISCUSSION

The calcium uptake data are furnished in Table.

Uptake of calcium by groundnut shoot: Uptake of calcium by groundnut shoot was higher in plants which received calcium treatment campared to no calcium application. Calcium sulphate treatment showed increased absorption of calcium than calcium carbonate treatment in Tindivanam soil. However, in Pollachi soil both forms were on a par. The data on soil analysis (not furnished in this paper) also indicated the beneficial effect of gypsum in increasing the availability of calcium in soil.

When potassium was not applied, addition of calcium caused larger uptake of calcium by shoot whereas when calcium and patassium were applied together calcium absorption was reduced to a value much lower for no calcium treatment. This clearly indicated the inhibiting and antagisontic effect of potasium on calcium absorption by groundnut shoot. The different stages of sampling of plant showed that uptake of calcium increased steadily from vegetative to harvest stage. Prevot (1949) studied the calcium status of groundnut at regular intervals by foliar diagnosis and observed that the amounts of calcium in leaves increased regularly.

Uptake of calcium by groundnut root: Tindivanam soil recorded higher uptake of calcium by groundnut root compared to Pollachi soil. This might be due to increased availability of calcium in Tindivanam soil during crop growth stages. Application of calcium has markedly increased the uptake of calcium by root compared to no calcium treatment. Mizuno (1961) reported the favourable influence of calcium application on the uptake of calcium by groundnut root. Uptake of calcium increased appreciable from vegetative to harvest stage. The interaction between stages and forms of calcium was significant. At vegetative stage, both forms were on a par. Calcium sulphate treatment recorded notably higher uptake of calcium compared to calcium carbonate at reproductive stage. However, the root samples of post-harvest stage showed larger uptake of calcium in calcium carbonate treatment than in the sulphate treatment.

Uptake of calcium by groundnut kernel: Calcium uptake by groundnut kernel was significantly higher in plants raised in Tindivanam soil than in Pollachi soil. This was in agreement with the findings of Reeve and Shive (1944) who have reported that calcium accumulated in the tissues was largely

determined by calcium concentration in the substrate. Application of calcium sulphate was found to result in increased uptake of calcium by kernel than calcium carbonate.

Uptake of calcium by groundnut shell : Uptake of calcium by groundnut shell in Tindivanam soil attained very high level of statistical significance ($P=0.01$) over Pollachi soil. This could be ascribed to the higher content of available calcium in Tindivanam soil. The interaction between soils and forms of calcium was significant. In the case of Tindivanam soil both the forms were on a par but in Pollachi soil, calcium sulphate treatment caused higher uptake of calcium by shell. Available calcium and water soluble calcium in the orginal Tindivanam soil taken up for the study were high that might have been the cause the poor performance of more soluble calcium sulphate in Tindivanam soil as far as uptake of calcium by shell was concerned.

The interaction between soils and potassium levels was significant. From the mean values it could be stated that potassium application depressed calcium uptake. At K_0 both soils were on a par. But at K_{40} Tindivanam soil showed significantly higher uptake of calcium than Pollachi soil. This might be explained based on the fact that in Pollachi soil, which had low original calcium content and showed low availability of calcium during crop growth, potassium had greater inhibiting effect on the uptake of calcium while in Tindivanam soil, which had higher original calcium content and showed in-

TABLE. Calcium uptake by groundnut (mg/pot)

Treatment	Vegetative stage		Reproductive stage		Harvest stage	
	TMV	POL	TMV	POL	TMV	POL
	(a) Shoot					
Ca_0K_0	38	43	270	266	412	367
CaC_1K_0	43	49	199	347	476	391
CaC_2K_0	42	47	227	336	453	427
CaS_1K_0	47	51	371	345	560	423
CaS_2K_1	43	49	334	215	518	459
Ca_0K_1	31	40	288	207	421	400
CaC_1K_1	33	42	256	337	512	396
CaC_2K_1	45	54	200	306	534	371
CaS_1K_1	48	44	295	282	412	420
CaS_2K_1	41	57	396	272	523	370
	(b) Root					
Ca_0	3.1	2.7	8.2	15.5	38.1	33.7
CaC_1	3.2	2.9	15.1	15.5	51.8	28.2
CaC_2	2.7	3.0	17.7	14.5	44.7	30.0
CaS_1	2.7	3.0	24.3	17.1	40.7	25.6
CaS_2	2.4	3.1	23.7	17.5	46.0	25.6
	(c) Kernel					
Ca_0	...	...	...	...	12	15
CaC_1	...	...	...	...	17	13
CaC_2	...	...	...	...	18	14
CaS_1	...	...	...	...	15	19
CaS_2	...	...	...	...	18	13
	(d) Shell					
Ca_0K_0	...	...	...	...	10	10
CaC_1K_0	...	...	...	...	13	8
CaC_2K_0	...	...	...	...	14	9
CaS_1K_0	...	...	...	—	10	14
CaS_2K_0	...	...	...	...	9	12
Ca_0K_1	...	...	...	...	15	9
CaC_1K_1	...	...	...	...	16	7
CaC_2K_1	...	...	...	...	12	8
CaS_1K_1	...	...	...	...	12	12
CaS_2K_1	...	...	...	...	13	11

TMV = Tindivanam soil
POL = Pollachi soil
Ca_0 = Calcium not applied
CaC_1 = Calcium carbonate 75 Kg/ha
CaC_2 = Calcium carbonate 150 Kg/ha
CaS_1 = Calcium sulphate 75 Kg/ha
CaS_2 = Calcium sulphate 150 Kg/ha
K_0 = No potassium
K_1 = 60 Kg K_2O/ha

creased avilability of calcium during crop growth, potassium did not have pronounced depressing effect. It was inferred that soil calcium might not have been a limiting factor in Tindivanam soil inspite of potassium application together with calcium.

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