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Effect of weed control and gypsum application on uptake of N, P, Ca and S by groundnut (*Arachis hypogaea*) and weeds

M, DEVAKUMAR AND GAJENDRA GIRI

Division of Agronomy, Indian Agricultural Research Institute, New Delhi 110 012

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ABSTRACT

Results of an experiment conducted during *kharif* 1992 and 1993 on groundnut (*Arachis hypogaea* L.) at New Delhi revealed that on an average weeds removed 25.8 kg N and 8.2 kg P/ha. Two hand weedings suppressed the weed dry matter and N and P uptake significantly. This resulted in higher uptake of N, P, Ca and S by groundnut. Split application of 200 and 400 kg gypsum/ha brought significant improvement in the uptake of N, P, Ca and S of groundnut.

Key words: Weed control, Gypsum, Split application, Groundnut, Nutrient uptake

Uptake of nutrients by crops is governed by the nutrient supply system of the soil through native and applied sources and their loss through leaching and weeds. In groundnut (*Arachis hypogaea* L.), apart from N and P, the need for the secondary nutrients especially Ca and S is frequently felt, as deficiency of these nutrients has deleterious effect on plant productivity (Agasimani, 1998). Ca prevents the abortion of underutilized ovules at a very early stage and reduces the pops (Dwivedi, 1988).

S is involved in protein formation and is also associated with various enzymatic processes of all living cells and biosynthesis of oil in plants (Dwivedi, 1988). Gypsum is the cheapest and best source of these two nutrients. Response to applied gypsum varies under different soil conditions (Pasricha and Aulakh, 1986). Keeping these points in view, an experiment was conducted to study the effect of gypsum application on the uptake of N, P, Ca and S by groundnut in relation to weed management.

MATERIALS AND METHODS

The experiment was conducted during *kharif* 1992 and 1993 at the farm of the Division of Agronomy, Indian Agricultural Research Institute, New Delhi in factorial RBD with three replications. The treatments consisted of three weed control measures (weedy check, one hand weeding at 15 days and two hand weedings at 15 and 30 days after sowing) and six combinations of doses and times of gypsum application (control, 200 kg/ha at sowing, 200 kg at flowering, 200 kg half at sowing + half at flowering, 400 kg half at sowing + half at flowing and elemental sulphur at 36 kg/ha). The soil of

the site was sandy loam, low in organic carbon (0.34%) and high in available phosphorus (27.0 kg/ha) and medium in potassium (196 kg/ha) with pH 7.5. The soil contained 7.0 ppm sulphur and 1.2 meq/100 g soil calcium.

Groundnut cv. ICGS 1 was sown on 3 July and 23 June during 1992 and 1993, respectively, at row distance of 40 cm using 100 kg seed per hectare. The crop was harvested on 28 and 22 October in the corresponding years. The weeds and plant samples collected at harvest were subjected to chemical analysis for nutrient content. From these data nutrient removal by weeds and crops was worked out.

RESULTS AND DISCUSSION

Studies on weeds

Effect of weed control: Weedy check plots recorded the highest dry matter of weeds in both the years (Table 1), whereas hand weedings suppressed the weeds significantly. Two weedings at 15 and 30 days reduced the dry matter content of weeds by 29.8 and 48.6% in respective years and recorded the lowest quantity of weeds at harvest of the crop.

N and P uptake was highest in weedy check plots because of higher weed biomass. Lowest amount of N and P was removed by weeds where two hand weedings were done at 15 and 30 DAS. However, N uptake in 1992 and P uptake in both years under weedy check and one hand weeding were at par.

Effect of gypsum and S application: Results (Table 1) indicated that gypsum application did not affect the dry matter production of weeds significantly during

Table 1. Dry-matter accumulation and N and P uptake in weeds as influenced by weed control and gypsum

Treatment	Weed dry weight (q/ha)		N uptake (kg/ha)		P uptake (kg/ha)	
	1992	1993	1992	1993	1992	1993
Weed control measures						
Weedy check	26.9	22.2	27.9	23.6	8.9	7.5
Hand weeding at 15 DAS	22.8	16.9	25.9	19.4	8.3	6.3
Hand weeding at 15 & 30 DAS	18.9	11.4	24.9	15.0	7.5	4.6
CD (P = 0.05)	3.4	3.2	NS	3.5	1.3	1.2
Gypsum (kg/ha)						
Control	22.9	17.8	24.5	19.3	7.7	6.0
200 kg at sowing	24.4	19.0	27.5	21.7	8.8	7.0
200 kg at flowering	20.7	15.1	23.9	17.2	7.6	5.7
200 kg in two splits	22.9	16.7	27.2	19.7	8.7	6.4
400 kg in two splits	24.3	15.7	29.4	19.3	9.2	6.1
36 kg elemental S at sowing	22.2	16.5	25.4	18.8	7.5	5.7
CD (P = 0.05)	NS	NS	NS	NS	NS	NS

DAS = Days after sowing

two years. N and P removal by weeds also remained unaffected due to gypsum and S application in two years.

Studies on groundnut

Effect of weed control: Weeds showed detrimental affect on the productivity of groundnut in both the years (Table 2). Hence weeds controlled by hand weeding gave significant boost to the pods yield. Two hand weedings being significantly superior than one hand weeding recorded highest yield. Highest uptake of N, P, Ca and S by groundnut was also recorded with two hand weedings. On an average, one and two hand weedings increased the N uptake by 108 and 180% and P uptake by 163 and 303%, over control. Two hand weedings also recorded 186 and 33% more uptake of Ca and 182 and 34% more uptake of S over weedy check and one hand weeding, respectively. Less competition for resources offered by weeds might have made more nutrients available to groundnut crop. This has been reflected by higher pod yield of groundnut crop. Increase in productivity and nutrient content (Devakumar, 1995) in groundnut parts was responsible for higher uptake of N, P, Ca and S by groundnut in weeded plots.

Effect of gypsum and S application: Application of gypsum increased the productivity of groundnut in both years (Table 2). However, differences were significant due to application of 200 kg gypsum either at flowering or in two splits and split allocation of 400 kg gypsum. This might be due to the

Table 2. Effect of gypsum application and weed control measures on N, P, Ca and S uptake of groundnut

Treatment	Pod yield (q/ha)		N uptake (kg/ha)		P uptake (kg/ha)		Ca uptake (kg/ha)		S uptake (kg/ha)	
	1992	1993	1992	1993	1992	1993	1992	1993	1992	1993
Weed control measures										
Weedy check	6.2	7.3	36.9	49.8	3.0	4.1	29.8	39.9	5.0	6.7
Hand weeding at 15 days	13.3	14.4	83.7	97.1	8.3	10.4	67.8	79.3	11.4	13.2
Hand weeding at 15 and 30 days	17.0	18.3	112.0	131.1	12.8	15.8	92.3	104.2	15.4	17.6
CD (P = 0.05)	1.2	1.1	6.6	12.0	0.9	1.4	5.1	8.5	0.8	1.4
Gypsum (kg/ha)										
Control	10.9	12.3	72.1	82.5	6.1	8.3	56.5	63.5	9.0	10.4
200 kg at sowing	11.6	12.5	75.1	91.0	6.7	9.2	60.2	71.2	9.6	11.7
200 kg at flowering	12.6	13.1	79.3	93.9	8.0	10.2	66.4	78.9	10.8	12.9
200 kg in two splits	13.9	14.0	82.0	95.7	10.1	10.9	69.1	76.8	12.4	13.3
400 kg in two splits	13.4	14.2	89.7	96.7	10.2	11.6	74.1	79.1	12.9	14.0
36 kg elemental S at sowing	11.5	13.0	67.2	96.2	6.9	10.3	53.5	77.2	8.7	12.7
CD (P = 0.05)	1.8	1.6	9.3	NS	1.3	2.0	7.2	12.0	1.2	2.0

fact that these treatments made S and Ca available to the crop at appropriate stage. This is confirmed by the increase in S and Ca content in haulm and kernel of groundnut with the application of 200 and 400 kg gypsum at flowering and in two splits (Devakumar, 1995). Increase in N uptake was also recorded due to split application of 200 and 400 kg gypsum; however differences were significant in 1992 only. Split application of 200 and 400 kg gypsum being at par significantly boosted the P uptake of groundnut in two years. Sulphur in known for its role in promotion of nodulation in legumes and formation of amino-acids, proteins and chlorophyll. Hence, S available through gypsum might have resulted in absorption of more N and P.

Application of 200 kg gypsum either at flowering or in two splits and 400 kg gypsum in splits significantly increased the uptake of Ca and S in groundnut (Table 2). Availability of Ca in sufficient quantity in the rooting and fruiting zone might have made the plants to absorb more Ca by the roots and gynophores. Similarly availability of S through gypsum might have caused to absorb more S by plants.

Increase in the uptake of N, P, Ca and S by groundnut with the gypsum application was due to the combined effect of increase in the yield (Table 2) and nutrient content in plant parts as reported by Devakumar (1995).

Application of 36 kg/ha elemental S at sowing did not show consistent influence on uptake of N, P, Ca and S by groundnut. Productivity of groundnut was also not increased due to application of S in elemental form. This might be due to the fact that S in elemental form in not readily available to plants. There is time lag between the time of application and oxidation of S to the available form. Hence plants might have not received S when it was required.

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