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Effect of Phosphate Rock Enriched FYM on Growth and Yield of Groundnut (*Arachis hypogaea* L.)

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ABSTRACT

A field experiment was conducted during *rabi*, 2005-06 on sandy soils of Agricultural College Farm, Bapatla to evaluate the Agronomic efficiency of phosphate rock enriched FYM in groundnut (*Arachis hypogaea* L.). Maximum crop growth, nodulation, filled pods plant^{-1} and yield with the treatment that received PROM made of double the recommended dose (DRD) of P_2O_5 through PR and FYM in 1:4 ratio which was significantly superior to other.

Key words : FYM, Groundnut, Growth, Phosphate rock, PROM and Yield.

Groundnut (*Arachis hypogaea* L.), an important oilseed crop of India. It is a unique commercial crop and has been described as the nature's master piece of food values (Nagaraj and Reddy, 1986). Groundnut response to phosphorus application is a well established factor, but Phosphorus use efficiency vary with given soil condition. However, when P is blended with any organic source, the efficiency is relatively improved.

Phosphate rich organic manure (PROM) comprises composting of high grade phosphate rock to fine size with natural organic matter such as FYM, rice or wheat straw, pressmud, karanj cake or waste from fruit industries. Treating phosphate rock with either farm yard manure, green leaf manure or other bio-culture is found to be effective than conventional phosphate fertilizer and in releasing phosphorus from phosphate rock under neutral and moderately calcareous soils. Phosphate rich FYM is known to improve the soil physical and chemical properties and also nutrient availability to crops. Hence, an attempt was made to study agronomic efficiency of phosphate rock enriched FYM on growth and yield of groundnut.

MATERIAL AND METHODS

An experiment was carried out in *rabi,* 2005-06 at the Agricultural College Farm, Bapatla. The mean minimum and maximum temperatures during the crop growth period ranged from 15.3°C to 23.7°C and 29.4°C to 33.4°C, respectively, with a total rainfall of 8.5 mm. The experiment site was sandy and well drained having pH 7.1, organic carbon 0.13 per cent, low in available N (125 kg ha^{-1}), low in available phosphorus (11 kg ha^{-1}) and high in potassium content (256 kg ha^{-1}).

The experiment comprised eight treatment combinations laid in randomized block design replicated thrice. The inoculation of Rhizobium was common. TMV-2 was the test variety and the seeds were sown after inoculation. The crop sown on 26-11-2005 and harvested on 6-3-2006 was cultivated following recommended package of schedules with the following treatment details.

T_1 = Control (no phosphorus)
T_2 = RD(recommended dose) of P_2O_5 through SSP (normal practice)
T_3 = PROM made of RD of P_2O_5 through (PR) phosphate rock and FYM in 1:2 ratio.
T_4 = PROM made of RD of P_2O_5 through PR and FYM in 1:3 ratio.
T_5 = PROM made of RD of P_2O_5 through PR and FYM in 1:4 ratio.
T_6 = PROM made of DRD(double the recommended dose) of P_2O_5 through PR and FYM in 1:2 ratio.
T_7 = PROM made of DRD of P_2O_5 through PR and FYM in 1:3 ratio.
T_8 = PROM made of DRD of P_2O_5 through PR and FYM in 1:4 ratio.

RESULTS AND DISCUSSION

A significant increase in the plant height and drymatter production at 30, 60, 90 and at harvest was recorded (Table-1) by PROM made of DRD of P_2O_5 through PR and FYM in 1:4 ratio (T_8) but was on a par with RD of P_2O_5 through SSP (T_2), PROM made of either DRD of P_2O_5 through PR and FYM in 1:3 ratio (T_7) and 1:2 ratio (T_6) and RD of P_2O_5 through PR and FYM in 1:4 ratio (T_5). Nodule number plant^{-1} and nodule dry weights (Table 2) significantly increased through PROM made of DRD of P_2O_5 through PR and FYM in 1:4 ratio (T_8). This

Table 1. Effect of phosphate rock enriched FYM on growth of groundnut (*Arachis hypogaea* L.)

Treatments	Plant height at different stages (cm)				Dry matter production at different stages (kg ha^{-1})			
	30 DAS	60 DAS	90 DAS	Harvest	30 DAS	60 DAS	90 DAS	Harvest
T_1 - Control	4.8	19.3	26.4	28.5	473	1677	3659	4574
T_2 - RD of P_2O_5 through SSP	8.3	22.3	35.3	40.0	717	2846	4986	6240
T_3 - PROM made of RD of P_2O_5 through PR and FYM in 1:2	5.2	19.7	26.8	29.3	520	1884	3925	4887
T_4 - PROM made of RD of P_2O_5 through PR and FYM in 1:3	5.3	19.9	26.9	30.1	543	2053	4135	5035
T_5 - PROM made of RD of P_2O_5 through PR and FYM in 1:4	7.6	20.2	32.0	36.1	630	2345	4562	5680
T_6- PROM made of DRD of P_2O_5 through PR and FYM in 1:2	7.9	20.3	33.7	37.7	710	2353	4739	5839
T_7- PROM made of DRD of P_2O_5 through PR and FYM in 1:3	8.5	22.2	35.3	39.5	716	2525	4792	6049
T_6 - PROM made of DRD of P_2O_5 through PR and FYM in 1:4	8.7	22.5	36.7	41.5	730	2884	5026	6258
SEm±	0.48	1.11	2.34	2.61	42.1	241.9	243.3	315
CD(p=0.05)	1.00	2.4	5.0	5.6	90.3	518.8	521.9	675.7
CV(%)	8.4	6.5	9.1	9.0	8.2	12.8	6.7	6.9

Table 2. Effect of phosphate rock enriched FYM on yield attributes of groundnut (*Arachis hypogaea* L.)

Treatments	Nodule number plant^{-1} at 45 DAS	Nodule dry weight at 45 DAS (mg)	Total pods plant^{-1} at harvest	Filled pods plant^{-1} at harvest	No.of kernels pod^{-1}	Shelling%	100 kernel weight (g)
T_1 - Control	20.3	23.5	17.2	12.5	1.5	61.5	27.9
T_2 - RD of P_2O_5 through SSP	37.1	40.0	21.1	17.1	1.8	71.3	32.1
T_3 - PROM made of RD of P_2O_5 through PR and FYM in 1:2	21.6	23.7	18.3	13.3	1.6	64.0	28.3
T_4 - PROM made of RD of P_2O_5 through PR and FYM in 1:3	24.3	26.4	18.8	14.5	1.7	65.0	29.1
T_5 - PROM made of RD of P_2O_5 through PR and FYM in 1:4	33.6	36.5	20.5	15.8	1.8	69.6	30.2
T_6- PROM made of DRD of P_2O_5 through PR and FYM in 1:2	34.3	37.5	21.6	16.7	1.8	70.0	31.9
T_7- PROM made of DRD of P_2O_5 through PR and FYM in 1:3	36.0	38.5	21.8	17.3	1.9	71.6	32.5
T_6 - PROM made of DRD of P_2O_5 through PR and FYM in 1:4	38.2	41.5	22.0	17.4	1.9	72.8	32.6
SEm±	2.29	2.11	0.9	1.01	0.12	1.72	1.2
CD(p=0.05)	4.9	4.5	1.9	2.2	0.3	3.7	2.6
CV(%)	9.1	7.75	5.4	7.9	8.2	3.1	4.8

Table 3. Effect of phosphate rock enriched FYM on yield and oil of groundnut (*Arachis hypogaea* L.)

Treatments	Pod yield (kg ha^{-1})	Haulm yield (kg ha^{-1})	Harvest index	Oil content (%)	Oil yield (kg ha^{-1})
T_1 - Control	1619	2350	40.7	39.8	386.5
T_2- RD of P_2O_5 through SSP	2565	3380	43.1	42.2	771.1
T_3 - PROM made of RD of P_2O_5 through PR and FYM in 1:2	1755	1477	41.4	40.1	450.5
T_4 - PROM made of RD of P_2O_5 through PR and FYM in 1:3	1969	2502	44.0	40.2	514.6
T_5 - PROM made of RD of P_2O_5 through PR and FYM in 1:4	2247	2792	44.5	41.4	647.8
T_6- PROM made of DRD of P_2O_5 through PR and FYM in 1:2	2326	2869	44.7	41.8	680.7
T_7 - PROM made of DRD of P_2O_5 through PR and FYM in 1:3	2499	3281	43.2	42.4	758.5
T_6- PROM made of DRD of P_2O_5 through PR and FYM in 1:4	2594	3408	43.2	42.5	802.3
SEm±	150.8	240.6	1.36	1.03	30.37
CD(p=0.05)	323.6	516.1	2.9	NS	65.1
CV(%)	8.4	10.2	3.9	3.1	5.9

increase in nodulation might be due to the positive effect of phosphorus on rapid multiplication with increased activity of nodule bacteria within legume rhizosphere (Griffith, 1978).

Increased plant height might be attributed to PSB, dissolving the insoluble P and making it available to the plants for profused root and vegetative growth (Ramamoorthy and Arokiaraj, 1999). Organic manure (FYM) application might have resulted in increased drymatter production, which might be due to increased release of macro as well as micronutrients in better extraction by the crop (Dosani *et. al.,* 1999).

Yield attributes *viz.,* number of total and filled pods per plant, number of kernels per pod, shelling percentage and 100 kernel weight (Table 2) significantly increased with PROM made of DRD of P_2O_5 through PR and FYM in 1:4 ratio (T_8). Srinivasarao *et.al.* (2004) reported that increased total number of pods and filled pods per plant might be improvement in vegetative growth owing to the application of FYM. Increased shelling percentage and 100 kernel weight might be due to the synthesis of more carbohydrates, proteins and fats besides increased accumulation of food materials in the kernels owing to the balanced application of phosphorus (Rao *et al.,* 1984).

Application of PROM made of DRD of P_2O_5 through PR and FYM in 1:4 ratio (T_8) significantly increased pod and haulm yields of groundnut (Table 3). The increase in pod and haulm yields was due to increased number of filled pods per plant, shelling percentage and 100 kernel weight. PROM made of DRD of P_2O_5 through PR and FYM in 1:4 ratio (T_8) was also instrumental to produce significant increase oil content and oil yield (Table 3). But there was no significant increase in oil content of groundnut. The highest oil content was recorded with the treatment T_8. It can be concluded that application of PROM made of DRD of P2O5 through PR and FYM in 1:4 ratio is more beneficial increasing pod & haulm yield and oil yield of groundnut.

LITERATURE CITED

Dosani A A K, Talashilkar S C and Mehta V B 1999 Effect of poultry manure applied in combination with fertilizers on the yield, quality and nutrient uptake of groundnut. Journal of the Indian Society of Soil Science 47 (1) : 166-169.

Griffith W K 1978 Effect of phosphorus and potassium on nitrogen fixation in phosphorus for agriculture. A Situation analysis potash/phosphate institute. atlanta G.A. pp- 80-84.

Nagaraj E and Reddy P S 1986 Some Indian groundnut varieties and their quality. Seeds and Farm 12 (3) : 20-23.

Rama Moorthy K and Arokiaraj A 1999 Agronomic effectiveness of organic source and mussorie rock phosphate to phosphorus economy in rainfed greengram. Madras Agricultrual Journal 84 (10) : 393-395.

Srinivasa Rao A, Venkateswarlu B and Prasad P V N 2004 Sustainable groundnut production through integrated nutrient management. The Andhra Agricultural Journal 51 (1&2) : 14-17.

Rao V, Subba Rao I V, Danielbabu M and Reddy P R 1984 Effect of phosphorus and *rhizobium* on groundnut. The Andhra Agricultural Journal 31 : 253-254.

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