

Effect of organic manure and biofertilizers on growth and yield attributing characters of *kharif* groundnut (*Arachis hypogaea* L.)

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ABSTRACT

An experiment was conducted during the *kharif* season of 2006-07 at Junagadh (Gujarat) to study the effect of organic manure with and without biofertilizers on growth, nodulation and yield of groundnut (*Arachis hypogaea* L.). Seed inoculation with biofertilizers (Rhizobium+PSM) significantly increased the plant height, nodules per plant, yield attributing characters and yield of groundnut. Manuring the crop with FYM 6 t/ha+Rhizobium+PSM gave significantly 40.19 and 35.96 per cent higher pod and haulm yields of groundnut, respectively over no manuring. Fertilizing the crop with vermicompost 2.0 t/ha+Rhizobium+PSM and FYM 3.0 t/ha+Rhizobium+PSM found equally effective and significantly superior to control in respect to growth parameters, yield attributes and yield of groundnut.

Key words : Groundnut, Organic manure, Biofertilizers, Growth, Nodulation, Yield

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is a major commercial oilseed crop in India, China, Brazil, Nigeria and USA. Among the oilseed crop grown in India, groundnut occupies pre-dominant position. In recent years, crop cultivation requires the use of chemical fertilizer, but it is expensive for people who have not capacity to buy fertilizer. Therefore, the current trend is to explore the possibilities of supplementing organic fertilizer like FYM, castor cake, vermicompost etc. with biofertilizers. Biofertilizers have shown positive interaction with organic manure in legume crops. Organic manure in conjunction with biofertilizers will sustain and maintain the productivity of soil. Therefore, it is needed to compare various organic manure with biofertilizers in order to find out most effective combination. Keeping this objective in view, the present investigation was conducted to study the effect of organic manure and biofertilizers on growth and yield of groundnut.

MATERIALS AND METHODS

An investigation was carried out at Instructional Farm, Junagadh Agricultural University, Junagadh during the *kharif* season of 2006-07. The soil of the experimental plot was clayey in texture having pH 7.9, high in available nitrogen and medium in available phosphorus and potash. The experiment was laid out in randomized block design with twelve treatment combinations which are as follows: T₁= Control, T₂= 100% RDF (12.5:25:0 NPK/ha), T₃= Rhizobium+PSM, T₄= FYM@ 6.0 t/ha, T₅= Castor cake@ 1000 kg/ha, T₆= Vermicompost@ 2.0 t/ha, T₇= FYM@ 6.0 t/ha+ Rhizobium+PSM, T₈= Castor cake@

1000 kg/ha+ Rhizobium+PSM, T₉= Vermicompost@ 2.0 t/ha+ Rhizobium+PSM, T₁₀= FYM@ 3.0 t/ha+ Rhizobium+PSM, T₁₁= Castor cake@ 500 kg/ha+Rhizobium+PSM, T₁₂=Vermicompost@ 1.0 t/ha+ Rhizobium+PSM

Groundnut cv. GG-20 was sown at 60 cm x 10-15 cm spacing with 100 kg seed/ha in second week of July. The recommended dose of fertilizers @ 12.5:25:0 kg NPK/ha was considered as 100% RDF. The crop was fertilized as per treatments at the time of sowing, while well decomposed FYM containing 0.5% N, 0.2% P₂O₅, and 0.5% K₂O was mixed with soil at preparation of soil. Seed was inoculated with a culture of Rhizobium plus PSM as per treatment before sowing. Other cultural operations were done as per recommendation and crop requirements. During crop growth period about 1004.5 mm rainfall was received in 44 rainy days. Finally the crop was harvested and produce were dried, threshed, cleaned and weighed. The yield data was subjected to statistical analysis.

RESULTS AND DISCUSSION

Effect of organic manure:

Groundnut crop manured with FYM 6.0 t/ha and vermicompost 2.0 t/ha significantly increased the growth parameters *viz.*, plant height and number of nodules per plant (Table 1) at harvest as well as yield attributes like number of pods per plant, weight of pods per plant at harvest, number of mature pods per plant and seed index as compared to control (without organic manure) (Table 2). This may be due to the fact that organic manure increases the adsorptive power of soil for cation and anion

Table 1 : Effect of organic manure and biofertilizers on growth parameters of kharif groundnut

Treatments	Plant population (plant/ha)	Plant height (cm)	No. of branches per plant	No. of nodules per plant
T ₁	108179	28.05	4.33	110.23
T ₂	107253	31.98	4.40	121.33
T ₃	110494	29.45	4.40	123.17
T ₄	109877	31.91	4.53	122.60
T ₅	109877	29.86	4.40	119.17
T ₆	109877	30.93	4.27	121.13
T ₇	111883	32.93	5.00	136.67
T ₈	109259	32.27	4.67	131.07
T ₉	110957	32.33	4.87	133.37
T ₁₀	111420	32.21	4.60	132.40
T ₁₁	110185	31.86	4.60	129.93
T ₁₂	110031	32.05	4.47	129.27
S.E.±	2354	0.94	0.15	4.30
C.D. (P=0.05)	NS	2.75	NS	12.61
C.V. %	3.71	5.18	5.7	5.92

NS-Non significant

and these absorbed ions are released slowly for the entire crop growth period resulted in better nutrient availability at active growth of the crop. It might be attributed to the increase in the population of rhizobia due to more availability of organic carbon for their growth and development. Organic manure have many advantages in increasing root growth, soil microflora by providing congenial rhizosphere. Application of FYM 6.0 t/ha increased 23.8 and 19.09 per cent pod and haulm yields, respectively as compared to control and which was

statistically at par with the vermicompost @ 2.0 t/ha, castor cake @ 1.0 t/ha. The results are in close conformity with the findings of Raj and Patel (1996), Marimuthu *et al.* (2002) and Verma and Munshi (2003).

Effect of biofertilizers (Rhizobium+PSM):

Seed inoculation with biofertilizers *viz.*, *Rhizobium*+PSM gave response on plant height as well as yield attributes *viz.*, number of pods per plant, weight of pods per plant, number of mature pods per plant and seed index of groundnut crop as compared to control (Table 2). Biofertilizers inoculation resulted in greater nodulation. The additional supply of nitrogen and phosphorus helped in formation of new cell and thus, proliferation of growth. Phosphorus is an important constituent of co-enzymes involved in photosynthesis which might have been increased accumulation of photosynthesis. *Rhizobium* bacteria have the capacity to fix atmospheric nitrogen to soil and make it available to plant. Phosphorus solubilizing microorganisms reserved in available form of readily hydrolyzes organic phosphate and degrade them in the soil through production of organic acids. Seed inoculation with *Rhizobium*+PSM increased 11.14 and 3.40 per cent higher pod and haulm yields of groundnut, respectively as compared to control. These findings are in agreement with those obtained by Panwar *et al.* (2002), Meshram *et al.* (2004) in groundnut crop.

Combine effect of organic manure and biofertilizers:

The combine effect between organic manure and biofertilizers on growth and yield parameters might be results of their synergistic effect. Organic manure and

Table 2 : Effect of organic manure and biofertilizers on yield attributing characters of kharif groundnut

Treatments	No. of pods per plant	No. of mature pods per plant	Pod weight per Plant (g)	Seed Index (g)	Pod Yield (kg/ha)	Haulm yield (kg/ha)
T ₁	8.30	5.13	7.38	49.67	1625	2472
T ₂	9.07	7.63	11.03	53.07	1972	3083
T ₃	8.70	6.17	8.08	50.10	1806	2556
T ₄	9.20	6.80	9.73	52.53	2000	2944
T ₅	8.87	6.00	8.90	51.57	1833	2861
T ₆	9.13	6.50	9.33	52.50	1861	2889
T ₇	9.67	8.13	11.87	55.27	2278	3361
T ₈	9.13	6.77	10.77	53.57	2028	3167
T ₉	9.47	7.97	11.07	54.78	2083	3250
T ₁₀	9.37	7.67	11.13	54.17	2056	3000
T ₁₁	8.60	6.13	9.78	51.23	1833	2944
T ₁₂	9.13	6.40	11.03	52.77	1944	2972
S.E.±	0.23	0.20	0.30	1.09	105	166
C.D. (P=0.05)	0.67	0.59	0.87	3.20	307	488
C.V. %	4.38	5.18	5.14	3.59	9.32	9.73

biofertilizers significantly improved plant growth characters *i.e.* plant height and no. of nodules per plant may be due to increased nutrient availability throughout the growth period of groundnut crop (Table 1). Application of FYM and vermicompost along with biofertilizers significantly increased no. of pods per plant, no. of mature pods per plant, pod weight per plant and seed index (Table 2).

The combine effect of FYM and vermicompost with biofertilizers (Rhizobium+PSM) was found to be significant in respect of pod and haulm yield (kg/ha). Pod and haulm yields were significantly increased 40.19 and 35.96 per cent more under application of FYM @ 6.0 t/ha+Rhizobium+PSM, respectively as compared to control. The increase in pod yield may be attributed to the reason that organic manure along with biofertilizers possibly increased the concentration of N, P and K ions of soil solution and ultimately affected the formation of more nodules, vigorous root development, better N fixation and better development of plant growth leading to higher photosynthetic activity and traslocation of photosynthates to the sink which in turn resulted in better development of yield attributes and finally in higher pod yield. The findings closely followed the results of Dhane *et al.* (1996), Kachot (1999), Badole *et al.* (2001) and Thakare *et al.* (2003).

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