

Effect of organic manure and bio-fertilizers on growth, yield attributes and economics on *Kharif* groundnut (*Arachis hypogaea*, L)

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Abstract

A field experiment was conducted to find out the growth, yield attributes and economics of *kharif* groundnut at Instructional farm, Department of Agronomy, Junagadh Agricultural University, Junagadh during *kharif* season of 2006-07. The results revealed that FYM @ 6.0 t/ha + Rhizobium + PSM significantly increased the plant height (cm), no. of nodules/plant, pod weight/plant, no. of mature pods/plant, seed index and shelling percentage of groundnut as compared to control, castor cake @ of 1000 kg/ha and treatment of -seed treated with Rhizobium + PSM. The crop responded favorably to application of FYM @ 6.0 t/ha + Rhizobium + PSM and gave significantly higher pod yield, net realization and B:C ratio over control, seed treated with Rhizobium + PSM and vermicompost @ 2.0 t/ha. Application of FYM 6.0 t/ha + Rhizobium + PSM reported the maximum net realization of Rs.55027/ha and the highest B:C ratio of 5.69 as compared to rest of the treatments.

Key words : Groundnut, organic manure, bio-fertilizers, INM, yield, economics.

Introduction

Groundnut is major commercial oilseed crop in India. The crop can grow successfully in areas receiving the rainfall ranging from 600 to 1250 mm. It contributes 40 % of the total area and 30 % of total production of oilseed crop. India ranks first in area and second in productions in the world. Gujarat ranks first in production and grown in an area of 18.4 lakh ha with a productivity of 1355 kg/ha (1). The organic matter plays in an important role in crop productions. The organic manure acts on the soil physical properties and promotes formation of soil crumbs. The organic carbon in the organic mater acts as source of energy for soil microorganism and upon mineralization release essential elements during crop growth (2). Biofertilizers are microbial inoculants of selective microorganism already existing in nature. Rhizobium may help in improving soil fertility by way of accelerating biological nitrogen fixation from atmosphere. Solubilisation of the insoluble nutrients already present in soil, decomposing plant residues, simultaneously plant growth and production.

Several phosphate solubilising micro organization

(PSM) have the consistant capacity to increase the availability of phosphate to plant, not only by mineralizing organic phosphorus compound, but also by rendering inorganic phosphorus compound more available to plant (3).

Material and methods

An experiment was conducted at Instructional Farm, Junagadh Agricultural University, Junagadh during the *kharif* season of 2006-07. The experimental soil was clayey in texture, low in available nitrogen and medium in available phosphorus as well as available potash with pH 7.9. The experiment was laid out in randomized block design with 12 treatment involving T₁-control; T₂ 100 % RDF (12.5-25.0 NPK kg/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 @ of 1000 kg/ha + Rhizobium + PSM; T₉ vermicompost @ of 2.0 t/ha + Rhizobium + PSM; T₁₀ FYM @ of 3.0 t/ha + Rhizobium + PSM; T₁₁ castor cake @ 500 kg/ha + Rhizobium + PSM and T₁₂ vermicompost @ 1.0 t/ha + Rhizobium + PSM with 3 replications.

Table 1. Effect of organic manure and biofertilizers on growth and yield attributing characters of groundnut

S.N.	Treatments	Plant height (cm)	No. of nod- ules/plant	Pod weight/ plant	No. of mature pod/plant	Seed Index (g)	Shelling (%)
1	T ₁ Control	28.05	110.23	7.38	5.13	49.67	69.95
2	T ₂ 100 % RDF (12.5: 25: 0 NPK kg/ha)	31.98	121.33	11.03	7.63	53.07	72.47
3	T ₃ Rhizobium + PSM	29.45	123.17	8.08	6.17	50.10	70.52
4	T ₄ FYM @ 6 t/ha	31.91	122.60	9.73	6.80	52.55	72.03
5	T ₅ Castor cake @ 1000 kg/ha	29.86	119.17	8.90	6.00	51.57	70.58
6	T ₆ Vermicompost @ 2 t/ha	30.93	121.13	9.33	6.50	52.50	71.55
7	T ₇ FYM @ 6 t/ha + Rhizobium + PSM	32.93	136.67	11.87	8.13	55.27	93.97
8	T ₈ Castor cake @ 1000 kg/ha + Rhizobium + PSM	32.27	131.07	10.77	6.77	53.57	73.13
9	T ₉ Vermicompost @ 2 t/ha + Rhizobium + PSM	32.33	133.38	11.07	7.97	54.78	73.43
10	T ₁₀ FYM @ 3 t/ha + Rhizobium + PSM	32.21	132.40	11.13	7.67	54.17	72.70
11	T ₁₁ Castor cake @ 500 kg/ha + Rhizobium + PSM	31.86	129.93	9.78	6.13	51.23	71.03
12	T ₁₂ Vermicompost @ 1 t/ha + Rhizobium + PSM	32.05	129.27	10.03	6.40	51.67	71.56
	S.E.m., ±	0.94	4.30	0.30	0.20	1.09	0.84
	C.D. at 5 %	2.75	12.61	0.87	0.59	3.20	2.45
	C.V. %	5.18	5.92	5.14	5.18	3.59	2.01

Groundnut Cv GG-20 was sown at 60 X 10 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 with application of Urea and Diammonium phosphate at the time of sowing, while FYM, castor cake, vermicompost, biofertilizers were applied prior to sowing as per treatments. Seed was inoculated with a culture of Rhizobium + PSM as per treatments 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.

Results and discussion

Growth and yield attributing characters

The results revealed that FYM @ 6.0 t/ha + Rhizobium + PSM significantly increased the plant height, no. of nodules/plant and pod weight/plant of groundnut as compared to control, castor cake @ 1000 kg/ha and treatments of seed treated with Rhizobium + PSM. Manuring the crop either with FYM 6 t/ha or vermicompost 2 t/ha remarkably increased the no. of pods/plant 10.84 and 10 per cent; seed index 5.76 and 5.70 per cent as well as shelling percentage 2.98 and 2.29 per cent, respectively as compared to control. (Table 1). The increase in these attributes might have been on account of the overall improvement in vegetative growth of plant due to the application of manure which favorably influence flowering and pod development. 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. The findings are in close vicinity with the results obtained by Agasimanu and Hosmani (4) with respect to no. of pods/plant, seed index and shelling percentage as well as Asodadaria (5) in groundnut for plant height with FYM and castor cake.

Effect on pod and haulm yield

Pod and haulm yields were significantly increased with FYM @ of 6 t/ha which was statistically at par with the vermi compost @ 2 t/ha and castor cake @ 1000 kg/ha. Application of FYM 6 t/ha increased 23.08 and 19.08 % pod and haulm yields as compared to control. The increase in no. of pods/plant, seed index and shelling percentage as a result of seed inoculation with biofertilizers might have been resulted in increase pod and haulm yields of groundnut. Seed

Table 2. Effect of organic manure and biofertilizers on yield and economics of groundnut

S.N.	Treatments	Pod yield kg/ ha	Haulm yield kg/ ha	Gross realization Rs./ha	Cost of cultivation Rs./ha	Net realization Rs./ha	B:C Ratio
1	T ₁ Control	1625	2472	46451	7923	38528	4.75
2	T ₂ 100 % RDF (12.5: 25: 0 NPK kg/ha)	1972	3083	56708	8650	48063	5.56
3	T ₃ Rhizobium + PSM	1806	2556	50847	7957	42800	5.39
4	T ₄ FYM @ 6 t/ha	2000	2944	56748	9633	46812	4.89
5	T ₅ Castor cake @ 1000 kg/ha	1833	2861	52694	11913	4078	3.42
6	T ₆ Vermicompost @ 2 t/ha	1861	2886	53430	15903	37527	2.36
7	T ₇ FYM @ 6 t/ha + Rhizobium + PSM	1278	3361	64694	9667	55027	5.69
8	T ₈ Castor cake @ 1000 kg/ha + Rhizobium + PSM	2028	3167	58292	11935	46466	3.88
9	T ₉ Vermicompost @ 2 t/ha + Rhizobium + PSM	2083	3250	59875	15937	43938	2.76
10	T ₁₀ FYM @ 3 t/ha + Rhizobium + PSM	2056	3000	58250	8800	49438	5.61
11	T ₁₁ Castor cake @ 500 kg/ha + Rhizobium + PSM	1833	2944	52654	9940	42341	4.29
12	T ₁₂ Vermicompost @ 1 t/ha + Rhizobium + PSM	1944	2972	55639	11947	43692	3.66
	S.E.m., ±	105	166	-	-	-	-
	C.D. at 5 %	307	488	-	-	-	-
	C.V. %	9.32	9.73	-	-	-	-

inoculation with *Rhizobium* + *Pseudomonas striata* increased 28.67 and 26.45 per cent higher pod and haulm yields of groundnut, respectively as compared to control. (Table 1) The present trend of increase in pod and haulm yields with application of organic manures are in close conformity with findings of Asodaria (5) for groundnut pod and haulm yields with FYM and castor cake application.

Effect of Economics

Fertilizing the groundnut crop with FYM @ 6 t/ha + *Rhizobium* + PSM gave the highest net return of Rs.55027/ha. The highest B:C ratio of 5.69 was also secured with FYM @ 6 t/ha + *Rhizobium* + PSM. (Table 2). The probable reason for increase net return with FYM @ 6 t/ha + *Rhizobium* + PSM found equally effective in securing the pod and haulm yields as well as cost of production is also lower as compared to rest of the treatments.

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