

Effect of organic manure and biofertilizers on yield, harvest index, shelling percentage and quality of *kharif* groundnut (*Arachis hypogaeae* L.)

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ABSTRACT

Field experiment was conducted during the *kharif* season of 2006-07 at Junagadh (Gujarat) to study the response of organic manure and biofertilizers (Rhizobium+PSM) in clayey soils on groundnut (*Arachis hypogaeae* L.). The results revealed that seed inoculation with biofertilizers (Rhizobium+PSM) significantly increased the pod, haulm and biological yields, shelling percentage, oil yield and protein content of groundnut crop over control (no manuring). The crop responded favourably to application of 6 t/ha and 3 t/ha FYM along with Rhizobium+PSM and gave significantly pod, haulm, biological yields, shelling percentage, oil yield and protein content of groundnut over no manuring. Harvest index and oil content was not influenced significantly due to application of organic manure alongwith biofertilizers (Rhizobium+PSM) in groundnut.

Key words : Groundnut, Organic maure, Bioferilizers, Yield, Quality

INTRODUCTION

Among the oilseed crop grown in India, groundnut occupies pre-dominant position. It has now not retained only as as important edible oilseed, but also gained prominence as an important cash crop and foreign exchange earner for India in general and for Gujarat in particular. Therefore, the groundnut is rightly called as "King of oilseed" in India. Groundnut seed contains about 50% of the seed has high qualities of protein (21.4-36.4%), carbohydrates (6.0-24.09%), minerals and vitamins. (Das, 1997).

Biofertilizers like Rhizobium and PSM are microbial inoculants of selective microorganisms like bacteria, algae, fungi already existing in nature. They may help in improving soil fertility by way of accelerating biological nitrogen fixation from atmosphere. Solubilization of the insoluble nutrients already present in soil, decomposing plant residues, stimulating plant quality and production.

An organic fertilizer has nitrogen, phosphorus, potassium, organic carbon, sulphur, hormones, vitamins, enzymes and antibiotics which helps to improve the quality and quantity of yield. Organic fertilizers like FYM, vermicompost, castor cake etc. with biofertilizers should be applied to obtain desirable yields and improvement in quality parameters. Keeping these objectives in mind, an experiment was conducted to find out level of organic manures with and without biofertilizers for maximizing yield and quality parameters of groundnut crop.

MATERIALS AND METHODS

An investigation was conducted at Instructional Farm, Junagadh Agricultural University, Junagadh during

the *kharif* season of 2006-07. The soil of the experimental plot was clayey in texture and slightly alkaline in reaction. The soil has average organic carbon content of 0.81 per cent and was high in available nitrogen and medium in available phosphorus and potash with pH 7.9.

The experiment was laid out in randomized block design with twelve treatment combinations. These treatments 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.

An improved variety, GujaratGroundnut-20 (GG-20) was used in this investigation. GG-20 variety of groundnut was sown in second week of July with 60 cm x 10-15 cm spacing with 100 kg/ha seedrate. The crop was fertilized as per treatments at the time of sowing. Groundnut seed was inoculated with a culture of Rhizobium plus PSM as per treatments before sowing. Other cultural and intercultural 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. An oil and protein content of kernel was determined by Nuclear Magnetic Resonance (NMR) as per method suggested by Tiwari *et al.* (1974). The oil yield (kg/ha) was calculated from the oil content and pod yield.

RESULTS AND DISCUSSION

Effect of organic manure:

Pod yield, haulm yield, biological yield, seed index and shelling percentage were significantly increased with FYM@ 6 t/ha which was statistically at par with the vermicompost@ 2.0 t/ha and castor cake @1000 kg/ha. The increase in these attributes might have been on account of the overall improvement in vegetative growth of the plant due to the application of organic manure, which favourably influenced flowering and fruiting. All these improved parameters jointly increased the pod and haulm yield (Table 1). Harvest index show non-significant results of different treatments. The results are in close vicinity with the findings of Dhane *et al.* (1996), Verma and Munshi (2003). The oil content in groundnut kernel was not influenced significantly due to application of organic manure. The application of 6 t FYM/ha increased 28.49 per cent higher oil yield and 21.61 per cent protein content of groundnut as compared to control. The results are similar to the findings of Mehata *et al.* (1995) and Ahmed and Osman (2003).

Effect of biofertilizers (Rhizobium+PSM):

Seed inoculation with biofertilizers brought about improvement in different pod yield, haulm yield, biological yield, seed index and shelling percentage in comparison to control. 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. The additional supply of nitrogen and phosphorus help in

formation of new cell and thus, proliferation of growth. It may be noted that phosphorus is an important constituent of co-enzymes involved in photosynthesis which might have been increased accumulation of photosynthesis. The effect of different treatments failed to influence significantly the harvest index in groundnut. The results are in close conformity with Panwar *et al.* (2002) and Dudde and Raut (2005).

Inoculated kernels either with rhizobium+PSM failed to exert significant influence on oil yield and protein content of groundnut kernels. Seed inoculation with rhizobium +PSM increased 11.65 and 1.37 per cent more oil yield and protein content of groundnut (Table 2), respectively as compared to control. Seed inoculation may be attributed to increase nitrogen content in grain, as nitrogen is an integral part of protein. It may also be attributed due to increase phosphorus content in kernel (Table 2) which is structural element of certain co-enzymes involved protein synthesis. Similar results were also obtained by Gupta *et al.* (1998) and Panwar *et al.* (2002).

Combine effect of organic manure and biofertilizers:

The application of farm yard manure alongwith biofertilizers (Rhizobium+PSM) significantly increased the pod, haulm, biological yields, seed index, shelling percentage of groundnut (Table 1). The mean pod and haulm yield recorded with 6 t/ha FYM+Rhizobium+PSM was 40.19 and 35.96 per cent higher, respectively over no manuring. The biological yield, seed index, shelling percentage observed with 6 t/ha FYM+Rhizobium+PSM were 37.64, 11.27, and 5.27 per cent higher, respectively

Table 1 : Effect of organic manure and biofertilizers on yield parameters, harvest index and shelling percentage of *kharif* groundnut (*Arachis hypogaea* L.)

Treatments	Seed index	Shelling percentage	Pod yield	Haulm yield	Biological yield	Harvest index
T ₁	49.67	69.95	1625	2472	4097	39.69
T ₂	53.07	72.47	1972	3083	5072	38.92
T ₃	50.10	70.52	1806	2556	4361	41.30
T ₄	52.53	72.03	2000	2944	4944	40.50
T ₅	51.57	70.58	1833	2861	4694	39.31
T ₆	52.50	71.55	1861	2889	4750	39.26
T ₇	55.27	73.97	2278	3361	5639	40.41
T ₈	53.27	73.13	2028	3167	5194	38.96
T ₉	54.78	73.42	2083	3250	5333	39.03
T ₁₀	54.17	72.70	2056	3000	5056	40.78
T ₁₁	51.23	71.03	1833	2944	4778	38.47
T ₁₂	52.77	71.56	1944	2972	4917	39.65
S.E.±	1.09	0.84	105	166	193	1.9032
C.D. (P=0.05)	3.20	2.45	307	488	565	NS
C.V. %	3.59	2.01	9.32	9.73	6.8	8.31

NS – Non significant

Table 2 : Effect of organic manure and biofertilizers on quality parameters of *kharif* groundnut (*Arachis hypogaea* L.)

Treatments	Oil content (%)	Oil yield (kg/ha)	Protein content (%)
T ₁	49.04	558	20.50
T ₂	50.09	710	22.35
T ₃	48.77	623	20.78
T ₄	49.79	717	21.61
T ₅	48.83	632	21.44
T ₆	49.77	662	21.51
T ₇	50.08	844	22.67
T ₈	48.99	727	22.15
T ₉	49.61	759	22.65
T ₁₀	48.11	717	22.39
T ₁₁	47.82	622	21.67
T ₁₂	48.34	671	22.55
S.E.±	0.75	33	0.19
C.D. (P=0.05)	NS	97	0.55
C.V. %	2.65	8.3	1.49

NS – Non significant

over control (no manuring). The higher yields owing to FYM application alongwith biofertilizers may be due to additional nutrients supplied by it and improvement in soil physical health. The effect of different treatments on harvest index was not significant during experimentation. The findings closely followed the results of Badole *et al.* (2001), Thakare *et al.* (2003).

The significant increase in oil yield (51.24%) and protein content (10.59%) due to application of 6 t/ha FYM+Rhizobium+PSM was observed more as compared to no manuring (Table 2). The effect of different treatment failed to show influence significantly on the oil content of groundnut crop. These findings are also followed by Kachot (1999) and Panwar *et al.* (2002).

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