EFFECT ON INTEGRATED NUTRIENT MANAGEMENT ON PRODUCTIVITY, QUALITY AND NUTRIENT UPTAKE ON SUMMER GROUNDNUT (*ARACHIS HYPOGAEA* L.)

ABSTRACT

To study the effect of integrated nutrient management on productivity, quality and nutrient uptake on summer groundnut (*Arachis hypogaea* L.) field experiment was conducted during summer season of 2018 at Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricutlural University, Sardarkrushinagar, Gujarat to study the effect The experiment consist of ten different integrated nutrient management treatments for application of recommended dose of nitrogen to summer groundnut i.e 25 kg nitrogen/ha through different source of organic fertilizers *viz*.(farm yard manure and vermicompost) inorganic fertilizer along with FYM and Vermicompost with *Rhizobium* and PSB. The results revealed that the integration of inorganic fertilizers along with seed inoculation of biofertilizers i.e *Rhizobium* and PSB recorded significantly the highest pod and haulm yield of summer groundnut as compared to rest of treatments. Combined application of 75 % RDN and 25 % RDN through vermicompost or FYM along with seed inoculation of *Rhizobium* and PSB recorded higher pod and haulm yield and also higher net realization and B: C ratio of summer groundnut.

Key words : Groundnut, INM, Biofertilizer, RDN, Vermicomost, FYM.

1. INTRODUCTION

Groundnut is known to be a unique and important legume cum oilseed crop of India. Groundnut is popularly known as nuts and it is grown in Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka and Maharashtra .The Kernel of groundnut used for many culinary preparation due to its rich source of oil and protein. Groundnut naturally enriches the soil through symbiosis. Cultivation of groundnut during summer season is increasing because of controlled moisture condition through irrigation, abundant sunshine and less infection of pest and disease. The continuous and imbalance use of chemical fertilizers creates problems in the production potential of summer groundnut. Use of chemical fertilizers in combination of organic manures might be recorded the higher production of groundnut crop and improve the soil health. Organic manures are good complimentary source of nutrients and improve the

efficiency of applied mineral (inorganic) nutrient in on hand and improve the physical and biological properties of the soil on other hand. A judicious and combined use of organic and inorganic sources of plant nutrients plays important role in the economically the use of fertilizers under increasing cost of chemical fertilizers. Hence the present experiment was carried out to find out the effect of organic and inorganic manures on pod and haulm yield and economics of summer groundnut.

2. MATERIALS AND METHODS

A field experiment was conducted during summer season of 2018 at Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, to study effect of Integrated nutrient management on productivity, quality and nutrient uptake on summer groundnut (*Arachis hypogaea* L.) The experiment was conducted on loamy sand soil having pH 7.42, organic carbon (0.23%) and available nitrogen (158 kg/ha), available P_2O_5 (37 kg/ha) and available K_2O (286 kg/ha) in 0-15 cm soil depth. There was ten treatments *viz.*, 100% RDF (25 : 50 N and P_2O_5 kg/ha) (T_1), 50% RDN + 50% N through FYM (T_2), 75% RDN + 25% N through FYM (T_3), 50% RDN + 50% N through vermicompost (T_4), 75% RDN + 25% N through vermicompost (T_5), 50% RDN + 50% N through FYM + *Rhizobium* + PSB (T_6), 75% RDN + 25% N through FYM + *Rhizobium* + PSB (T_7), 50% RDN + 50% N through vermicompost + *Rhizobium* + PSB (T_8), 75% RDN + 25% N through vermicompost + *Rhizobium* + PSB (T_9), 100% RDF + *Rhizobium* + PSB (T_{10}). Ten treatments were evaluated in randomised block design with four replications. The nutrient sources viz. FYM (0.5 % N, 0.25 % P_2O_5 and 0.5 % K_2O) and vermicompost (3 % N, 1.0 % P_2O_5 and 1.5 % K_2O) as well as required quantity of nitrogen and phosphorus in the form of urea and single super phosphate, respectively were applied as per treatments at the time of sowing. The organic sources of fertilizers i.e FYM and vermicompost was applied 15 days before sowing.

Groundnut variety TG 37 was sown with 100 kg/ha seed rate at inter raw spacing of 30 cm and intra raw spacing of 10 cm on 19th February 2018. All the cultural operations was carried out as per the recommendation of summer groundnut. Randomly five plants per net plot were selected from the net plot area and tagged for recording the growth and yield attributes characters. The cost of cultivation and returns were calculated by taking account the prevailing cost of inputs and price of produce.

The crop was manually harvested, threshed and pod yield was recorded. The soil sample were collected from each plot after harvesting groundnut crop at 0-15 cm depth and analysed

using standard procedure. The total nitrogen content of kernel and haulm of groundnut plants was analysied by micro Kjedahl method and phosphorus by Vanado molydophosphorus acid yellows colour methods (Jackson, 1967). Total nitrogen values thus obtained were multiplied with a factor of 6.25 to obtain protein content. The estimation oil content was determined by soxhlet extraction methods following standard procedure as per association of official Analytical Chemists (AOAC, 1970). The total oil yield per hectare was also worked out by multiplying kernel yield (kg/ha) with oil percent in kernel and divided by 100.The uptake of nitrogen and phosphorus in kernel and haulm were determined by using following formula.

$$\text{Nutrients uptake (kg/ha)} = \frac{\text{Nutrient content (\%)} \times \text{Kernel yield (kg/ha)}}{100}$$

3. RESULT AND DISCUSSION :

Yield and yield attributes

Significantly higher number of pods per plant and dry weight of pods per plant were recorded by the application of RDF **+** *Rhizobium* + PSB and it was followed by 75% RDN + 25% N through vermicompost + *Rhizobium* + PSB and 75% RDN + 25% N through FYM + *Rhizobium* + PSB. Since the plants were healthy under treatments of during combination FYM, vermicompost and biofertilizers then reflected in their yield attributes viz. number of pods and dry weight of pods per plant. The minimum number of pods per plant and dry weight of pod per plant were recorded by 50% RDN + 50% N through FYM. Application of fertilizer along FYM and vermicompost increased the number of pods and dry weight of pods per plant significantly, which further increased the pod and haulm yield of summer groundnut. Mohapatra and Dixit (2010) also reported that pod and haulm yield were significantly higher by the application of FYM, vermicompost and biofertilizers.

An application of recommended dose of fertilizers through various sources (viz. FYM + Vermicompost) along with biofertilizers (*Rhizobium* + PSB) significantly increased the pods and haulms yield of summer groundnut. The application of RDF along with biofertilizers (*Rhizobium* + PSB) resulted in significantly highest pods and haulms yield, but it was closely followed by 75% RDN + 25% N through vermicompost + *Rhizobium* + PSB and 75% RDN + 25% N through FYM + *Rhizobium* + PSB. In case of pods and haulms yield, the latter two treatments in combination of FYM and vermicompost were found

statistically alike. The increase in pods yield was 22.8, 22.0 and 20.9 per cent(Table 2) than that of 50% RDN + 50% N through FYM .

This might be attributed to rapid mineralization of nitrogen and slowly supply of nitrogen from FYM and vermicompost along with biofertilizers which might have met the nitrogen requirement of crop at critical stages of growth. Further, FYM and vermicompost act as a nutrient reservoir and upon decomposition produce organic acides, thereby absorbed ions are released slowly during entire growth period leading to improvement in different yield attributes characters and ultimately pods and haulms yield of groundnut increased. The percent increase in pods yield by fertilizing the crop with 100% RDF + *Rhizobium* + PSB (T_{10}), 75% RDN + 25% N through vermicompost + *Rhizobium* + PSB (T_9) and 75% RDN + 25% N through FYM + *Rhizobium* + PSB (T_7) was tune to the tune of 22.8, 22.0 and 20.9 per cent, respectively over 50% RDN + 50% N through FYM. Similar trend was found by Abraham and Thenua (2010). Dhadge and Satpute (2014) also reported significantly heigher the pods and haulms yield.

Quality

The protein content in summer groundnut influenced markly by different integrated nutrient management treatments. As the nitrogen is the basic constituent of protein and with the increase in the availability nitrogen by the application of organic manures and *Rhizobium* inoculants, the uptake nitrogen increased which resulted in heigher protein content in kernel. Oil content was not significantly influenced by different integrated nutrient management treatments, as oil content is a genetical characters which was not much influenced by agronomical practices. But oil yield was influenced by different integrated nutrient management treatments due to higher kernel yield of the groundnut. Lowest oil content and oil yield was recorded in 50% RDN + 50% N through FYM. Bhosale *et al.* (2017) also reported maximum oil content and oil yield under organically manured plots.

Soil fertility

Integrated Application of nutrients had mark effect on available nitrogen and available phosphorus in soil but it failed to reached the level of significance but with respect to available potassium. An application of 50 % RDN + 50 % nitrogen through FYM along with biofertilizers **(***Rhizobium* + PSB) resulted in significantly higher available nitrogen (151 kg/ha) and available phosphorus (38.63 kg/ha) followed by 50 % RDN + 50 % nitrogen through FYM along with biofertilizers **(***Rhizobium* + PSB) and 50 % nitrogen through vermicompost. An application of 100 % RDF recorded significantly low content of available nitrogen and phosphorus levels as compared to organic manured plots.This might be due to

the fact that in organically manured plots microbial population might be increased and as a result soil aggregation and decomposition have resulted in increased organic content in soil leading to higher available nitrogen in soil the higher of nitrogen by groundnut with the incorporating of manured with *Rhizobium* + PSB may be due to release of higher amount of nitrogenous compounds by root nodules at early stage of growth and their subsequent decomposition at lower stages. Moreover, FYM increase the absorptive power of the soil for cations and anions particularly phosphates and nitrates. The increase in available phosphorus might be due to the organic acids which are released during microbial decomposition of organic matter which helped in solubilising of native phosphorus as a result of which the availability of phosphorus content in soil increased. The beneficial effects of organic manured and biofertilizers on increased availability of nitrogen and phosphorus to soil as were also reported by Choudhary *et al.* (2011).

Nitrogen, phosphorus and potassium content and uptake integrated application of nutrients failed to reach the level of significance with respect to potassium content in kernel and haulm (Table 3). Marked differences were observed in nitrogen and phosphorus content and uptake in kernel and haulm of groundnut. Significantly higher content and uptake of nitrogen and phosphorus was recorded with the application of 100% RDF along with biofertilizers **(***Rhizobium* + PSB) followed by 75% RDN + 25% N through vermicompost + *Rhizobium* + PSB and 75% RDN + 25% N through FYM + *Rhizobium* + PSB. The content and uptake of nitrogen and phosphorus was more in vermicompost treated plots, than that of FYM treated plots owing to better availability of phosphorus in crop root zone resulting from solubilisation caused by the organic acids , produced from decaying organic matter and also increased uptake by the groundnut roots due to their association with microrrhizal filaments increasing in the ascribing area of roots. The increased in nitrogen uptake might be due to enhanced activity of nitrogenease and nitrate reductase enzyme in the soil. Choudhary *et al.* (2011) also recorded the highest content and uptake of nitrogen and phosphorus by showed that the application of 100% RDF + *Rhizobium* + VAM + PSB.

4. CONCLUSION :

Fertilizing the crop with 100% RDF + *Rhizobium* + PSB recorded significantly higher pod and haulm yield ,protein content, oil yield and also higher net realization and B: C ratio of summer groundnut. .

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Table 1 : Effect of integrated nutrient management treatments on productivity on summer groundnut

Sr. No.	Treatments	Number of pods per plant			Dry weight of pods/plant	Pod yield (kg/ha)	Haulm yield (kg/ha)	Shelling (%)
		Filled	Unfilled	Total				
T_1	100% RDF (25:50 N and P_2O_5 kg/ha)	17.0	6.2	23.2	12.15	2751	4878	68.03
T_2	50% RDN + 50% N through FYM	13.0	5.4	18.4	10.66	2543	4201	65.24
T_3	75% RDN + 25% N through FYM	15.0	5.5	21.0	11.90	2726	4634	67.25
T_4	50% RDN + 50% N through vermicompost	13.9	5.4	19.3	10.76	2576	4301	65.46
T_5	75% RDN + 25% N through vermicompost	15.7	5.8	21.5	12.14	2737	4742	67.86
T_6	50% RDN + 50% N through FYM + *Rhizobium* + PSB	14.4	5.5	19.9	11.47	2603	4422	65.62
T_7	75% RDN + 25% N through FYM + Rhizobium + PSB	18.4	6.4	24.8	12.90	3075	5100	68.22
T_8	50% RDN + 50% N through vermicompost + *Rhizobium* + PSB	14.6	5.5	20.1	11.76	2723	4607	66.91
T_9	75% RDN + 25% N through vermicompost + *Rhizobium* + PSB	18.3	6.9	25.1	13.01	3104	5236	69.09
T_{10}	100% RDF + *Rhizobium* + PSB	19.4	7.2	26.6	13.43	3122	5438	70.82
	S.Em. ±	0.98	0.28	0.97	0.43	124	192	2.36
	C.D. at 5 %	2.85	0.81	2.81	1.26	360	558	NS
	C.V. %	12.31	0.38	8.83	7.21	8.87	8.09	7.00

Table 2 : Effect of integrated nutrient management treatments on quality parameters of summer groundnut

Sr. No.	Treatments	Protein content (%)	Oil content (%)	Oil yield (kg/ha)
T_1	100% RDF (25:50 N and P_2O_5 kg/ha)	22.9	47.63	892
T_2	50% RDN + 50% N through FYM	20.9	44.96	752
T_3	75% RDN + 25% N through FYM	22.0	46.81	850
T_4	50% RDN + 50% N through vermicompost	21.3	45.22	769
T_5	75% RDN + 25% N through vermicompost	22.7	47.11	876
T_6	50% RDN + 50% N through FYM + *Rhizobium* + PSB	21.4	46.02	791
T_7	75% RDN + 25% N through FYM + Rhizobium + PSB	23.6	47.95	999
T_8	50% RDN + 50% N through vermicompost + *Rhizobium* + PSB	21.6	46.33	849
T_9	75% RDN + 25% N through vermicompost + *Rhizobium* + PSB	23.9	48.22	1029
T_{10}	100% RDF + *Rhizobium* + PSB	24.0	48.52	1074
	S.Em. ±	0.45	1.49	54.6
	C.D. at 5 %	1.30	NS	158.5
	C.V. %	3.98	6.35	12.30

Table 3: Effect of integrated nutrient management on uptake by kernel and haulm

Sr. No.	Treatments	Nutrient uptake by kernel (kg/ha)			Nutrient uptake by haulm (kg/ha)		
		N	P	K	N	P	K
T_1	100% RDF (25:50 N and P_2O_5 kg/ha)	67.87	8.62	11.79	27.55	3.67	12.37
T_2	50% RDN + 50% N through FYM	56.34	7.20	10.07	20.39	2.92	10.16
T_3	75% RDN + 25% N through FYM	64.89	8.26	11.51	26.05	3.45	11.64
T_4	50% RDN + 50% N through vermicompost	57.56	7.41	10.27	21.71	3.00	10.55
T_5	75% RDN + 25% N through vermicompost	67.08	8.40	11.66	26.91	3.54	11.92
T_6	50% RDN + 50% N through FYM + *Rhizobium* + PSB	58.67	7.55	10.60	23.25	3.09	10.69
T_7	75% RDN + 25% N through FYM + Rhizobium + PSB	79.10	9.67	13.21	31.15	4.23	13.89
T_8	50% RDN + 50% N through vermicompost + *Rhizobium* + PSB	63.14	8.16	11.40	25.41	3.34	11.49
T_9	75% RDN + 25% N through vermicompost + *Rhizobium* + PSB	82.28	10.07	13.62	32.24	4.42	14.38
T_{10}	100% RDF + *Rhizobium* + PSB	85.14	10.56	14.29	33.39	4.72	14.83
	S.Em. ±	4.37	0.49	0.70	1.53	0.26	0.70
	C.D. at 5 %	12.68	1.43	2.04	4.45	0.74	2.03
	C.V. %	12.80	11.51	11.86	11.43	14.06	11.49