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Response of *kharif* groundnut to different sources of organic and inorganic nutrients under North Gujarat condition

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Abstract
A field experiment entitled "Response of *kharif* groundnut to different sources of organic and inorganic nutrients under North Gujarat condition" was conducted at Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sandarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar during *kharif* season of 2020-21. The soil of experimental field was loamy sand in texture with low in organic carbon, low in available nitrogen, medium in available phosphorus and available potash having pH of 7.1. The experiment consisting of ten treatment combinations comprising 100% RDF (12.5:25:00 kg/ha) and combinations of 75% and 50% RDF with FYM 5 t/ha, castor cake 0.5 t/ha, *Rhizobium* + PSB and different combinationa from above were evaluated in randomized block design with four replications. Plant population at 30 DAS and at harvest did not differ significantly due to different combination of organic and inorganic sources of nutrients. Significantly the higher number of pods per plant, no. of nodules per plant at flowering, fresh and dry weight of nodules (g), number of seeds per pod, pod yield per plant (g), dry matter accumulation per plant (g) at harvest, pod yield(kg/ha), haulm yield (kg/ha), shelling percentage (%), gross realization net realization and B: C ratio was recorded under 75% RDF + castor cake 0.5 t/ha + *Rhizobium* + PSB which was at par with 75% RDF + FYM 5 t/ha + *Rhizobium* + PSB in all above mentioned observations.

Keywords: *Kharif* groundnut, organic, inorganic nutrients

Introduction
Groundnut (*Arachis hypogaea* L.) is one of the most important oilseed crop and cash crop in the world. It belongs to family Leguminosae and sub family Papilionaceae and popularly called as poor man's almond. The commercially cultivated groundnut varieties belong to the species *viz*., hypogaea (verginia or runner), fastigiata (valencia) and vulgaris (spanish). It is also known as peanut, earthnut, monkeynut, manilanut, pandanut as well as goober nut. Groundnut is rich source of oil (48%) and high quality protein (21.4-36.4%). Groundnut kernels are rich in vitamins *viz*., A, B, and some members of B2 group (Bhondve *et al*., 2009) [4]. Their calorific value is 349 per 100 grams. Groundnut is also considered as a stable and nutritive as it contains the right proportion of oleic (40-45%) and linoleic (25-35%) acids (Mathur and Khan, 1997) [7].
Globally, groundnut is cultivated on an area of 29.81 mha with a production of 49.54 mt with an average productivity 16.62 q/ha. In India, groundnut is cultivated on 6.09 mha area with a production of 10.21 mt and productivity of 16.76 q/ha (Anon., 2022) [1]. In India 80 per cent of the groundnut area and 84 per cent of the production is confined to the states of Gujarat, Andhra Pradesh, Telangana, Tamil Nadu, Karnataka and Maharashtra. In India, Gujarat holds first position in groundnut production and contributes 35.50% to the area (2.16 mha) and 40.42% to the production (4.13 mt) with an average productivity of 19.08 q/ha (Anon., 2022) [1]. The groundnut cultivation in Gujarat is largely confined to Junagadh, Jamnagar, Rajkot, Amreli, Saurashtra, Banaskantha and Bhavnagar districts. The Saurashtra region of Gujarat is considered as 'Bowl of groundnut'. However, recently it has also been noticed that the area under groundnut cultivation is increasing in potato growing belt of North Gujarat because of suitable agro-climatic conditions and coarse texture of soil.

Materials and Methods
A field experiment entitled "Response of *kharif* groundnut to different sources of organic and inorganic nutrients under North Gujarat condition" was conducted at Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sandarkrushinagar Dantiwada Agricultural

University, Sardarkrushinagar during *kharif* season of 2020. The soil of experimental field was loamy sand in texture with low in organic carbon, low in available nitrogen, medium in available phosphorus and available potash having pH of 7.1. The experiment consisting of ten treatment combinations comprising 100% RDF (12.5:25:00 kg/ha) and combinations of 75% and 50% RDF with FYM 5 t/ha, castor cake 0.5 t/ha, *Rhizobium* + PSB and different combinationa from above were evaluated in randomized block design with four replications. Groundnut variety GG 20 was used and sown at a distance of 45 cm between the rows. The weather conditions were almost favourable for the crop growth and there was no any severe attack of insect and disease during the course of investigation. The statistical analysis of the data collected for different parameters were carried out following the procedures of as described by Panse and Sukhatme (1967) [9] using computer system at the Computer Centre, Department of Agricultural Statistics, C. P. College of Agriculture, S. D. Agricultural University, Sardarkrushinagar.

Results and Discussion

Different organic and inorganic sources of nutrients did not exert their significant influence on plant population at 30 DAS and at harvest on plant height and number of branches per plant of groundnut. Significantly the higher no. of pod per plant (filled) of groundnut (25.9) were observed with treatment T_6 (75% RDF + castor cake 0.5 t/ha + *Rhizobium* + PSB). Significantly higher no. of nodules per plant were noted under T_6 (75% RDF + Castor cake 0.5 t/ha + *Rhizobium* + PSB). Significantly higher Fresh and dry weight of nodules at of groundnut were observed under treatment T_6 (75% RDF + castor cake 0.5 t/ha + Rhizobium + PSB). Significantly higher no. of seeds per pod were observed under T_6 (75% RDF + castor cake 0.5 t/ha + *Rhizobium* + PSB). Significantly higher pod yield per plant (45.9 g) of groundnut was recorded under the treatment T_6 (75% RDF + castor cake 0.5 t/ha + *Rhizobium* + PSB). Pod yield (kg/ha) of groundnut was significantly higher (2009 kg/ha) under treatment T_6 (75% RDF + castor cake 0.5 t/ha + *Rhizobium* + PSB). Significantly higher haulm (3607) yield was recorded under treatment T_6 (75% RDF + castor cake 0.5 t/ha + *Rhizobium* + PSB). 100 kernel weight (44.9 g) of groundnut was not influenced significantly due to different treatments. Significantly higher shelling percentage of groundnut was recorded under the treatment T_6 (75% RDF + castor cake 0.5 t/ha + *Rhizobium* + PSB). Increase in pod yield (kg /ha) were mainly because of increase in growth parameters and yield attributes which resulted from combined effect of FYM and chemical fertilizers that provided balanced nutrition and favourable soil environment, better plant growth and ultimately leads to maximum pod yield per plant. These result are agreements earlier work by Meena (2009) [8], Goverdhan and Ramanjaneyulu (2016) [5]. The yield increases associated with use of the FYM might have helped in increase of uptake of nutrients due to release of nutrients or mobilizing unavailable plant nutrients into available form and its optimum amount timely that in turn gave higher yield (pod and haulm). This might be due to application of N and P fertilizer, FYM and Fe and Zn helped in slow and steady rate of nutrient release into soil solution to match the required absorption pattern of groundnut thereby increase yield. These results are in close vicinity with the findings of Basu *et al.* (2008) [2], Meena (2009) [8], Bharti *et al.* (2010) [3], Madhu Bala and Kedar Nath, (2015) [6], Rahevar *et al.* (2015) [10] in groundnut.

From the one year experimentation, it is concluded that for securing profitable yield and higher net profit of *kharif* groundnut (GG-20), the crop should be nourished with 75% RDF(12.5-25-0 NPK kg/ha) + Castor cake 0.5 t/ha along with *Rhizobium* and PSB or 75% RDF(12.5-25-0 NPK kg/ha) + FYM 5 t/ha along with *Rhizobium* and PSB.

Table 1: Effect of different integrated nutrient management practices on plant population and growth parameters of groundnut

Treatments	Plant population per meter row length		Plant height (cm)			Number of branches per plant	Number of pods per plant
	30 DAS	At harvest	30 DAS	60 DAS	At harvest		
T_1- 100% RDF (12.5:25:00 kg/ha)	10.5	9.78	23.9	31.0	37.4	7.4	21.7
T_2 - 75% RDF + FYM 5 t/ha	10.6	10.32	24.1	31.1	37.5	7.6	17.5
T_3 - 75% RDF + castor cake 0.5 t/ha	10.7	10.16	24.5	31.2	37.5	7.6	18.6
T_4 - 75% RDF + *Rhizobium* + PSB	10.5	9.95	24.0	31.0	37.5	7.5	19.2
T_5 - 75% RDF + FYM 5 t/ha + *Rhizobium* + PSB	10.6	10.13	24.6	31.4	37.8	7.6	21.0
T_6 - 75% RDF + castor cake 0.5 t/ha + *Rhizobium* + PSB	10.9	10.36	24.7	31.5	38.2	7.7	25.9
T_7 - 50% RDF + FYM 5 t/ha + castor cake 0.5 t/ha	10.4	9.96	23.7	30.8	37.3	7.4	18.5
T_8 - 50% RDF + FYM 5 t/ha + *Rhizobium* + PSB	10.3	9.91	23.0	30.7	37.0	7.3	21.5
T_9 - 50% RDF + castor cake 0.5 t/ha + *Rhizobium* + PSB	10.4	10.05	23.4	30.9	37.3	7.4	20.4
T_{10} - 50% RDF + FYM 5 t/ha + castor cake 0.5 t/ha + *Rhizobium* + PSB	10.5	9.86	23.8	30.6	37.4	7.4	23.1
S.Em.±	0.52	0.48	1.02	1.40	1.66	0.32	0.86
C.D. at 5%	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	2.51
C.V.%	9.85	9.62	8.48	9.01	8.88	8.62	8.33

Table 2: Effect of integrated nutrient management practices on pod yield, haulm yield, Number of seed per pod, shelling percentage and seed index of groundnut

Treatments	Pod yield (kg/ha)	Haulm yield (kg/ha)	Number of seeds per pod	Shelling percentage	Seed index - 100 kernal weight (g)
T_1- 100% RDF (12.5:25:00 kg/ha)	1858	3322	1.78	71.2	44.3
T_2 - 75% RDF + FYM 5 t/ha	1794	3210	1.70	71.9	44.5
T_3 - 75% RDF + castor cake 0.5 t/ha	1815	3261	1.93	74.7	44.6
T_4 - 75% RDF + *Rhizobium* + PSB	1842	3302	1.96	71.2	44.4
T_5 - 75% RDF + FYM 5 t/ha + *Rhizobium* + PSB	1901	3312	1.86	75.4	44.8
T_6 - 75% RDF + castor cake 0.5 t/ha + *Rhizobium* + PSB	2009	3607	2.28	79.6	44.9
T_7 - 50% RDF + FYM 5 t/ha + castor cake 0.5 t/ha	1621	2997	2.33	70.5	44.2
T_8 - 50% RDF + FYM 5 t/ha + *Rhizobium* + PSB	1578	2845	2.21	69.8	44.1
T_9 - 50% RDF + castor cake 0.5 t/ha + *Rhizobium* + PSB	1600	2916	1.96	69.8	44.2
T_{10} - 50% RDF + FYM 5 t/ha + castor cake 0.5 t/ha + *Rhizobium* + PSB	1718	3129	2.16	70.5	44.3
S.Em.±	78.49	148.96	0.09	2.11	1.40
C.D. at 5%	227.74	432.24	0.26	6.14	N.S.
C.V.%	8.85	9.34	8.95	5.84	6.32

Conclusion

From the one-year experimentation on kharif groundnut (GG-20), it is concluded that the most effective nutrient management strategy involves applying 75% of the recommended dose of fertilizers (12.5-25-0 NPK kg/ha) combined with castor cake (0.5 t/ha), Rhizobium, and phosphate-solubilizing bacteria (PSB). This treatment significantly improved pod yield, nodule formation, and shelling percentage compared to other methods. An alternative approach using 75% RDF with farmyard manure (FYM) at 5 t/ha, Rhizobium, and PSB also produced favorable results. These strategies offer a balanced nutrient supply, enhancing growth parameters and leading to higher yields and profitability.

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