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Effect of various nutrient management practices on yield attributes, yield and uptake of groundnut

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Abstract
Field experiment was conducted during kharif 2018 at wetland farm of S.V. Agriculture College, Tirupati. There were nine treatments of different levels of nutrient managements and three replications. The experimental results revealed that significantly higher values of yield attributes, pod yield and haulm yield were higher with the treatment T_6 100% RDF + Rhizobium seed treatment and PSB @ 5 kg ha^{-1} soil application followed by T_2 application of 100% RDF only. The experimental results also revealed that significantly higher concentration of N,P,K and uptake were higher under T6 treatment i.e. 100% RDF + Rhizobium seed treatment and PSB @ 5 kg ha^{-1} soil application followed by T_2 application of 100% RDF only.

Keywords: Groundnut, nutrient management practices, yield, yield attributes, concentration and uptake

Introduction
Groundnut one of the principal economic crops, ranked as the second most important cultivated grain legume and the fourth largest edible oilseed crop in the world and it is grown in more than 100 countries. India is the second largest producer of groundnut in the world (Tiwari *et al*. 2018, Hauser 2018) [1, 2]. In India, though the area and production of groundnut are high, but great variation in productivity is observed. The productivity of groundnut in India is much less as compared to other leading countries due to soil heterogeneity, imbalanced fertilization, uncertainty of monsoons, poor cultural practices adopted by farmers, growing the energy crop groundnut under energy starved conditions like marginal and sub-marginal lands (mainly under rain fed condition), shortage of calcium, low soil pH, biological limitations, biotic and abiotic stress and many socio- economic factors. (Kumar, 2012) [4]. Improving the soil fertility by providing adequate nutrients to the crop could be a viable option to raise the productivity of groundnut. Various researchers working in this area opined that none of the inorganic and organic sources of nutrients alone can meet the total plant nutrient needs of the crop adequately. Hence, an integrated use of nutrients from chemical, organic manures, bio fertilizers is the most efficient way to supply plant nutrients for sustained crop productivity and improved soil fertility (Vala *et al* 2018) [3]. Nutrient management ensures the plant nutrient supply through optimization of benefits from all possible sources of plant nutrients in an combined manner to achieve as well as sustain the desired crop productivity while maintaining soil fertility and can be considered as an important tool for sustainable agriculture to achieve the sustainable development goals (SDG) to ensure sustainable consumption and production patterns. This experiment was planned to study the effect of various nutrient management practices on yield, yield attributes, concentration and uptake of groundnut.

Material and Methods
The field experiment was conducted with groundnut variety Dharani at wet land farm of S.V. Agricultural College, Tirupati, Andhra Pradesh during kharif 2018 Wetland Farm, S. V. Agricultural College, Tirupati campus of Acharya N. G. Ranga Agricultural University, which is geographically situated at 13.5°N latitude and 79.5°E longitude with an altitude of 182.9 m above mean sea level in the Southern Agro Climatic Zone of Andhra Pradesh. According to Trolls classification, it is classified under Semi-Arid Tropics (SAT) The experiment was laid out in randomized block design (RBD) with three replications and nine treatments. The treatments were viz.; T1 [Control], T_2 100% RDF *Kharif*; FYM @ 5 t ha^{-1}+20: 40: 50 N: P_2O_5: K_2O kg ha^{-1} T_3 100% N through FYM T_4 75% N through RDF +25% N through FYM T_5 50% N through RDF+50% N through FYM T_6 100% RDF + Rhizobium seed treatment and PSB @

5 kg ha^{-1} soil application T_7 100% N through FYM + Rhizobium seed treatment and PSB @ 5 kg ha^{-1} soil application T_8 75% N through RDF+ Rhizobium seed treatment and PSB @ 5 kg ha^{-1} soil application T_9 50% N through RDF+ Rhizobium seed treatment and PSB @ 5 kg ha^{-1} soil application. The soil of the experimental plot was sandy loam in texture, neutral in soil reaction, non-saline soils. The soil was also low in organic carbon (0.39%), available N (248 kg ha^{-1}) high in available phosphorus (30.8 kg ha^{-1}) and medium in available potassium (208 kg ha^{-1}) Well decomposed farmyard manure applied to the soil which contains 0.5% nitrogen, 0.2% P and 0.4% K. The recommended dose of fertilizers were given in the form of urea, di ammonium phosphate, and muriate of potash. Gypsum @ 250 kg ha^{-1} was applied at peg initiation stage. Seeds were treated with Rhizobium culture and PSB culture applied to soil @ 5 Kg ha before sowing. Yield and yield attributing parameters were recorded during harvest. Yield components in groundnut that composed of pod and kernel yield per unit area was collected from data analysis after harvest of the crop. The weight Pod index (g) of 100- pod samples, drawn randomly and 100-index (g) kernel samples, drawn randomly from shelling of the pod samples were calculated by standard procedure.

Effect of various nutrient management practices on yield components and yield

Various nutrient management practices significantly influenced the yield components and yield during the research period are presented in the Table.1. Among the different treatments T6 100% RDF + Rhizobium seed treatment and PSB @ 5 kg ha^{-1} soil application recorded the higher values of yield components Viz., 100 pod weight (g) (93.60) and hundred kernel weight (39.60g) viz., pod yield (1796 kg ha^{-1}), haulm yield (4330 kg ha-1) and shelling percentage of (74.23) during the year of kharif 2018 and that was closely followed by T_2 (100% RDF *Kharif*; FYM @ 5 t ha^{-1}+20: 40: 50 N: P_2O_5: K_2O kg ha^{-1})

This was followed by treatments T_6, T_{12}, T4, T_7, T_2, T_9, T_{13}, T_3, T_{10} and T_8. Whereas, the absolute control (T_1) had the least effect in all other treatments. The treatment imposed with INM practices (T_8) significantly increased the yield components and yield of groundnut. This might be due to wide availability of nutrients throughout its growth period resulting in huge biomass production that leads to availability of photosynthates, metabolites and nutrients to develop reproduction structure. This present results are in line with the findings of El-saady *et al*. (2014) [5]. The higher yield (pod and haulm yield) in T8 received plots could be due to better interception, absorption and utilization of radiation energy leading to higher photosynthetic rate and finally more accumulation. The overall improvement reflected into better source- sink relationship, which in turn enhanced the yield and yield attributes. This was in concomitant with the findings of Singh *et al*., (2010) [7] and Patil *et al*. (2015) [6]. An increase in yield by inoculation of bio fertilizers could be attributed to synergistic interaction among phosphate solubilizing microorganism and Brady Rhizobium which led to increase in nodulation and nitrogen fixation was also reported by Jain and Trivedi (2005) [8].

Table 1: Effect of various nutrient management practices on yield

Treatments	100 pod weight (g)	100 kernal weight (g)	Shelling %	pod yield (g)	Haulm yield (g)
T1	73.27	31.12	62.54	1579.33	3377.33
T2	92.37	37.61	72.14	1762.67	4206.67
T3	75.86	32.44	66.44	1616.67	3573.33
T4	88.41	36.07	71.27	1704.00	3975.67
T5	81.62	34.78	68.55	1672.67	3837.33
T6	93.60	39.63	74.23	1796.67	4330.67
T7	76.84	33.29	67.24	1649.33	3730.67
T8	90.58	38.08	71.88	1733.33	4097.33
T9	84.21	36.03	69.62	1683.33	4012.00
Mean	84.19	35.45	69.32	1688.67	3904.56
S.Em±	0.47	0.37	1.11	6.27	25.89
C.D (P = 0.05)	1.42	1.11	40.92	18.79	77.61

Effect of various nutrient management practices on concentration and uptake

Various nutrient management practices significantly influenced the nutrient content and uptake during the research period are presented in the Table. 2. Among the different treatments T_6 100% RDF + Rhizobium seed treatment and PSB @ 5 kg ha^{-1} soil application recorded the higher values of concentration and uptake Viz., N concentration (1.78%) and uptake (77.23 kg ha^{-1}) P concentration (0.55%) and uptake (23.68 kg ha^{-1}) K concentration (1.35%) and uptake (58.48 kg $ha^{-1)}$ during the year of kharif 2018 and that was closely followed by T_2 (100% RDF *Kharif*; FYM @5 t ha^{-1}+20: 40: 50 N: P_2O_5: K_2O kg ha^{-1})

It was observed from a field study that application of optimum dose of NPK in conjunction with FYM recorded highest uptake of N, P and K in pod and haulm of groundnut (Laxminarayana and Patiram, 2005) [9]. According to Sunilkumar *et al*. (2005) [11], nutrient content and uptake by forage sorghum was significantly influenced by integration of organic and inorganic nutrients over control. Higher N (136.6 kg ha^{-1}), P (23.5 kg ha-1) and K (218.4 kg ha-1) uptake was recorded with 50% recommended dose of NP + vermicompost @ 5 t ha-1 +

FYM @ 5 t ha-1. They also reported that nutrient content and uptake by forage sorghum was significantly influenced by integration of organic and inorganic nutrients over control.

Prasannakumar *et al*. (2007) [13] reported that among inorganic fertilizer levels, application of 125 per cent RDF recorded significantly higher nitrogen, phosphorus and potassium uptakes when compared to 100 per cent RDF and it was on par with 75 per cent RDF. Setia and Sharma (2007) [10] reported that potassium uptake by grain (10.4 kg ha^{-1}) and stover (13.0 kg ha^{-1}) in maize was higher when N, P and K were applied @ 180:35:33 kg ha-1 as compared to lower doses of fertilizers Mohanty *et al*., (2005) [12] also reported that application of organic

manures had significant direct and residual effect on biomass yield and NPK uptake in both groundnut and maize in

groundnut and maize cropping system. They also recorded more 'N' uptake with FYM, 'P' uptake with inorganic fertilizers and 'K' uptake with FYM.

Table 2: Effect of various nutrient management practices on concentration and uptake of nutrients

Treatments	% N	N uptake (kg ha^{-1})	% P	P uptake (kg ha^{-1})	% K	K uptake (kg ha^{-1})
T1	1.14	38.50	0.23	7.76	0.65	21.84
T2	1.63	68.56	0.56	23.70	1.27	53.56
T3	1.22	43.60	0.24	8.57	0.74	26.44
T4	1.52	60.57	0.53	21.08	0.94	37.42
T5	1.45	55.78	0.30	11.65	0.83	31.97
T6	1.78	77.23	0.55	23.68	1.35	58.48
T7	1.35	50.24	0.29	10.69	0.80	29.96
T8	1.60	65.55	0.47	19.39	1.17	47.81
T9	1.47	59.12	0.40	16.01	0.88	35.39
Mean	1.46	57.68	0.40	15.84	0.96	38.10
S.Em±	0.02	0.83	0.02	0.82	0.04	1.50
C.D (P = 0.05)	0.06	2.48	0.06	2.47	0.12	4.49

Conclusions

Based on the results of the field experiment, it is concluded that among the different treatments tried, the application NPK 100% RDF along with Rhizobium and Phosphobacteria @ 5 kg ha $^{-1}$ was superior in performance with respect to yield and yield attributes of groundnut and also found to be effective in improving soil physical, chemical and biological properties. It improves the concentration and uptake of nutrients. It can be recommended to the farmers to achieve more benefit cost.

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