



Organic Groundnut Production Under Rainfed Conditions For Sustained Productivity

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ABSTRACT

A field experiment was conducted at the dryland farm of S.V. Agricultural College, Tirupati during kharif, 2015 to study the response of groundnut to various organic sources viz., farm yard manure, poultry manure, sheep manure and neem cake along with recommended NPK through fertilizers. Application of 100% recommended dose of nutrients through fertilizers resulted in the highest dry matter production, pod, haulm yields and nutrient uptake of groundnut, where as 100% N through FYM resulted in the higher values, which was however in parity with 50% N through FYM + 50% N through sheep manure. The highest post-harvest soil available nitrogen and potassium status were recorded with 100% N through neem cake, where as soil available phosphorus status was noticed to be higher with 100% N through poultry manure. The post-harvest soil nutrient status was lower with 100% recommended dose of nutrients through fertilizer compared to various organic sources.

Key words: Groundnut, Organic manures, Yield, Nutrient uptake and Post harvest available N, P and K.

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INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is the world's fourth important source of edible oil and third important source of vegetable protein. India is the leader in groundnut farming with 4.19 million hectares of area, 6.68 million tonnes of production and a productivity of 1591 kg ha⁻¹. The low level of productivity of groundnut in India has been ascribed to several constraints. Poor fertility status of the soil with low in organic matter content is considered to be the major problems under rainfed conditions. The ever-increasing cost of chemical fertilizer has made us to realize once again that organic material have to be utilized judiciously to maintain and improve the soil fertility and productivity. Use of farmyard manure with other organic amendments like vermicompost, neem cake, poultry manure, sheep manure etc, may provide an economic and environmental friendly way of applying nutrients to groundnut (Prasad, 2005). Keeping these in view, the present experiment was taken up to study the organic groundnut production under rainfed conditions for sustained productivity in order to achieve the maximum production with sustenance of soil fertility.

MATERIAL AND METHODS

A field experiment was carried out during *kharif*, 2015 at the dryland farm of S.V. Agricultural College, Tirupati. The experimental soil was sandy loam in texture, neutral in reaction (pH 6.9), low in organic carbon (0.43 per cent) and available nitrogen (138.0 kg ha⁻¹), high in available phosphorus (40.4 kg ha⁻¹) and medium in potassium (176.2 kg ha⁻¹). The experiment was laid out in a randomized block design with three replications. There were nine treatments viz., control, 100% RDF i.e 20-40-50 kg N, P₂O₅ & K₂O ha⁻¹, 100% N through farm yard manure (FYM), 100% N through poultry manure, 100% N through sheep manure, 100% N through neem cake, 50% N through FYM + 50% N through poultry manure, 50% N through FYM + 50% N through sheep manure, 50% N through FYM + 50% N through neem cake. The well decomposed farm yard manure, poultry manure, sheep manure and neem cake with 0.5%, 1.1%, 1.2%, and 1.9% N, respectively were used as organic sources for nitrogen. Based on the equal nitrogen basis, the required quantities of organic manures were incorporated in the soil 15 days before sowing. The quantities of phosphorus and potassium supplied by these manures were considered and the remaining quantities were applied through organic sources of biophos and biopotash, respectively. The

recommended doses of nitrogen, phosphorus and potassium in were applied in the form of urea, single super phosphate and muriate of potash at the time of sowing in 100% RDF treatment. It was maintained separately in the field to avoid leaching of nutrients to the organic treatments. All the plant protection measures were taken up by using organic sources only. The test variety of groundnut 'Kadiri-6' was used in the study by adopting spacing of 30 cm x 10 cm.

RESULTS AND DISCUSSION

Growth attributes:

Supply of 100% recommended dose of nutrients through fertilizers produced the tallest plants with highest leaf area index compared to organic manures. Better nutrient availability with 100% recommended dose of nutrients through fertilizers might have triggered the cell multiplication and cell elongation, which increased the plant height, produced more number of leaves with good expansion and resulted in the highest leaf area index. These findings are in support of Devi et al. (2003). The next higher values of leaf area index noticed with application of 100% N through FYM followed by 50% N through FYM + 50% N through sheep manure might be due to the balanced and timely release of nutrients and their favorable effect on producing of more number of larger leaves. These results are in close confirmity with the findings of Zalate and Padmani (2009).

The highest dry matter accumulation observed with the application of 100% recommended dose of nutrients through fertilizers might be due to the immediate availability of adequate amounts of nutrients, which resulted in vigorous crop growth with effective interception of light coupled with higher rate of photosynthesis. These findings are in support of Devi et al. (2003). Among the organic manures tried, the higher dry matter accrual was noticed with 100% N through FYM is ascribed due to its better and timely release of macro and micro nutrients sufficiently required by the groundnut crop. Similar results were also perceived by Zalate and Padmani (2009).

Yield

The highest pod and haulm yields were obtained with the application of 100% recommended dose of nutrients through fertilizers. Accordingly, the groundnut crop under comfortable nutrition might have produced the elevated stature of growth and yield attributes which inturn reflected in producing the highest pod yield. These results are in agreement with the findings of Devi *et al.* (2003). Under organic approach, 100% N through FYM resulted in 87.9 per cent of improvement in the pod yield over control and 39.4 per cent over 100% N through neem cake. Besides being slow in the release of nutrients, different organic manures, require different durations for release of nutrients. It appears that poultry manure, sheep manure and neem cake might be slower in releaseof nutrients compared to FYM. Further, beneficial effect of FYM could be owing to better physical environment with improved aeration and root activity conducive for nutrient absorption. The complementary effect of these favorable conditions was reflected through higher level of biomass accrual coupled with its efficient translocation and accumulation in the pods, which consequently resulted in higher pod and haulm yields. The results are in close confirmity with the findings of Zalate and Padmani (2009).

Nutrient Uptake at Harvest

The highest nutrient (N, P and K) uptake of groundnut was registered with 100% recommended dose of nutrients through fertilizers(Table 2), which might be due to the best performance of the crop under comfortable nutrition, resulting in greater absorption of nutrients coupled with higher dry matter production as compared to organic sources. The above results are in confirmity with the findings of Reddy and Moorthy (1984). Among the organic manures, 100% N through FYM resulted in better nutrient uptake as compared to poultry manure, sheep manure and neem cake, which were richer in nutrient content. This might be due to the better nutrient release pattern of FYM in to the soil there by availability to the crop. The present findings corroborates with that of Rao and Shaktawat (2002) and Laxminarayana and Patiram (2005). Though, different organic sources were applied on equal nitrogen basis, the phosphorus and potassium contents of the respective manures were considered and the remaining amounts were supplied through biophos and biopotash to meet the crop requirement. Therefore, the nitrogen, phosphorus and potassium uptake might have followed the similar trend.

Post-Harvest Soil Fertility Status

Post-harvest soil fertility status was found to be significantly influenced with various sources of organic manures. The highest post-harvest soil available nitrogen and potassium status was recorded with 100% N through neem cake, which was in practice with 100% N through sheep manure and poultry manure. Post-harvest soil available phosphorus status was noticed to be higher with 100% N through poultry manure, which was however comparable with 100% N through sheep manure and neem cake. The post-harvest soil nutrient status was lower with 100% recommended dose of nutrients through fertilizer compared to various organic sources. The due to faster mineralization process, application of FYM might

have enhanced the availability of nitrogen and potassium to the crop which may consequently lead to lower status in the soil after harvest as compared to other manures. Further, 100% recommended dose of nutrients through fertilizers resulted in readily release and better uptake of nutrients by the crop due to which the post-harvest soil available nutrient status was found to be depleted over other organic manures. The results are in close conformity with the findings of Dosani *et al.* (1999) and Rao and Shaktawat (2005).

CONCLUSION

In conclusion, the investigation revealed that though higher pod yield of groundnut could be realized with 100% recommended dose of nutrients through fertilizers., 100% N through FYM as well as 50% N through FYM + 50% N through sheep manure were proved to be promising organic manurial practices for higher yield of groundnut along with maintenance of soil fertility under rainfed conditions.

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Table 1. Plant height, leaf area index, dry matter production and yield (kg ha⁻¹) of groundnut at harvest as influenced by various organic sources of nutrients.

Treatments	Plant height (cm)	Leaf area index	Dry matter production	Pod yield	Haulm yield
T ₁ : Control	36.0	1.45	3763	1103	2049
T ₂ : 100% RDF (20-40-50 kg N, P ₂ O ₅ and K ₂ O ha ⁻¹)	47.3	2.62	6917	2357	3813
T ₃ : 100% N through farm yard manure (FYM)	44.9	2.34	6337	2073	3375
T ₄ : 100% N through poultry manure	39.1	1.72	5193	1497	2587
T ₅ : 100% N through sheep manure	39.2	1.73	5194	1499	2598
T ₆ : 100% N through neem cake	39.0	1.70	5190	1487	2557
T ₇ : 50% N through FYM + 50% N through poultry manure	42.2	2.09	5733	1767	2997
T ₈ : 50% N through FYM + 50% N through sheep manure	44.7	2.29	6310	2070	3351
T ₉ : 50% N through FYM + 50% N through neem cake	42.0	1.99	5707	1750	2993
SEm±	0.49	0.05	153.0	66.2	105.6
CD (P=0.05)	1.4	0.14	458	200	319

Table 2. Effect of organic manure on nutrient uptake and available N, P and K (kg ha⁻¹) in groundnut at harvest as influenced by various organic sources of nutrients.

Treatments	N uptake	P uptake	K uptake	Available N, P and K (kg ha ⁻¹)		
				N	P ₂ O ₅	K ₂ O
T1: Control	59.1	15.0	51.6	135.1	21.1	130.1
T2: 100% RDF (20-40-50 kg N-P ₂ O ₅ and K ₂ O ha ⁻¹)	97.2	30.1	75.2	155.4	27.1	151.2
T3: 100% N through farm yard manure (FYM)	89.1	27.2	69.3	176.4	33.3	172.4

T4: 100% N through poultry manure	69.4	18.5	59.1	198.3	45.6	200.4
T5: 100% N through sheep manure	70.1	19.2	60.3	199.1	44.3	203.5
T6: 100% N through neem cake	67.3	17.6	58.2	201.5	42.3	205.3
T7: 50% N through FYM + 50% N through poultry manure	79.1	22.5	66.2	179.4	36.3	178.1
T8: 50% N through FYM + 50% N through sheep manure	88.2	26.3	68.4	191.4	34.4	174.5
T9: 50% N through FYM + 50% N through neem cake	80.2	23.4	67.7	178.3	35.1	176.2
SEm±	2.38	0.48	1.65	5.34	1.17	6.18
CD (P=0.05)	7.1	1.4	4.9	16.0	3.5	18.5

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