



EFFECT OF VARIOUS ORGANIC SOURCES ON GROWTH AND YIELD OF GROUNDNUT

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ABSTRACT

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A field experiment was conducted at the dryland farm of S.V. Agricultural College, Tirupati during *kharif*, 2015 to study the effect of various organic sources *viz.*, farm yard manure, poultry manure, sheep manure and neem cake along with recommended NPK through fertilizers on growth, yield attributes and yield of groundnut. Application of recommended dose of nutrients through fertilizers (20-40-50 kg N, P_2O_5 and K_2O ha^{-1}) resulted in improved growth parameters, yield attributes and yield of groundnut. Among the various organic sources tested, supply of 100% N through FYM recorded significantly higher growth, yield attributes and yield, which was in parity with 50% N through FYM + 50% N through sheep manure. Application 50% N through poultry manure or sheep manure or neem cake in combination with 50% N through FYM recorded significantly higher pod yield compared to sole application of these manures.

KEYWORDS: Groundnut, Organic manures, Yield attributes and Yield.

INTRODUCTION

Indiscriminate use of chemical fertilizers leads to development of several problems like decline in soil organic carbon, soil pollution and severe attack of pest and diseases (Chakraborti and Singh 2004). Due to these problems, organic farming is gaining popularity in recent years. Balanced use of nutrients through organic sources like farm yard manure, poultry manure, sheep manure and neem cake are the prerequisites to sustain soil fertility and to produce reasonably good crop yield with optimum level of input usage.

Groundnut is a premier oil seed and an important food legume in the world. 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} . Groundnut is an exhaustive crop and for every one tonne of pods and two tonnes of haulms, it removes about 63 kg N, 11 kg P_2O_5 , 46 kg K_2O , 27 kg Ca and 14 kg Mg ha^{-1} . Groundnut depletes the soil nutrients rapidly unless the crop is adequately manured (Nair *et al*, 1982). Use of farmyard manure with other organic amendments like vermicompost, neem cake, poultry manure, sheep manure etc, provide an economic and environmental friendly way of applying nutrients to groundnut (Prasad, 2005). Although, many attempts have been made to study the effect of fertilizers on groundnut crop, the information

on response of groundnut to various organic sources of nutrients is meager. Keeping these in view, the present experiment was taken up to study the response of groundnut to different organic sources on growth and yield in order to achieve the maximum production.

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 (T_1), 100% RDF *i.e* 20-40-50 kg N, P_2O_5 & K_2O ha^{-1} (T_2), 100% N through farm yard manure (FYM) (T_3), 100% N through poultry manure (T_4), 100% N through sheep manure (T_5), 100% N through neem cake (T_6), 50% N through FYM + 50% N through poultry manure (T_7), 50% N through FYM + 50% N through sheep manure (T_8), 50% N through FYM + 50% N through neem cake (T_9). 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

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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 biophos and biopotash, respectively. The recommended doses of nitrogen, phosphorus and potassium in treatment (T₂) were applied in the form of urea, single super phosphate and muriate of potash at the time of sowing. 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 parameters

The tallest plants with highest leaf area index was associated with 100% recommended dose of nutrients through fertilizers 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 conformity 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 Dosani *et al.* (1999).

Yield attributes

The highest number of pods plant⁻¹ in groundnut was recorded with 100% recommended dose of nutrients through fertilizers, which was significantly higher than rest of the treatments. The pod formation is the complex process and governed by complementary interaction between source and sink. Thus, the favorable effect of readily available nutrients with 100% recommended dose of nutrients through fertilizers is evident with higher dry matter accumulation and effective translocation of photosynthates to the sink. These results were in conformity with the findings of Devi *et al.* (2003).

Among the various organic sources tried, 100% N through FYM resulted in more number of pods plant⁻¹. The supremacy of FYM might be due to balanced and continuous supply of macro and micro nutrients required to enhance the enzymatic activity and physiological process of plant which in turn reflected through the inflated stature of all the yield attributes of groundnut. These results are in close conformity with the findings of 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 in turn 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. Application of 100% N through FYM recorded on an average of 39.4 per cent higher pod yield than 100% N through neem cake. Different organic manures, besides being slow in the release of nutrients, require different durations for release of nutrients. It appears that poultry manure, sheep manure and neem cake might be slower to release 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 conformity with the findings of Zalate and Padmani (2009).

Table 1. Effect of different organic sources on growth, yield and economics of groundnut

Treatments	Plant height (cm)	Leaf area index	Dry matter production (kg ha ⁻¹)	Number of pods plant ⁻¹	Pod yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)	Net returns	B : C ratio
T ₁ : Control	36.0	1.45	4663	14.7	1103	2049	32716	2.34
T ₂ : 100% RDF (20-40-50 kg N-P ₂ O ₅ and K ₂ O ha ⁻¹)	47.3	2.62	6917	26.7	2357	3813	93462	4.32
T ₃ : 100% N through farm yard manure (FYM)	44.9	2.34	6337	24.0	2073	3375	69422	2.85
T ₄ : 100% N through poultry manure	39.1	1.72	5193	17.3	1497	2587	45148	2.40
T ₅ : 100% N through sheep manure	39.2	1.73	5194	17.6	1499	2598	42384	2.21
T ₆ : 100% N through neem cake	39.0	1.70	5190	17.0	1487	2557	34583	1.82
T ₇ : 50% N through FYM + 50% N through poultry manure	42.2	2.09	5733	20.3	1767	2997	56384	2.61
T ₈ : 50% N through FYM + 50% N through sheep manure	44.7	2.29	6310	23.5	2070	3351	70459	2.94
T ₉ : 50% N through FYM + 50% N through neem cake	42.0	1.99	5707	20.0	1750	2993	50529	2.26
SEm±	0.49	0.05	153.0	0.54	66	106	3292.0	0.12
CD (P=0.05)	1.4	0.14	458	1.62	200	319	9956	0.35

Economics

The highest net returns and benefit-cost ratio were registered with 100% recommended dose of nutrients through fertilizers, which was however distinctly higher than various organic sources tried. The net returns and benefit-cost ratio obtained with application of 50% N through FYM + 50% N through sheep manure and 100% N through FYM were comparable with each other. However, the economic returns with various organic sources were found to be lesser compared to recommended dose of nutrients through fertilizers. This might be due to the higher cost of organic sources and lesser pod and haulm yields of groundnut realized under organic sources.

CONCLUSION

In conclusion, the investigation has revealed that higher pod yield of groundnut as well as economic returns could be obtained with 100% recommended dose of nutrients through fertilizers. Among the various organic sources tried, 100% N through FYM as well as the combination of 50% N through FYM + 50% N through sheep manure were proved to be the promising organic manurial practices for obtaining higher yield and economics of groundnut. However, the economic returns under organic approach could be enhanced with premium price for the organic produce in the market after certification.

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