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**GD Umadevi**
Department of Agronomy, S.V. Agricultural College, Tirupati, ANGRAU, Andhra Pradesh, India

**N Sunitha**
Department of Agronomy, S.V. Agricultural College, Tirupati, ANGRAU, Andhra Pradesh, India

**Y Reddi Ramu**
Department of Agronomy, S.V. Agricultural College, Tirupati, ANGRAU, Andhra Pradesh, India

**Correspondence**
**GD Umadevi**
Department of Agronomy, S.V. Agricultural College, Tirupati, ANGRAU, Andhra Pradesh, India

# Effect of various organic sources on soil microbial count and groundnut yield

**GD Umadevi, N Sunitha and Y Reddi Ramu**

**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 recommended dose of nutrients through fertilizers (20-40-50 kg N, $P_2O_5$, & $K_2O$ $ha^{-1}$) resulted in the highest yield of groundnut. Among the various organic sources tested, supply of 100% N through FYM recorded significantly higher yield, which was in parity with 50% N through FYM + 50% N through sheep manure. Application 100% N through poultry manure recorded higher soil microbial population *i.e* bacteria, fungi and actinomycetes, which was however on par with 100 % N through farm yard manure, 50% N through FYM + 50% N through poultry manure and 100 % N through sheep manure.

**Keywords:** ground nut, organic manures, soil microbial population and yield

## Introduction
Microorganisms plays a key role in nutrient cycle to sustain the productivity of the soil. Because, they are the source and sink for mineral nutrition and bio-chemical transformations. 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. The low level of productivity of groundnut in India has been ascribed to several constraints. Soils were low in organic matter content, poor in fertility status are 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 will have to 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, provide an economic and environmental friendly way of applying nutrients to groundnut (Prasad, 2005) [3]. Keeping these in view, the present experiment was taken up to study the effect of different organic sources on growth and yield of groundnut and their influence on soil microbial population in order to achieve the maximum production with substance of soil fertility.

## Materials 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 $ha^{-1}$). Initial bacteria (36 CFU x $10^6$ $g^{-1}$), fungi (6 CFU x $10^4$ $g^{-1}$) and actinomycetes (15 CFU x $10^4$ $g^{-1}$). The experiment was laid out in a randomized block design with three replications. There were nine treatments viz., control (T1), 100% RDF i.e 20-40-50 kg N, $P_2O_5$ & $K_2O$ $ha^{-1}$ (T2), 100% N through farm yard manure (FYM) (T3), 100% N through poultry manure (T4), 100% N through sheep manure (T5), 100% N through neem cake (T6), 50% N through FYM + 50% N through poultry manure (T7), 50% N through FYM + 50% N through sheep manure (T8), 50% N through FYM + 50% N through neem cake (T9). 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 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

### 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) [1]. 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 favourable 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) [6].

### Soil microbial load

### Bacteria

Different manural practices significantly influenced the soil bacterial population at flowering and harvest. The bacterial population was increased with crop age and reached the highest value at flowering and declined at harvest. Application of 100 % N through poultry manure recorded the highest soil bacterial population at flowering, which was however on par with 100 % N through farm yard manure, 50% N through FYM + 50% N through poultry manure and 100 % N through sheep manure. Increase in bacterial population could be the result of enhancement of soil organic matter in the soil as indicated by positive correlation of enzyme activities with soil organic carbon. This can be ascribed to the decomposed food material available from organic sources. The similar results were reported by Vineela *et al.* (2008) [5] and Nagavani *et al* (2015) [2]. Significantly lowest soil bacterial population was recorded in control plot.

### Fungi

Supply of 100 per cent nitrogen through poultry manure recorded significantly higher fungal population, which was however on par with 100 % N through farm yard manure, 50% N through FYM + 50% N through poultry manure and 100 % N through sheep manure. Higher population of organic treatments acted as an index of soil fertility because it serves as temporary sink of nutrient flux. The findings are in conformity with results of Nagavani *et al*. (2015) [2] and Vineela *et al.* (2008) [5].

### Actinomycetes

Increased population of actinomycetes with 100 per cent nitrogen through poultry manure can be attributed to rapid decomposition of organic matter added to the soil, which inturn provide carbon and energy to the soil microbes. It is due to higher organic carbon content of the soil and also the poultry manure had more secondary and micronutrients than other organics and this helped to increase microflora. This is agreement with the results obtained by Somasundaram *et al*. (2007) [4].

**Table 1:** Yield and quality of groundnut as influenced by various organic sources

| Treatments | Pod yield (kg ha$^{-1}$) | Haulm yield (kg ha$^{-1}$) |
|---|---|---|
| $T_1$: Control | 1103 | 2049 |
| $T_2$: 100% RDF (20-40-50 kg N, $P_2O_5$ and $K_2O$ ha$^{-1}$) | 2357 | 3813 |
| $T_3$: 100% N through farm yard manure (FYM) | 2073 | 3375 |
| $T_4$: 100% N through poultry manure | 1497 | 2587 |
| $T_5$: 100% N through sheep manure | 1499 | 2598 |
| $T_6$: 100% N through neem cake | 1487 | 2557 |
| $T_7$: 50% N through FYM + 50% N through poultry manure | 1767 | 2997 |
| $T_8$: 50% N through FYM + 50% N through sheep manure | 2070 | 3351 |
| $T_9$: 50% N through FYM + 50% N through neem cake | 1750 | 2993 |
| SEm± | 66.2 | 105.6 |
| CD (P=0.05) | 200 | 319 |

**Table 2:** Soil microbial population in groundnut as influenced by different sources of organic manures

| | Bacteria x10$^6$ CFU g$^{-1}$ of soil | | Fungi x10$^3$ CFU g$^{-1}$ of soil | | Actinomycetes x10$^4$ CFU g$^{-1}$ of soil | |
|---|---|---|---|---|---|---|
| Treatments | Flowering | Harvest | Flowering | Harvest | Flowering | Harvest |
| $T_1$: Control | 57.5 | 29.3 | 10.2 | 5.1 | 22.2 | 10.2 |
| $T_2$: 100% RDF (20-40-50 kg N, $P_2O_5$ and $K_2O$ ha$^{-1}$) | 65.4 | 35.5 | 11.9 | 6.7 | 27.5 | 14.8 |
| $T_3$: 100% N through farm yard manure (FYM) | 84.8 | 54.5 | 18.7 | 13.4 | 38.8 | 22.3 |
| $T_4$: 100% N through poultry manure | 87.1 | 56.7 | 20.1 | 14.8 | 34.5 | 17.9 |
| $T_5$: 100% N through sheep manure | 82.7 | 51.3 | 14.9 | 9.7 | 35.0 | 18.5 |
| $T_6$: 100% N through neem cake | 79.0 | 47.4 | 14.3 | 9.0 | 37.1 | 20.6 |
| $T_7$: 50% N through FYM + 50% N through poultry manure | 84.3 | 53.8 | 19.4 | 14.1 | 39.7 | 23.5 |
| $T_8$: 50% N through FYM + 50% N through sheep manure | 77.5 | 46.0 | 18.1 | 12.9 | 41.0 | 24.2 |
| $T_9$: 50% N through FYM + 50% N through neem cake | 81.6 | 50.1 | 16.5 | 11.2 | 42.2 | 25.6 |
| SEm± | 1.98 | 0.52 | 0.47 | 0.29 | 0.44 | 0.45 |
| CD (P=0.05) | 6.0 | 1.6 | 1.4 | 0.9 | 1.3 | 1.39 |

## Conclusion

From the above study, we concluded that application of poultry manure either applied alone or in combination of different organic manures enhanced the microbial activity (bacteria, fungi and actenomycetes), which inturn improves the soil fertility.

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