*Agropedology*,1998, **8**, 73-75

# Influence of FYM and gypsum on soil properties and yield of groundnut grown in Vertisols

*Syed Ismail*, G.U. Malewar, V.S. Rege and N.V. Yelvikar*

Department of Agricultural Chemistry and Soil Science, Marathwada Agricultural University, Parbhani, Maharashtra 431 402, India.
* Sorghum Research Station, Marathwada Agricultural University, Parbhani 431 402.

*Abstract*

Field experiment conducted on kharif groundnut during 1994 on a Typic Haplusterts indicated that application of FYM @ 20 and 30 Mg $ha^{-1}$ significantly increased the dry kernel yield, haulm yield, oil content and nutrient uptake over control. Soil pH, organic carbon, NPK, porosity, bulk density, infiltration rate, hydraulic conductivity in post harvest soil were also significantly improved with the application of 30 Mg $ha^{-1}$ FYM over control. However, groundnut did not respond significantly to the application of gypsum either in terms of yield, nutrient uptake or improvement in physical and chemical properties of soil.

*Additional keywords* : Soil amendments, organic and inorganic sources.

## Introduction

Groundnut grown in black soils shows wide variations in yield due to the variation in bulk density of soil during the prolonged dry spell (Venkaiah 1985) followed by porosity problem (Patel *et al.* 1993) which ultimately affect the growth of crop and peg formation. Application of soil amendments was found to improve the physical and chemical properties of soil and increase the yield and quality of the groundnut (Mayalagu 1983; More and Nalawade 1993). It was felt necessary to study the effect of gypsum and FYM on soil properties and yield of groundnut in the black soil environment of central India.

## Materials and methods

A field experiment was conducted in kharif (June-September), 94 with groundnut (CV JL 24) on Typic Haplusterts of Marathwada (Parbhani). The soil had clay 55%, pH 8.1, EC 0.87 dS $m^{-1}$, organic carbon 5.49 $gkg^{-1}$, $CaCO_3$ 124 $gkg^{-1}$, available N 311 kg $ha^{-1}$, available $P_2O_5$ 17 kg $ha^{-1}$, available $K_2O$ 334 kg $ha^{-1}$, available S ($SO^{=}_4$) 14 mg $kg^{-1}$, available Ca 29 cmol (p+) $kg^{-1}$ and bulk density 1.21 Mg $m^{-3}$, porosity 45.0 per cent, hydraulic conductivity 9.9 $ms^{-1}x\ 10^{-6}$, infiltration rate 4.0 cm $hr^{-1}$ and aggregate stability 25.62 % Treatments replicated thrice consisted of four levels of FYM ( 0, 10, 20 and 30 Mg $ha^{-1}$) and four levels of gypsum (0, 200, 400 and 600 kg $ha^{-1}$). Recommended dose of N (25 kg N $ha^{-1}$) and P (50 kg $P_2O_5$ $ha^{-1}$) was applied basaly in the form of urea and single superphosphate, respectively. Physical and chemical properties of soil, NPK in haulm and kernels and oil content in kernels were estimated and computed as per standard methods.

## Results and discussion

Results (Table 1) show that addition of FYM @ 20 and 30 Mg $ha^{-1}$ significantly increased the Kernal and haulm yield and also the oil content of groundnut. This may be ascribed to the enhanced supply of nutrients and improvement in physical condition of the soil. The results are in conformity with the finding of Mayalagu (1983). Application of gypsum up to 600 kg $ha^{-1}$ increased the kernel yield due to higher availability of calcium and sulphur in the experimental soil. Similar results were reported by More and Nalawade (1993) in calcareous Vertisols.

Organic carbon, available N and available $P_2O_5$ of the soil increased significantly with the application of FYM @ 30 Mg $ha^{-1}$ (Table 2) possibly due to the increase of decomposition products of organic matter. The acidulating effect of FYM on applied and native phosphorus might have also enhanced the availability of P as reported by Badnur *et al.* (1990) and Dhargave *et al.* (1991). Total uptake of N was significantly enhanced due to addition of FYM @ 30 Mg $ha^{-1}$ and gypsum @ 600 kg $ha^{-1}$. Application of gypsum had not altered these soil properties significantly. Neither available soil potassium nor uptake were influenced by the application of FYM or gypsum.

**Table 1. Effect of FYM and gypsum on haulm and kernel yield, oil content and NPK uptake in groundnut**

| Treatments | Haulm yield (q $ha^{-1}$) | Kernel yield (q $ha^{-1}$) | Oil content (%) | Nutrient uptake (kg $ha^{-1}$) | | |
|---|---|---|---|---|---|---|
| | | | | N | P | K |
| *FYM levels (Mg $ha^{-1}$)* | | | | | | |
| 0 | 48.5 | 9.1 | 45.1 | 127.5 | 13.9 | 65.3 |
| 10 | 49.9 | 9.9 | 46.3 | 138.9 | 15.8 | 66.9 |
| 20 | 52.2 | 11.0 | 46.9 | 152.3 | 16.5 | 68.5 |
| 30 | 54.6 | 12.1 | 47.5 | 165.1 | 17.9 | 72.0 |
| C.D. (P=0.05) | 3.62 | 1.40 | 1.45 | 14.6 | 1.6 | NS |
| *Gypsum levels (kg $ha^{-1}$)* | | | | | | |
| 0 | 48.7 | 9.3 | 45.8 | 130.2 | 14.1 | 66.1 |
| 200 | 51.1 | 9.6 | 46.0 | 136.8 | 15.4 | 67.5 |
| 400 | 52.4 | 10.7 | 46.7 | 149.9 | 16.4 | 69.0 |
| 600 | 52.6 | 11.3 | 46.5 | 160.3 | 16.6 | 70.1 |
| C.D. (P=0.05) | NS | 1.40 | NS | 14.6 | NS | NS |

NS = Non-significant

**Table 2. Effect of FYM and gypsum on physical and chemical properties of soil**

| Treatment | Bulk density (Mg $m^{-3}$) | Hydraulic conductivity ($ms^{-1}x10^{-6}$) | Infiltration rate (cm $hr^{-1}$) | % water stable aggregates (> 0.25 mm) | pH | Organic carbon (g $kg^{-1}$) | Nutrient availability (kg $ha^{-1}$) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | N | $P_2O_5$ | $K_2O$ |
| *FYM levels (Mg $ha^{-1}$)* | | | | | | | | | |
| 0 | 1.21 | 9.7 | 3.9 | 25.5 | 8.07 | 5.4 | 316.6 | 15.9 | 365 |
| 10 | 1.20 | 10.4 | 4.5 | 27.3 | 8.04 | 6.0 | 332.9 | 17.1 | 370 |
| 20 | 1.17 | 10.9 | 5.2 | 29.2 | 8.02 | 6.5 | 342.5 | 18.0 | 373 |
| 30 | 1.15 | 11.3 | 5.9 | 30.3 | 7.99 | 6.7 | 360.8 | 19.5 | 377 |
| C.D.(P=0.05) | 0.03 | 0.56 | 0.57 | 1.30 | 0.05 | 0.78 | 14.3 | 0.88 | N.S. |
| *Gypsum levels (kg $ha^{-1}$)* | | | | | | | | | |
| 0 | 1.20 | 10.0 | 4.2 | 25.9 | 8.06 | 5.8 | 321.2 | 16.1 | 368 |
| 200 | 1.19 | 10.4 | 4.7 | 27.6 | 8.04 | 6.1 | 330.8 | 16.9 | 372 |
| 400 | 1.18 | 10.8 | 4.9 | 28.9 | 8.04 | 6.3 | 341.6 | 17.5 | 373 |
| 600 | 1.18 | 10.8 | 5.0 | 29.0 | 8.03 | 6.4 | 350.4 | 18.4 | 375 |
| C.D.(P=0.05) | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. |

Significant decrease in bulk density and increase in hydraulic conductivity, infiltration rate, total porosity and per cent stable aggregates with application of FYM @ 30 Mg $ha^{-1}$ was noted over control and 10 Mg $ha^{-1}$ (Table 2). This might be ascribed to possible increase in friability, promotion of aggregation and increase in microbial activity (Mayalagu, 1983 and Badnur *et al.* 1990).

It is concluded that application of FYM @ 30 Mg $ha^{-1}$ has favourable effect on groundnut yield, crop quality, nutrient uptake, and physical and chemical properties of the experimental soil, but gypsum did not affect these parameters significantly.

## References

Badnur, V.P., Poleshi, C.M., and Naik, Balchandra, K. (1990). Effect of organic matter on crop yield and physical and chemical properties of Vertisols. *Journal of the Indian Society of Soil Science* **38**, 426-429.

Dhargave, B.N., Matte, D.B., Babulkar, P.B., Kene, D.R., and Borkar, D.K. (1991). Availability of soil phosphorus as affected by organic matter. *Journal of Soils and Crops* **1**, 142-146.

Mayalagu, K. (1983). Influence of different soil amendments on the physical properties of heavy black soil and yield of groundnut (TMV-7) in the periyar vaigai command area. *Madras Agri cultural Journal* **70**, 304-308.

More, S.D., and Nalawade, S.K. (1993). Effects of gypsum application on soil properties and performance of kharif groundnut. *Journal of Maharashtra agricultural Universities* **18**, 421-423.

Patel, M.L., Gami, R.C., and Patel, P.V. (1993). Effect of FYM and NPK fertilizer on bulk density of deep black soil under rice, wheat, green gram rotation. *Gujarat Agricultural University Research Journal* **18**, 109-111.

Venkaiah, K. (1985). Effect of bulk density on growth and yield of groundnut. *Indian Journal of Agronomy* **30**, 278-280.