56

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# Scope of Enhancing Nodulation of Groundnut through Soil Amendments by Crop Residues of Wide C:N Ratios

*Thedchanamoorthy.K[1] and Gurung[2]*

## Abstract

*A pot experiment was conducted to study the effect of different crop residues having wider C:N ratios, on nitrogenase activity, nodulation and biomass of inoculated groundnut. The experiment indicated a positive effect on nitrogenase activity, nodulation and biomass of inoculated groundnut through soil amendments by crop residues of wide C:N ratios.*

## Introduction

Nodulation of groundnut is reported to be higher in the United States than in the soils in Asian countries, even under controlled environment and in the absence of abiotic stress conditions. This was clearly seen in high nodulation cultivars such as Flori giant Hypogae-bunch. After several observations, it was thought that the reason for poor nodulation could be due to differences in soil N and C(Munns, 1977, Harderson, et al; 1984, Gibson, et at; 1985, Streeter, 1988, Nyle and Brady, 1990). Application of amendments to reduce soil N during initial stages of nodule formation may offer better scope for a favourable legume - *Rhizobium* symbiosis (Rupela 1993). A temporary reduction in soil N could be brought about by organic materials having wider C:N ratio (Nyle and Brady). Such Crop residues are known to immobilize N (Ken E.Giller, 1993) and thus can serve as good soil amendments to enhance $N_2$ fixation by legumes (Rupela, 1993). Based on this concept pot experiments were conducted to study the effect of different Crop residues having wide C:N ratios, on nodulation, biomass and pod yield of groundnut in Alfisol and in regosol.

## Materials and Methods

The Pot experiment was conducted under controlled environment in a glass house at ICRISAT, India on a Randomized Complete Block Design with 4 replicates and 8 treatments as follows:

To: Inoculation Only (Control)
T1: Inoculation + Grass 10 t $ha^{-1}$
T2: Inoculation + Grass 100 $tha^{-1}$

1. Eastern University, Sri Lanka
2. Pakhribas Agricultural Centre, Kathmandu, Nepal

T3: Inoculation + Compost 10t ha $^{-1}$
T4: Inoculation+Compost 100 t ha$^{-1}$
T5: Inoculation + Neopeat 10 t ha$^{-1}$
T6: Inoculation + Neopeat 100t ha$^{-1}$
T7: Inoculation + Urea 100 kg ha$^{-1}$

The experiment was carried out in 18" diameter plastic pots, each of them filled with 4.0Kg of autoclaved and dried Alfisol soil, along with ground Crop residues and Urea in accordance with the treatments. Each pot received 350ml of Arnons nutrient solution which is accepted for pot experiments in Microbiology.

Four seeds of ground nut variety ICG 2729 (Flori giant Hypogaea - bunch) were dibbled into each pot and each seed top dressed with 5ml of NC 92 *Rhizobium* peat inoculant (1g per litre of water) and then covered with the soil. After sowing, soil Moisture in each pot was kept approximately at Field Capacity, by daily applying equal quantity of water.

The plants were carefully uprooted at 65 DAS when observations were taken on nodule dry weight, total biomass and pod yield. ARA was conducted to evaluate the nitrogenase activity of nodules. The average of plants in each pot was recorded.

**Results and Discussion**

**Nitrogenase activity**

Increased nitrogenase activity was observed in pots receiving Compost and Grass, both at 100 t ha$^{-1}$. While they were comparable, their effect was significantly different from that of the rest of the treatments.

**Nodule dry mass and number**

The nodule dry mass produced by Compost, Grass and Neopeat, all at 100 t ha$^{-1}$ was significantly higher than the rest of the treatments. The effect of treatments on Nodule number is similar, except in the case of Neopeat which is comparable to the rest of the treatments.

**Shoot weight**

Increased shoot weight was observed in pots receiving Grass and Compost, both at 100 t ha$^{-1}$.

**Root weight:**

The root weight did not vary significantly by treatments.

**Conclusion:**

The results show a positive effect by Compost and Grass both at 100 t ha$^{-1}$ on Nitrogenase activity, Nodule mass and number and plant shoot weight, thus indicating scope of enhancing nodulation of inoculated groundnut by these Crop residues.

## Nitrogenase activity, Shoot and root weights and Nodulation of Inoculated as affected by Organic Matter and Mineral N-POT EXPT.

| Treatments | ARA Plant $^{-1}$ ymh-1 | Nodule no.Plant$^{-1}$ | Nodule wt Mg Plant $^{-1}$ | Shoot wt g Plant $^{-1}$ | Root wt g Plant $^{-1}$ |
|---|---|---|---|---|---|
| T0 Control | 2.35 | 95 | 61 | 9.15 | 0.926 |
| T1 OM1 (10t) | 1.51 | 104 | 67 | 9.28 | 0.849 |
| T2 OM1 (100t) | 3.24 | 286 | 221 | 21.38 | 1.497 |
| T3 OM2 (10t) | 1.81 | 109 | 68 | 10.87 | 0.954 |
| T4 OM2 (100t) | 4.65 | 352 | 290 | 22.65 | 1.569 |
| T5 OM3 (10t) | 1.86 | 107 | 76 | 11.25 | 1.117 |
| T6 OM3 (100t) | 1.26 | 90 | 53 | 8.81 | 0.768 |
| T7Urea(100kg)N | 1.34 | 98 | 64 | 10.22 | 0.967 |
| SE | 1.186 | 81 | 47 | 4.94 | 0.377 |
| CV % | 52.7 | 52.6 | 41.8 | 38 | 34.7 |

O M 1 - Grass
O M 2 - Compost
O M 3 - Neopeat

**References:**


1. **Gibson, A.H.,** and **Harper, J.E.** 1985 Nitrate effect on the nodulation of soyabean by *Bradyrhizobium japonicum.* Crop Science 25:497-501.
2. **Hardeson. G., Zapata, F.,** and **Danso, S.K.S.** 1984. Effect of Plant genotype and nitrogen fertilizer on symbiotic nitrogen fixation by soyabean cultivar. Plant and Soil 82:397-405.
3. **Ken E. Giller and Kate. J. Wilson,** 1993. Nitrogen Fixation in Tropical Cropping Systems. CAB International Publications.
4. **Munns, D.N.** (1977) Mineral nutrition of Legumes. In :A treatise on dinitrogen fixation : Sec .IV (Ed. R.W.F.Hardy). A wiley - Inerscience Publication. John Wiley & Sons, New York.
5. **Nyle C. Brady.,** Soil Organic Matter and Organic Soils. In : The Nature and Properties of Soils (10$^{th}$ Ed.), Maxwell Macmillan International Edition.
6. **Rupela, O.P.** (1993), Personal contacts.
7. **Streeter, J.** 1988. Inhibition of legume nodule formation and $N_2$ fixation by nitrate. Critical Reviews in Plant Science 7:1-23.