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# PERFORMANCE OF DIFFERENT RHIZOBIAL CULTURES IN GROUNDNUT

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**ABSTRACT**

The results of a field experiment conducted for three consecutive years during summer 1990, 1991 and 1992 revealed that rhizobial inoculation significantly increased groundnut pod yield and returns under irrigated condition. Performance of rhizobial cultures TNAU 14, IGR 40 and IGR 40 6 was superior to other cultures tried. Though there was a response to rhizobial ioculation even at 100 per cent recommended dose of nitrogen (15 kg/ha), application of 7.5 kg N/ha along with seed treatment of *Rhizobium* resulted in higher benefit cost ratio. Groundnut variety VRI.1 performed better than Co.2

KEY WORDS : Groundnut, Yield, *Rhizobium*

Beneficial effect of rhizobial inoculation on groundnut yield and net return is well established (Joshi *et al.* 1989; Khune *et al.* 1989). Vargas and Ramirez (1989) reported that effect of rhizobial inoculation in groundnut is expressed best at low nitrogen rates. Further, Prabakaran and Sivasubramaniam (1991) reported varied response of groundnut to different strains of Rhizobium. Hence to study the performance of different rhizobial cultures under varying fertiliser doses and varieties of groundnut, the present study was conducted.

## MATERIALS AND METHODS

Field experiments were conducted at the Agricultural Research Station. Aliyarnager on sandy loam soil having available N, $P_2O_5$ and $K_2O$ as 150.0 16.0 and 350 kg/ha, respectively. Field experiments were conducted during summer (sowing in December second week) of 1990, 1991 and 1992. The experiment was laid out in a split -split plot design under irrigated condition. The treatment details are as follows:

### I. Rhizobium cultures (R)

TAL 1000, TNAU 14, IGR 40, IGR 6, TAL 167, TAL 1371 and control.

### II. Varieties (V)

Groundnut variety - Co.2 and VRI.1

### III. Fertiliser dose (F)

$N_1$ - Recommended dose of N, P and K (15:30:45 kg NPK/ha).

$N_2$-Half the recommended dose of N and full recommended dose of P and K (7.5: 30:45 kg NPK/ha)

The trial was laid out with two replications. The groundnut seeds were treated at the rate of three packets (600 g) for seeds required to sow one ha. Rhiozobial cultures were obtained from Microbiology Division, National Research Centre for Groundnut, Junagadh. All standard procedures relating to crop cultivation, recording yield and other components were followed. The data for individual years were statistically scrutinised and the pooled analysis carried out is presented in Table 1.

## RESULTS AND DISCUSSION

### Nodule number, yield, yield and quality attributes

It is seen that *Rhizobium* inoculation increased sound matured kernel percentage, nodule number per plant, 100 kernel weight, shelling percentage and yield. There was response to rhizobial inoculation at both levels of nitrogen tried. The initial available nitrogen status of the experimental field was low (150 kg/ha). This low level of soil nitrogen is probably the reason for response to rhizobial inoculation even at the recommended does of fertiliser nitrogen application. Among the different rhizobial cultures tried, TNAU 14, IGR 40 and IGR 6 were superior to others. Response to rhizobial inoculation was relatively more in VRI.1 (15.1% yield increase) than in Co.2 (14.3%). At the recommended level of fertiliser application ($N_1$), rhizobial inoculation (mean over all the strains)

**Table 1. Effect of treatment on groundnut yield and economics (Pooled table for the three year results)**

| Treatment | | Nodule (No./plant) | Pod yield (kg/ha) | Haulms yield (kg/ha) | Shelling (%) | 100 kernel weight (g) | SMK (%) | Net return (Rs/ha) | B-C ratio (Rs/ha) |
|---|---|---|---|---|---|---|---|---|---|
| $Co_2$ $N_1$ | TAL 1000 | 35.0 | 2184 | 3822 | 67.1 | 36.0 | 77.7 | 15781 | 4.34 |
| | TNAU 14 | 36.8 | 2386 | 4964 | 69.0 | 37.6 | 80.5 | 17656 | 4.71 |
| | IGR 40 | 29.5 | 2146 | 4126 | 68.8 | 38.3 | 80.6 | 15867 | 4.33 |
| | IGR 6 | 28.6 | 2120 | 4269 | 68.3 | 37.6 | 78.0 | 15552 | 4.25 |
| | TAL 167 | 36.6 | 1920 | 4187 | 66.5 | 36.7 | 78.2 | 13680 | 3.86 |
| | TAL 1371 | 37.9 | 1847 | 3946 | 67.2 | 33.2 | 77.9 | 14354 | 3.07 |
| | Control | 25.1 | 1824 | 3349 | 63.7 | 30.4 | 75.0 | 12733 | 2.72 |
| $N_2$ | TAL 1000 | 44.9 | 1880 | 3534 | 67.3 | 38.7 | 81.0 | 14119 | 4.22 |
| | TNAU 14 | 47.7 | 2089 | 4291 | 69.5 | 38.0 | 83.0 | 16128 | 4.71 |
| | IGR 40 | 41.5 | 2276 | 3808 | 69.1 | 38.3 | 82.4 | 17515 | 5.08 |
| | TAL 6 | 42.7 | 2079 | 3818 | 69.0 | 41.4 | 79.5 | 15932 | 4.63 |
| | TAL 167 | 34.5 | 1896 | 3380 | 663.4 | 38.1 | 79.4 | 14166 | 4.27 |
| | TAL 1371 | 46.3 | 1970 | 3457 | 67.0 | 34.7 | 79.1 | 14575 | 4.37 |
| | Control | 30.9 | 1791 | 2866 | 63.8 | 31.5 | 75.9 | 13059 | 4.00 |
| $VRI_1$ $N_1$ | TAL 1000 | 49.3 | 2275 | 3921 | 68.3 | 37.6 | 79.1 | 16588 | 4.63 |
| | TNAU 14 | 40.3 | 2492 | 5115 | 70.2 | 38.7 | 81.7 | 18602 | 5.00 |
| | IGR 40 | 46.5 | 2231 | 4244 | 70.1 | 39.4 | 81.8 | 16666 | 4.57 |
| | IGR 6 | 35.4 | 2181 | 4384 | 68.9 | 38.1 | 78.3 | 16504 | 4.55 |
| | TAL 167 | 39.8 | 1991 | 4312 | 67.5 | 38.0 | 78.7 | 14346 | 4.08 |
| | TAL 1371 | 39.5 | 1908 | 4057 | 68.1 | 35.1 | 77.7 | 13634 | 3.91 |
| | Control | 32.2 | 1878 | 3413 | 65.6 | 30.8 | 75.0 | 13226 | 3.84 |
| $N_2$ | TAL 1000 | 51.2 | 1944 | 3634 | 69.0 | 36.7 | 81.0 | 14649 | 4.34 |
| | TNAU 14 | 60.4 | 21.58 | 4409 | 70.4 | 37.8 | 82.9 | 16696 | 4.81 |
| | IGR 40 | 45.1 | 2363 | 3887 | 70.0 | 38.5 | 82.4 | 18216 | 5.21 |
| | IGR 6 | 47.2 | 2157 | 3931 | 69.8 | 38.4 | 81.1 | 16582 | 4.80 |
| | TAL 167 | 55.3 | 1963 | 3474 | 67.0 | 37.3 | 78.7 | 14719 | 4.36 |
| | TAL 1371 | 58.9 | 2047 | 3554 | 67.9 | 34.9 | 78.4 | 15194 | 4.52 |
| | Control | 43.3 | 1845 | 2922 | 65.0 | 30.7 | 75.7 | 13480 | 4.10 |
| | SE (V) | 2.28 | 7.31 | 14.43 | 0.29 | 0.20 | 0.31 | 54.63 | 0.008 |
| | CD | 6.63 | 21.45 | 48.20 | 0.85 | 0.59 | 0.90 | 160.26 | 0.024 |
| | SE (F) | 2.28 | 7.31 | 16.43 | 0.29 | 0.20 | 0.31 | 54.63 | 0.008 |
| | CD | 6.63 | 21.45 | 48.20 | 0.85 | 0.59 | 0.90 | 160.26 | 0.024 |
| | SE (R) | 4.27 | 13.14 | 24.45 | 0.51 | 0.38 | 0.56 | 81.01 | 0.018 |
| | CD | 12.40 | 37.88 | 70.47 | 1.46 | 1.09 | 1.61 | 233.51 | 0.052 |
| | SE (VF) | 3.23 | 11.05 | 19.65 | 0.40 | 0.32 | 0.47 | 62.40 | 0.012 |
| | CD | 9.37 | 32.03 | 56.98 | 1.17 | 0.94 | 1.35 | 180.91 | 0.036 |
| | SE (VR) | 6.04 | 18.16 | 29.47 | 0.77 | 0.66 | 0.88 | 103.95 | 0.026 |
| | CD | 7.53 | 52.89 | 85.82 | 2.24 | 1.93 | 2.55 | 302.76 | 0.075 |
| | SE (FR) | 6.04 | 18.16 | 29.47 | 0.77 | 0.66 | 0.88 | 103.95 | 0.026 |
| | CD | 17.53 | 52.89 | 85.47 | 2.24 | 1.93 | 2.55 | 302.76 | 0.075 |
| | SE (VER) | 8.55 | 24.88 | 40.68 | 1.06 | 0.89 | 1.27 | 152.21 | 0.096 |
| | CD | 24.80 | 71.98 | 118.21 | 3.09 | 2.60 | 3.68 | 442.31 | 0.096 |

SMK - Sound Matured Kernal percentage
B-C ratio - Benefit Cost Ratio

increased groundnut yield by 277 kg/ha in case of Co.2 and302 kh/ha in case of VRI.1, compared to control. At $N_2$ fertiliser level, this increase was 241 kh/ha and 260 kg/ha in Co.2 and VRI.1, respectively.

## Economics

Data on net returns and benefit cost ratio revealed significant increase in both the factors due to rhizobial inoculation. Among the different cultures tried TNAU 14, IGR 40 and IGR 6 were found to be more remunerative. At the recommended dose of fertiliser application ($N_1$), rhizobial inoculation recorded mean increase (over different strains of Rhizobium) in net returns to the tune of Rs.2,749/ha in case of variety Co.2 and Rs.2,831/ha in case of VRI.1 compared to untreated control; At $N_2$ fertiliser level the increase in net returns was Rs.2,347/ha (Co.2) and Rs.2.529/ha (VRI.1) over untreated control. However, benefit cost ratio was higher when rhizobial seed treatment was combined with 7.5 kg N/ha application (4.3).

The foregoing results show that rhizobial inoculation significantly increased groundnut pod yield, yield and quality attributes and returns. Performance of Rhizobium cultures TNAU 14, IGR 40 and IGR 6 were superior to other cultures tried. Though there was response to rhizobial inoculation even at the higher nitrogen rate (15 kg/ha), higher benefit cost ratio was observed when seed inoculation of Rhizobium was combined with soil application of 7.5 kg N/ha.

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# INFLUENCE OF SINGLE RICE BASED CROPPING SYSTEMS ON SOIL HEALTH IN CAUVERY DELTA ZONE OF TAMIL NADU

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### ABSTRACT

Field experiment conducted at the Tamil Nadu Rice Research Institute, Aduthurai, Tamil Nadu for two years (1985-87) revealed that the computed nitrogen balance was positive (20.8 kg $ha^{-1}$) in the system of rice-cotton. Net loss of nitrogen was observed in system encompassing rice-soybean (-24.4 kg $ha^{-1}$) and -214.6 kg $ha^{-1}$ in systems of finger millet -rice -cotton. The computed balance for phosphorus was positive in all the systems and the highest was 196.3 kg $ha^{-1}$ in system possessing rice -soybean. The potassium balance was very much negative (-441.8 kg $ha^{-1}$) in the system of maize-rice-cotton. Wherever cotton constituted a component in the sequence, there was considerable enhancement in soil nutrient status (system 5 and 6) Cotton and finger millets are not less efficient than legume crop in enhancing soil nutrient status especially nitrogen balance.

KEYWORDS : Cropping System, Rice-based, Influence, Soil, Cauvery Delta Zone

Against the back drop of escalating demographic pressure, multiple cropping has gained importance. Various agricultural institutes have been perfecting techniques and exploring more remunerative crop sequences (Singh and Nair, 1973). Maintenance of soil health is primarily important while proposing any new or alternate cropping systems to any particular location. Over revealed that nutrient supplying power of many soils declined stadily under intensive cropping and soil fertility stablised at a low level (Nambiar and Abrol, 1989). Biswas and Benbi (1989) observed that both wheat and maize responded positively to application of nitrogen, phosphorus and potassium over the years. Meena *et al.* (1993) observed that application of N to preceeding wheat had a din green