EFFECT OF NPK AND BIOFERTILIZERS ON PIGEON PEA (CAJANAS CAJAN L. MILL SP)

L. P. DALAL* AND P. B. NANDKAR
Department of Botany, J. B. College of Science, Wardha - 442 001
Department of Botany, P. G. T. D., R. T. M. Nagpur University, Nagpur - 440 033
E-mail: lalchanddalal@gmail.com

ABSTRACT
Field trials were conducted in cotton black soil during the season 2001-02 and 2002-03. Response of Pigeon pea cultivar (Maroti var. IPC-87119) to inoculation with Rhizobial strains was studied. Wild strains of *Rhizobium* sp. from Pigeon pea and *Azotobacter chroococcum*, *Pseudomonas striata* (Regional centre for organic farming, Nagpur) and its mix culture T4, T5 and T6 was performed significantly well in improving plant height, number of branches, and grains (seeds) yield of higher cost benefits and more additional net income as compared to NPK controls. It was further reported that T5 performed well with Pigeon pea cultivar (Maroti var. IPC-87119) indicating its specificity.

INTRODUCTION
Pigeonpea (*Cajanus cajan* Linn. Mill) sp.) is popularly grown pulse crop in India during kharif. About 90% world area is contributed by India. It has acquired 3.82, 3.52 million hectare area with the total production of 2.93 and 2.69 metric tones throughout the world and Asia respectively (Anonymous, 2003). Pigeon pea (*Cajanus cajan* L. Mill sp.) ranks second amongst pulses in terms of area and production in India. Legume crop possess the root nodules and fix atmospheric nitrogen enriching soil fertility (Mareckova, 1979). It is a good practice to give *Rhizobium* sp. treatment to legume seedlings. This is achieved by symbiotic nitrogen fixing bacteria *Rhizobium* sp. and *Azotobacter chroococcum*. Phosphorus can be made soluble in soil by phosphate solubalizing bacteria (*Pseudomonas striata*). They possess ability to bring insoluble phosphate in to soluble form by secreting organic acids. NPK is most important elements in controlling the normal growth and yield of crops including Pigeon pea. Generally the crops need recommended doses of 25kg N: 50 kg P: 50 kg K/ha and to get the 1.2 tonnes/ha yield, the crop plant requires 8.5, 8.0 and 16kg NPK/ha respectively, Aulakh et al., (1985). The variability in the studies on inoculations of *Rhizobium* sp., *Pseudomonas striata* and *Azotobacter chroococcum* singly and in combination of 2-3 strains alone and in combination with NPK fertilizers are noticed (Katsuyuki Katayama et al., 1990). A less information was available on Pigeon pea. Considering the advantage of biofertilizers and NPK, the studies were undertaken to investigate the effect of *Rhizobial*, *Pseudomonial* and *Azotobacterial inoculation* on Pigeon pea as well as to find out the combination of these strains over recommended doses of NPK fertilizers on biochemical and yield contributing parameters.

MATERIALS AND METHODS
The experiment was conducted under the field conditions of the Department of Botany, P.G.T.D., RTM, Nagpur University, Nagpur, for two years during the rainy seasons (Kharif) of 2001-02 and 2002-03 in a factorial randomized block design with three applications. Total seventeen treatment, comprising of 5-treatments with dual inoculation of *Rhizobium* sp., and *Pseudomonas striata* with 5-levels of NPK. 5-treatments with dual inoculation of *Rhizobium* sp. and *Azotobacter chroococcum* with 5-levels of NPK, and 5-treatments with triple inoculation of *Rhizobial + Pseudomonas + Azotobacter* with 5-levels of NPK and one treatment of uninoculated (control) were tested in black cotton soil. The 15-days old seedling was fertilized with 1mL of inocul of *Rhizobia* sp., *Pseudomonas striata* and *Azotobacter chroococcum* respectively. These strains were obtained from regional centres of organic farming and composting, Nagpur region, Nagpur. The seeds sown at 30 x 30cm spacing in plots. The basal dose of 12.5N:25P₂O₅:25K₂O kg/ha was applied to all treatments plots. Observations on plant height, number of shoots (branches) per plant, seed yield contributing character in terms of treatment with biofertilizers in combination with NPK fertilizers were recorded at harvest stage. The data were pooled for two years and analysed. The minimization of NPK fertilizers due to fertilization of plant with biofertilizers were also recorded.
RESULTS AND DISCUSSION

Data in respect of plant height (cms), number of branches per plant and mean yield (t/ha) are given in Table 1. In chemical treatment $T_6$, it is observed that the plant height and branches per plant are significant over treatment $T_5$, $T_7$ and $T_6$, however, in treatment $T_3$, yield factor and plant height is slightly higher but if we consider the cost factor of NPK, treatment $T_3$ is non significant over $T_6$. Similarly the impact of higher doses, influences adverse effect on yield and other factors i.e. non significant ($T_{13}$). Mahalakshmi, P.A, and Vijayalakshmi (2001) Recorded that application of sago waste and pressmud @ 12.5 t/ha each increased growth parameters of green gram. Inoculation with NPK (15:30:30 kg/ha) $T_4$ and dual strain of Rhizobium sp. and Pseudomonas (T$_5$) were non significant over $T_6$ and NPK (15:30:30 kg/ha) with dual strain of Rhizobium and Azotobacter (T$_7$). Similar findings were noted by Borde, B. K., Mohite, A. V. and Kadam, J. R. 1983. Effect of application through fertilizers and PMC on green gram. J. Maharashtra agric. treatment $T_6$, it is observed that the plant height and branches per plant are significant over treatment $T_5$, $T_7$ and $T_6$, however, in treatment $T_3$, yield factor and plant height is slightly higher but if we consider the cost factor of NPK, treatment $T_3$ is non significant over $T_6$. Similarly the impact of higher doses, influences adverse effect on yield and other factors i.e. non significant ($T_{13}$). Mahalakshmi, P.A, and Vijayalakshmi (2001) Recorded that application of sago waste and pressmud @ 12.5 t/ha each increased growth parameters of green gram. Inoculation with NPK (15:30:30 kg/ha) $T_4$ and dual strain of Rhizobium sp. and Pseudomonas (T$_5$) were non significant over $T_6$ and NPK (15:30:30 kg/ha) with dual strain of Rhizobium and Azotobacter (T$_7$). Similar findings were noted by Borde, B. K., Mohite, A. V. and Kadam, J. R. 1983. Effect of application through fertilizers and PMC on green gram. J. Maharashtra agric.

Table 1: Mean grain yield (t/ha), plant height (cms) and number of branches. Control and NPK treatment. (Pooled data of two years 2001-02 and 2002-03)

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Grain yield/ha</th>
<th>Plant height (cms)</th>
<th>No. of branches per plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control ($T_0$)</td>
<td>1.03</td>
<td>108.75</td>
<td>5.0</td>
</tr>
<tr>
<td>NPK(Kg/ha):5:10:10 ($T_1$)</td>
<td>2.68</td>
<td>211.0</td>
<td>7.0</td>
</tr>
<tr>
<td>10:20:20 ($T_2$)</td>
<td>3.12</td>
<td>216.0</td>
<td>10.0</td>
</tr>
<tr>
<td>15:30:30 ($T_3$)</td>
<td>3.48</td>
<td>225.0</td>
<td>12.0</td>
</tr>
<tr>
<td>20:40:40 ($T_4$)</td>
<td>3.50</td>
<td>227.0</td>
<td>12.0</td>
</tr>
<tr>
<td>25:50:50 ($T_5$)</td>
<td>3.29</td>
<td>224.0</td>
<td>11.0</td>
</tr>
</tbody>
</table>

Inoculation of Rhizobium sp. + Azotobacter chroococcum + Pseudomonas striata showed more effectiveness over $T_5$. Inoculation with $T_5$ showed higher seed weight (3.62 t/ha) over $T_1$ (3.48 t/ha) but inoculation with $T_2$ (3.57 t/ha) showed lower yield over $T_3$ (3.62 t/ha) and $T_5$ (3.48 t/ha). Inoculation with $T_5$ showed highest seed weight (i.e. 3.64 t/ha) over $T_1$ (3.48 t/ha), $T_3$ (3.62 t/ha) and $T_5$ (3.57 t/ha). Increase in grain yield per hectare might be a impact of increased dry matter content at maturity. The seed development might be attributed to the mobilization of reserved food material to developing seed, which acts as a sink for carbohydrates present in plant. Similar type of findings was reported by Rewari et al., (1980); Singh et al., (1979). The results reported by Gibson, (1980); Khurana and Phutela, (1980); Lie, (1981); Mareckova, (1979); Wange, (1990) and Singh et al., (1979) are in line with present findings.

REFERENCES


