INFLUENCE OF DIFFERENT SOURCES OF NITROGEN ON GRAIN YIELD AND ECONOMICS OF RICE (*ORYZA SATIVA L.*) UNDER CAUVERY DELTA REGION OF TAMIL NADU

S. RAMESH

Assistant professor, Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu.

ABSTRACT

A field experiment was conducted during samba season (September 2006 to January 2007) at experimental farm, Faculty of Agriculture, Annamalai University to study the influence of different sources of nitrogen on grain yield and economics of rice. The experiment was conducted in randomized block design and replicated thrice. The experiment comprised eight treatments includes absolute control (No fertilizer and no organic manure), recommended dose of fertilizer alone and graded dose of fertilizer nitrogen along with different organic manures viz., Green manure, Vermicompost and Pressmud. Use of different sources and combination sources of nitrogen had significant influence on yield attributes and yield of rice. The results of the experiment showed that application of 100% RDN along with vermicompost @ 5 tonnes ha\(^{-1}\) significantly recorded higher yield attributes, maximum grain and straw yield and higher gross return, net returns and return rupee\(^{-1}\) over other organic manure in combination with inorganic fertilizer which was followed by application of 75% RDN along with vermicompost @ 5 tonnes ha\(^{-1}\).

Key words: Rice, Recommended dose of Nitrogen, Vermicompost, Green manure and Pressmud gross return, net returns and return rupee\(^{-1}\)

INTRODUCTION

Rice is one of the most important staple cereal foods in human nutrition and major food grain for more than a two third of the world’s population. In world, 90% rice is produced and consumed in Asian countries. It is the major source of calories for 40 per cent of the world population (Ahmad Ranjha, 2001). Currently, the world population is increasing at alarming rate but there is no scope to increase the net cultivable land for crop production. Exploiting the production potential of high yielding rice varieties through agronomic management is one of the alternatives to feed the ever rising population. For this, fertilizers have contributed substantially to the spectacular increase in rice yield. However, growing crop with indiscriminate use of fertilizers has resulted into degradation of lands owing to low yields with poor quality of produce. The use of inorganic fertilizer to sustain cropping was found to increase yield only for
some few years but on long-term, it has not be effective and leads to soil degradation (Satyanarayana et al., 2002). On the other hand, continuous application of organic fertilizer alone on rice field resulting low yield and low N and K content at the mid-tillering stage of rice plant (Javier et al., 2004). This implies that the need of integrated nutrient management for rice production. INM practices are a holistic management system, which promotes sustainable agriculture and enhances agro-ecosystem health. Organic manures like green manure, pressmud and vermicompost deserves priority for sustained production and better utilization in intensive cropping system. Vermicompost is a rich source of enzymes, antibiotics, immobilised micro flora and growth hormones like gibberellins which regulate the growth of plants and microbes. (Usha Kumari et al., 2006). Green manure is considered as good source of nitrogen and it increases the availability of P, K and secondary and trace elements in the soil. Incorporation of Sesbania green manuring over the years before transplanting of rice helps in improving DTPA-extractable micronutrient cations of the soil (Nayyar and Chhibba, 2000). Combined use of organic manures and inorganic fertilizers help in maintaining yield stability through correction of marginal deficiencies of secondary and micronutrients, enhancing efficiency of applied nutrients and providing favourable soil physical conditions (Panda, 2005). Keeping this as an overview, study was conducted to find out the influence of different sources of nitrogen on grain yield and economics of rice (oryza sativa L.) under cauvery delta region of Tamil nadu.

MATERIAL AND METHODS

Field experiment was conducted during samba season (September 2006 to January 2007) at Experimental farm, Faculty of Agriculture, Annamalai University, Annamalai Nagar and Tamil Nadu. The experimental soil was deep clay, low in available N, medium in available P2O5 and high in available K2O with pH of 7.5. The experiment comprised of eight treatments viz., T1 - Control (No fertilizer and no organic manure), T2 - 100% RDN (Recommended dose of nitrogen), T3 - T2 + Green manure @ 6.25 t ha\(^{-1}\), T4 - 75% RDN + Green manure @ 6.25 t ha\(^{-1}\), T5 - T2 + Vermicompost @ 5 t ha\(^{-1}\), T6 - 75% RDN + Vermicompost @ 5 t ha\(^{-1}\), T7 - T2 + Pressmud @ 10 t ha\(^{-1}\), T8 - 75% RDN + Pressmud @ 10 t ha\(^{-1}\). The experiment was conducted in a randomized block design and replicated thrice. The following organic manures were used in the study viz., green manure, vermicompost and pressmud. The seeds of Sesbania rostrata were obtained from the Experimental Farm, Annamalai University and grown in a plot adjoining to the experimental field. After 45 days green manure was cut and incorporated in the respective plots as per the treatment schedule. Vermicompost was collected from Experimental Farm, Annamalai University and used for the experiment as per the treatment schedule. The pressmud was collected from M.R.Krishnamurthy Sugar Mill, Sethiathope, Cuddalore district, Tamil Nadu and dumped under shade for curing. After six month it was used for experiment as per the treatment schedule. The recommended dose of NPK fertilizers was 150:50:50 kg ha\(^{-1}\). Fertilizers were applied according to the experimental treatments. Nitrogen, phosphorous and potassium were supplied through urea (46 per cent N), single super phosphate (16 per cent P2O5) and muriate of potash (60 per cent K2O), respectively. Twenty-eight days old seedlings of CO 43 rice variety were transplanted in puddle field at a spacing of 20 x 15cm. Matured rice crop from the net plot area
was harvested, threshed and grains were separated, cleaned, dried and the grain yield was recorded at 14 per cent moisture content.

**Economic analysis**

**Gross return**

Gross return was calculated using grain yield of rice on market price and expressed in Rs ha\(^{-1}\).

**Net return**

Net return was calculated by deducting the cost of cultivation from gross returns as detailed below and presented in Rs ha\(^{-1}\).

\[
\text{Net return} = \text{Gross return} - \text{total cost of cultivation}
\]

**Return rupee\(^{-1}\) invested**

Return rupee\(^{-1}\) invested was calculated based on gross returns and cost of cultivation as given.

\[
\text{Return rupee}\(^{-1}\)\text{ invested} = \frac{\text{Gross return (Rs. ha}\(^{-1}\))}{\text{Cost of cultivation (Rs. ha}\(^{-1}\))}
\]

The observations recorded during the course of investigation were tabulated and analyzed statistically to draw a valid conclusion. The data were analyzed as per the standard procedure for ANOVA (Gomez and Gomez 1984).

**RESULTS AND DISCUSSIONS**

**Yield Attributes and Yield**

All the treatments exerted significant influence on yield attributes and yield of rice over the control. Application of 100% RDN + vermicompost @ 5 t ha\(^{-1}\) (T\(_5\)) significantly recorded maximum productive tillers m\(^{-2}\) of 396.00 and filled grains panicle\(^{-1}\) of 82.63. This might be due to rapid mineralization of N from inorganic fertilizer and steady supply of nutrients from vermicompost might have met the N requirement throughout the crop growth and especially at the critical stages of crop growth, which manifested the higher yield attributes of rice. Similar kind of results was also reported by Murali and Setty (2001) in rice. With regard to grain yield and straw yield, 100% RDN + vermicompost @ 5 t ha\(^{-1}\) (T\(_5\)) applied plots significantly recorded higher grain and straw yield of 5.74 and 6.66 t ha\(^{-1}\), respectively. This might be due to the fact that vermicompost offer a balanced nutritional release pattern to plants, providing nutrients such as available N, soluble K, exchangeable Ca, Mg and P that can be taken readily by plants (Edwards, 2004) and greater microbial diversity and activity resulting in higher grain and straw production. This is in accordance with the reports of Yadvinder Singh *et al.* (2003). It was followed by treatment T\(_6\) (75% RDN + vermicompost @ 5 t ha\(^{-1}\)). The least productive tillers m\(^{-2}\) and filled grains panicle\(^{-1}\), grain and straw yield were recorded under control (T\(_1\)).

**ECONOMIC ANALYSIS**

Among the treatments, the maximum gross returns of Rs. 43510 and net returns of Rs. 21855 were observed with 100% RDN + vermicompost @ 5 t ha\(^{-1}\). Also the same treatment registered higher return...
rupee\(^1\) invested of 2.01. The aforesaid treatments registered higher yield attributes viz., productive tillers m\(^2\), number of filled grains and panicle\(^{-1}\), which are directly reflected on increased yield of rice. These might be the reason for increased profitability in the rice crop. The present results are in agreement with the findings of Babu Mathew (2001). This was followed by T\(_6\) (75% RDN + vermicompost @ 5 t ha\(^{-1}\)), which registered gross returns of Rs. 41115, net returns of Rs.20005 and return rupee\(^{-1}\) of Rs.1.95. The lowest gross returns of Rs. 15880 , net returns of Rs.4360 and return rupee\(^{-1}\) of Rs1.38 registered under T\(_1\) (control).

Thus it can be concluded that application of 100% recommended dose of nitrogen along with vermicompost @ 5 t ha\(^{-1}\) can be an effective integrated nitrogen management practices that can be recommended to the farmers of coastal tracts of Tamil Nadu for higher productivity and sustainability besides enhancing monetary returns in rice.

Table 1. Influence of different sources of nitrogen on yield attributes, grain and straw yield and economic analysis in rice

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Productive tillers m(^2)</th>
<th>Filled Grains panicle(^{-1})</th>
<th>Grain Yield (t ha(^{-1}))</th>
<th>Straw yield (t ha(^{-1}))</th>
<th>Total cost of cultivation Rs</th>
<th>Gross Income Rs.</th>
<th>Net income Rs.</th>
<th>Return rupee(^{-1}) invested</th>
</tr>
</thead>
<tbody>
<tr>
<td>T(_1)</td>
<td>193.50</td>
<td>59.46</td>
<td>2.07</td>
<td>2.78</td>
<td>11520</td>
<td>15880</td>
<td>4360</td>
<td>1.38</td>
</tr>
<tr>
<td>T(_2)</td>
<td>296.50</td>
<td>66.83</td>
<td>3.47</td>
<td>4.41</td>
<td>15170</td>
<td>26495</td>
<td>11325</td>
<td>1.75</td>
</tr>
<tr>
<td>T(_3)</td>
<td>362.00</td>
<td>77.83</td>
<td>4.91</td>
<td>5.85</td>
<td>19435</td>
<td>37295</td>
<td>17860</td>
<td>1.92</td>
</tr>
<tr>
<td>T(_4)</td>
<td>347.00</td>
<td>76.05</td>
<td>4.62</td>
<td>5.58</td>
<td>18900</td>
<td>35130</td>
<td>16230</td>
<td>1.86</td>
</tr>
<tr>
<td>T(_5)</td>
<td>396.00</td>
<td>82.63</td>
<td>5.74</td>
<td>6.66</td>
<td>21655</td>
<td>43510</td>
<td>21855</td>
<td>2.01</td>
</tr>
<tr>
<td>T(_6)</td>
<td>380.00</td>
<td>80.72</td>
<td>5.42</td>
<td>6.35</td>
<td>21110</td>
<td>41115</td>
<td>20005</td>
<td>1.95</td>
</tr>
<tr>
<td>T(_7)</td>
<td>339.00</td>
<td>74.83</td>
<td>4.41</td>
<td>5.42</td>
<td>18195</td>
<td>33580</td>
<td>15385</td>
<td>1.85</td>
</tr>
<tr>
<td>T(_8)</td>
<td>321.50</td>
<td>72.73</td>
<td>4.14</td>
<td>5.13</td>
<td>17660</td>
<td>31545</td>
<td>13885</td>
<td>1.79</td>
</tr>
<tr>
<td>S.E(_D)</td>
<td>7.43</td>
<td>0.89</td>
<td>0.14</td>
<td>0.11</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CD (p=0.05)</td>
<td>14.86</td>
<td>1.78</td>
<td>0.28</td>
<td>0.21</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

(Treatment details: T\(_1\) - Control (No fertilizer and no organic manure), T\(_2\) - 100 % RDN (Recommended dose of nitrogen),T\(_3\) - T\(_2\) + GM -(Green manure), @ 6.25 t ha\(^{-1}\), T\(_4\) - 75 % RDN + GM -(Green manure), @ 6.25 t ha\(^{-1}\), T\(_5\) - T\(_2\) + VC (Vermicompost) @ 5 t ha\(^{-1}\), T\(_6\) - 75 % RDN + VC (Vermicompost) @ 5 t ha\(^{-1}\), T\(_7\) - T\(_2\) + PM (Pressmud)@ 10 t ha\(^{-1}\) and T\(_8\) - 75 % RDN + PM (Pressmud)@ 10 t ha\(^{-1}\)
REFERENCES


