The response of SRI to different sources of nitrogen and combination of nitrogen sources

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Rice (*Oryza sativa* L.) is the main staple food crop cultivated in Asian countries. It is estimated that the demand of rice will be 100 million tones during 2010 and 140 million tones in 2025 (The Hindu Survey of Indian Agriculture, 2004). For achieving this target, an alternative higher productivity system for growing rice under depleting and diminishing resources is very much essential. This additional rice will have to be produced on less land with less water, less labour, and fewer chemicals (Zheng *et al,* 2004). System of Rice Intensification (SRI) offers oppurtunities to researchers and farmers as a cost-cutting means and labour-saving procedure for growing rice. Experience with SRI methods suggests that average rice yields can be about double the present world average without requiring a change in cultivar or the use of purchased input (Wang *et. al.* 2002). Furthermore, the soils of rice growing areas are becoming sick and therefore, there is an urgent need to minimize the chemical fertilizer to sustain the agro-ecological conditions as well as to maintain the soil health.

The experiment was carried out during the *Kharif* 2007 and 08 at 'C' Block Farm, Bidhan Chandra Krishi Viswavidyalaya, Kalyani, Nadia, West Bengal under rainfed condition. The soil of the experimental field was Gangetic alluvium (Entisol), sandy clay loam in texture with low water holding capacity and moderate fertility status.

Table 1 : Soil properties of experimental field.

Parameter	*Kharif* 2007	*Kharif* 2008
pH	7.3	7.2
Organic carbon (%)	0. 597	0. 597
Total nitrogen (%)	0. 064	0. 066
Available phosphorus (kg ha^{-1})	16.11	16.18
Available potash (kg ha^{-1})	123.5	127.0

The experiment was conducted in Randomized Block design with nine treatments and replicated thrice. Twelve days old single seedling of rice cultivar Satabdi (IET 4786) raised in sand bed was sown at a spacing of 20 x 20 cm, 30 kg ha^{-1} each of P_2O_5 and K_2O was applied through single super phosphate and muriate of potash. Nitrogen was applied in different combinations of treatments. T_1 - 80 kg N (Urea) ha^{-1}, T_2 - 50% Urea + 50% Enrich adhar, T_3 - 25% Urea + 75% Enrich adhar, T_4 - 50% Urea + 50% Neemcake, T_5 - 25% Urea + 75% Neemcake, T_6 - 80 kg N (Enrich adhar) ha^{-1} , T_7 - 60 kg N (Enrich adhar) ha^{-1} , T_8 - 80 kg N (Neemcake) ha^{-1} and T_9 - 60 kg N (Neemcake) ha^{-1} in both the years. Enrich adhar is a bio-fertilizer prepared from the sea weed, *Ascophylum nodosum*, very rich in macro- and micro-nutrients enriched with different enzymes. The carbon, nitrogen, phosphate (p_2O_2) and potassium (K_2O) content of biofertilizer are 16.2%, 2.7%, 2.5% and 3.0 respectively.

Table 2: Average beneficial micro flora population (million /g) of Enrich adhar

Total bacteria	:	1000
Azotobactor	:	100
Nodule bacteria	:	1
Nitrobacteria	:	1
Phosphate solubilising bacteria	:	10
Actinomycetes	:	10
Beneficial fungi	:	10

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The neem cake used in this experiment was local. The water is applied only when the soil showed light cracks in the experimental field. Number of tillers m^{-2} remarkably enhanced with the combination of 25% ino. (Urea)+ 75% org (Enrich adhar) closely followed by the same combination of 25% inorganic (Urea) + 75% orgganic (Neemcake). Similar trend was recorded in filled grain percentage and panicle length, however the highest plant height was observed in the treatment where all the required amount of nitrogen was supplied through inorganic (urea). The highest grain yield (4.85 t ha^{-1}) was recorded from the treatment T_3 *i.e.* 25% ino. + 75% organic (Enrich adhar) which was significantly higher than the sole inorganic treatment. In case of straw yield same kind of variation was found. Grain weight was not influenced with the different treatments. The SRI method out-performed the normal planting in terms of growth attributes, root growth and yield (Thiyagarajan 2002, Manjunatha *et al,*. 2009).

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Table 1 : Effect of nutrient management on yield components and yield (pooled data)

Treatments	Plant height (cm)	No. of tiller (m^{-2})	Filled grains (%)	Panicle length (cm)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Test weight(g)
80 kg N (Urea) ha^{-1}	96.5	440.76	75.5	20.3	3.80	4.97	20.35
50% N(Urea) + 50% N(EA)	93.8	460.51	79.6	21.2	4.32	5.08	21.44
25% N(Urea)+ 75% N(EA)	94.3	521.52	82.4	21.5	4.85	5.72	21.96
50% (Urea) + 50%N(NC)	92.4	464.48	77.7	21.0	3.91	4.39	20.94
25% (Urea) + 75% N(NC)	90.3	509.71	80.9	20.5	4.61	5.45	21.34
80 kg N ha^{-1} (EA)	91.7	470.35	76.8	20.6	4.37	5.33	20.99
60 kg N ha^{-1} (EA)	90.8	446.73	79.9	19.6	4.09	4.93	20.70
80 kg N ha^{-1} (NC)	88.7	488.06	73.8	20.4	4.14	5.17	20.92
60 kg N ha^{-1} (NC)	86.2	454.60	68.8	19.2	3.76	4.83	20.72
SEm(±)	**2.475**	**5.473**	**2.792**	**0.582**	**0.076**	**0.159**	**0.321**
LSD (0.05)	**7.405**	**16.371**	**8.352**	**1.742**	**0.223**	**0.476**	**NS**

EA – Enrich Adhar; NC- Neem Cake

From this experiment it may be concluded that supplying 25 % of recommended nitrogen through urea and the rest by organic sources could significantly increase rice yield under SRI. Thus, in rainfed *kharif* situation of the Gangetic West Bengal there is a lot of scope to increase the productivity of rice with less water without disturbing the ground water.

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