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Effect of integrated nitrogen management in rice (*Oryza sativa* L.) under system of rice intensification at Allahabad

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Abstract
A field experiment was conducted at the research farm of department of soil science, Sam Higginbottom Institute of Agriculture, Technology & Science, Allahabad, During the *Kharif* season, 2015-15. Eight treatment *viz.* control, 100% N through urea, 75% N through urea+25% N through FYM, 75% N through urea +25% N through GM, 50% N through urea+25% N through FYM+25% N through GM, 50% N through urea+50% N through FYM and 100% N through FYM 100% N through GM, were comprised in Randomized Block Design replicated as thrice. The variety VNR-235 was taken as test crop. The maximum growth and yield (grain 62.35 and straw 63.40 q ha^{-1}) were recorded with the application of 75% N through urea+25% N through GM which was significantly superior over T_5 (50% N through urea + 25% N through FYM + 25% N through GM), T_6 (50% N through urea+ 50% N through FYM), T_1 (100% N through FYM) and T_1 (Control) and statistically at par with T_2 (100% N through urea) and T_3 (75% N through urea+25% N through FYM).

Keywords: *Oryza sativa* L., FYM, organic fertilizer, inorganic fertilizer growth and Yield.

Introduction
Rice (*Oryza sativa* L.), the prince among the cereals is the premier food crop not only in India but world also. Rice is the staple food for more than 50% of the world population (Xiong, 2013) [9].

System of rice intensification (SRI) is a new method of rice (*Oryza sativa* L.) culture. This is an environment and ecology benign method that increases productivity and resource-use efficiency of irrigated rice by changing the way of managing soil, plants, water and nutrients. Emerged by chance in 1980s in Madagascar, it is now practiced on research farms and farmers' fields in about 60 countries world-over. Yield differences between the SRI and conventional system are highly variable and potential of SRI method, which can increase yield by 50-100% (Termel *et al.,* 2011) [8]. Wider spacing is one of the important principles of SRI and influences growth and yield of rice. Initially, planting spacing ranging from 25cm × 25cm to 50cm × 50cm was prescribed, but later on wide spread experiments across the world showed 25cm × 25cm to be the best planting spacing for SRI. However, some studies have suggested even lower spacing 20cm × 20cm to be ideal for SRI. Spacing of 25cm × 25cm seems to be better in *kharif* season, while in *rabi* season in southern India, 20cm × 20cm spacing appears to more rewarding than 25cm × 25cm. Seedling age of 10–12 days is invariably found suitable for transplanting to obtain higher yield and resource-use efficiency. Although under SRI yields were best when irrigations were scheduled at 3 days after disappearance of ponded water (DADPW), but larger water savings with some yield penalty suggests the delaying irrigations till 5 or 7 DADPW. Regarding nutrient management, it could be concluded that yield, profitability and resource-use efficiency from SRI under integrated nutrient management capsule consisting of 50% RDF + 50% nutrients from organic sources were either higher or equal to those obtained from the use of 100% RDF. Weeds infestation is more in SRI, which could be managed most economically by employing integrated weed management, using cono-weeder as one of the component (Dass *et al.* 2015) [4]. The basic concept underlying the principles of nutrient management modules is the maintenance and possibly improvement of soil fertility for sustainable crop productivity on long term basic, which may be achieved through combined use of all possible source of nutrient and their scientific management for optimum growth, yield and quality of rice and cropping system in specific agro-ecological situation without impairing natural eco-system condition

Materials and Methods
The investigation entitled, "Effect of integrated nitrogen management in rice (*Oryza sativa* L.) Under system of rice intensification method and soil health at Allahabad" was conducted during *Kharif* season, 2015 at the Research Farm of Soil Science, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Deemed-to-be-University, Allahabad. The details about the experimental site and the soil described together with the experimental design and layout plan, culture practice and techniques employed for growth studies.

The experiment was conducted on the research farm of Department of Soil Science the experimental site is located in $25^0$27' N *latitude* $81^0$51' E longitude and 98 *MSL altitude.*

The area of Allahabad district comes under subtropical belt in the South east of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46-48 ^{0}C and seldom falls as low as 4 – 5 ^{0}C. The relative humidity ranges between 20 to 94 percent. The average rainfall in this area is around 1100 mm annually.

Result and Discussion

The observations recorded during the experimental year have been processed statistically in order to assess their degree of variance due to diverse treatments. The pattern of rice crop behavior under different treatments have been illustrated by the use of tables on appropriate place.

Effect of integrated nitrogen management on yield attributes

The data presented in Table 1. Revealed the plant height at the time of harvesting. The maximum plant height (119.17 cm) was observed with treatment T_5 (75% N through urea+25% N through GM. Similar finding reported by Berkelaar (2008) [1], Barison (2002), Wang *et al.* (2002) and Sarath and Thilak (2004).

The maximum number of tillers hill^{-1} (10.70) was recorded with treatment having 75% N through urea+25% N through GM (T_5) Similar finding reported by Raju and Reddy (1991), Paladugu *et al.* (2004) [5] and Chapagain *et al.* (2011) [3].

The maximum panicle length (29.31 cm) was recorded with treatment receiving 75% N through urea+25% N through GM (T_5) Similar finding reported by Bindra and Thakur (1994) [2], Raju and Reddy (1991), Awan *et al.* (2000).

The highest grain yield (62.35 q ha^{-1}) was recorded with treatment having 75% N through urea+25% N through GM (T_4), similar finding reported by Randriamiharisoa (2002), Yamah (2002), Mulu (2004) and Sarath and Thilak (2004).

Thestraw yield have been presented in treatment T_5 (75% N through urea r+25% N through GM) was recorded maximum straw yield (63.40q ha^{-1}), Similar finding reported by Premi and kalia (2003) and Gupta and Sharma (2007). Reddy *et al.* (2003) [6]

Table 1: Effect of integrated nitrogen management on plant height at harvest stage, No. of tillers hill^{-1}, No. of effective tillers hill^{-1}, Panicle length (cm) No. of grains panicle^{-1} Test weight (gm) Grain yield (qha^{-1}) Straw yield (qha^{-1}) Harvest index (%)

S. No.	Treatments	Plant height (cm)At harvest	No. of tillers hill^{-1}	Panicle length (cm)	Grain yield (qha^{-1})	Straw yield (qha^{-1})
1.	Control	110.80	8.73	22.64	29.33	42.20
2.	100% recommended dose of nitrogen through FYM	111.80	8.93	27.77	43.35	50.90
3.	100% recommended dose of nitrogen through GM.	116.23	9.07	27.18	54.53	51.10
4.	100% recommended dose of nitrogen through urea.	121.07	10.33	28.54	61.02	52.26
5.	75% N through urea+25% N through FYM.	119.17	9.87	29.31	59.73	51.90
6.	75% N through urea+25% N through GM.	11360	10.70	26.33	62.35	63.40
7.	50% N through urea+50% N through GM	118.53	9.73	24.33	57.80	51.70
8.	25% N through urea+50% N through FYM + 25% N through GM	116.70	9.53	23.78	55.68	51.60
	SEm±	0.57	0.17	0.73	1.87	00.9
	CD at 5%	2.98	0.88	21.43	9.83	0.47

Conclusion

On the basis of present investigation, it could be concluded that in SRI method of rice cultivation, in Integrated Nitrogen Management for substitution of 25% nitrogen through GM or GM were found most effective in enhancing the growth and yield of riec. It may be advocate that for sustainable rice production the integration of nitrogen as 75% N through urea + 25% N through green manure are most appropriate for rice cultivation under System of Rice Intensification (SRI).

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