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Effect of fertilizer placement and methods of sowing on rice productivity

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Abstract
A field experiment was laid out during kharif 2017 at the Research cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, and Raipur (C.G) with in strip split plot design with four replication. The treatments comprised of three method of rice sowing, two sources of nitrogen with four different levels and two doses of phosphorous. The results revealed that all the growth and yield parameters were significantly influenced by different method of rice sowing, nitrogen levels and sources and doses of phosphorous The treatment combination M1 (tray method of sowing) N3 (100%N (RDF) through Urea briquette) and P1 (100%P (RDF) through SSP) was found significantly superior to other treatment combinations. The deep placement of briquettes induces slow release of nutrient reducing the losses and thereby higher nutrients uptake and ultimtely produces higher yield. urea briquette application among different sources of fertilizer nitrogen was found most suitable for irrigated rice cultivation system.

Keywords: Urea briquettes, rice productivity, SSP

Introduction
The low utilization efficiency of N fertilizers is attributed to losses like volatilization, denitrification, leaching and surface run-off. These losses can be reduced by management practices like proper timing, rate and modified forms of urea and deep placement of N fertilizers. Several strategies have been tried to enhance nitrogen use efficiency (NUE) in rice including split N application, the use of slow release N fertilizers and nitrification inhibitors (NIs). Deep placement of N briquette at 8-10 cm depth of soil can save 30% N compared to Prilled Urea (PU), increases absorption rate, improves soil health and ultimately increases rice yield. The present study was undertaken to evaluate the effect of PU, N briquette and N briquette in combination with organics on N use efficiency and yield of rice crop.

Materials and Methods
1. Site description
The present investigation was carried out under field conditions during kharif 2017 at the Research cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G). The soil of the experimental field was *vertisol*. Rice variety "*Rajeshwari*"was used as a test crop.

2. Experiment design
The Experimental details are as follows:-

Location	Instructional cum Research Farm, I.G.K.V. Raipur
Soil Type	*Vertisols*
Season	*Kharif* 2017
Crop	Rice
Variety	*Rajeshwari*
Treatment Combinations	24
Design	Strip-Split plot design
Replications	Four
Net Plot size	3m x 2m (6 m^2)
Spacing	25 cm x 25 cm
RDF	100:60:40 kg/ha (N: P_2O_5: K_2O)

3 Treatment Details

Main plot (Method of Sowing)	Tray transplanted plants (M1)
	SRI transplanted plants (M2)
	Normal transplanted plants (M3)
Strip plot (Nitrogen Sources)	100% N (RDF) through Prilled Urea (N1)
	50% N (RDF) through Prilled Urea (N2)
	100% N (RDF) through Urea Briquettes (N3)
Strip-Split plot (Phosphorous Doses)	50% N (RDF) through Urea Briquettes (N4)
	100% P (RDF) through Single Super Phosphate (P1)
	50% P (RDF) through Single Super Phosphate (P2)

* UB = Urea Briquettes, PU = Prilled Urea, RDF = Recommended dose of fertilizer @ 100:60:40 Kg N:P_2O_5:K_2O ha^{-1}

4 Statistical Analysis

The data collected from field observations and those recorded in laboratory were subjected to statistical analysis by standard analysis of variance technique. For significant treatment effects, standard error of means (SEm ±) and critical differences were calculated at 5 per cent level of significance.

Results and Discussion

1. Growth and Yield attributes

In the experiment various growth and yield attributing characters viz., number of panicles m^{-2}, number of grains per panicle, test weight of 1000 grain and grain and straw yields have been recorded and results are presented in the following table1 and table 2. fig.1, fig.2, fig.3, and fig.4.

Table 1: Effect of rice establishment and nutrient management on growth and yield attributes in rice

Treatment		Number of Panicles/m^2	Number of Grains/Panicle	Test Weight
Method of Sowing				
TRAY(M1)		210[a]	120[a]	31.21
SRI(M2)		192[b]	118[ab]	31.16
NT(M3)		176[c]	113[b]	31.46
SEm±		0.66	1.74	NS
CD (P= 0.05)		2.29	6.01	NS
Nitrogen Sources				
100% (RDF) through PU (N1)		184[b]	103[b]	31.36
50% (RDF) through PU (N2)		147[d]	96[c]	31.18
100% (RDF) through UB (N3)		274[a]	173[a]	31.48
50% (RDF) through UB (N4)		165[c]	99[bc]	31.09
SEm±		3.43	1.42	NS
CD (P= 0.05)		10.99	4.55	NS
Phosphorus Doses				
100% SSP (P1)		195[a]	121[a]	31.29
50% SSP (P2)		190[b]	113[b]	31.26
SEm±		1.27	1.30	NS
CD (P= 0.05)		3.64	3.73	NS
Interactions				
M × N	0.66	0.66	1.23	NS
	1.96	1.96	3.66	NS
M × P	NS	0.73	0.75	NS
	NS	2.10	2.15	NS
N × P	0.85	0.85	0.87	NS
	2.43	2.43	2.48	NS
M× N× P	0.37	0.37	0.38	NS
	1.05	1.05	1.08	NS
MEAN		196	117	31.27

(Means followed by same letter in the column do not differ statistically)

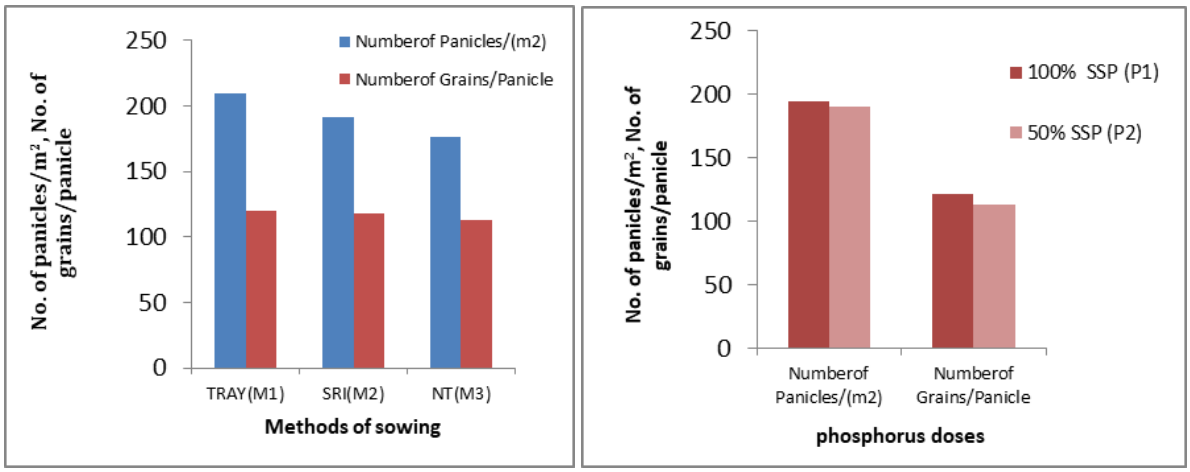

Fig 1: Effect of methods of sowing and phosphorus doses on number no. of panicles/m^2 and no. of grains/panicles

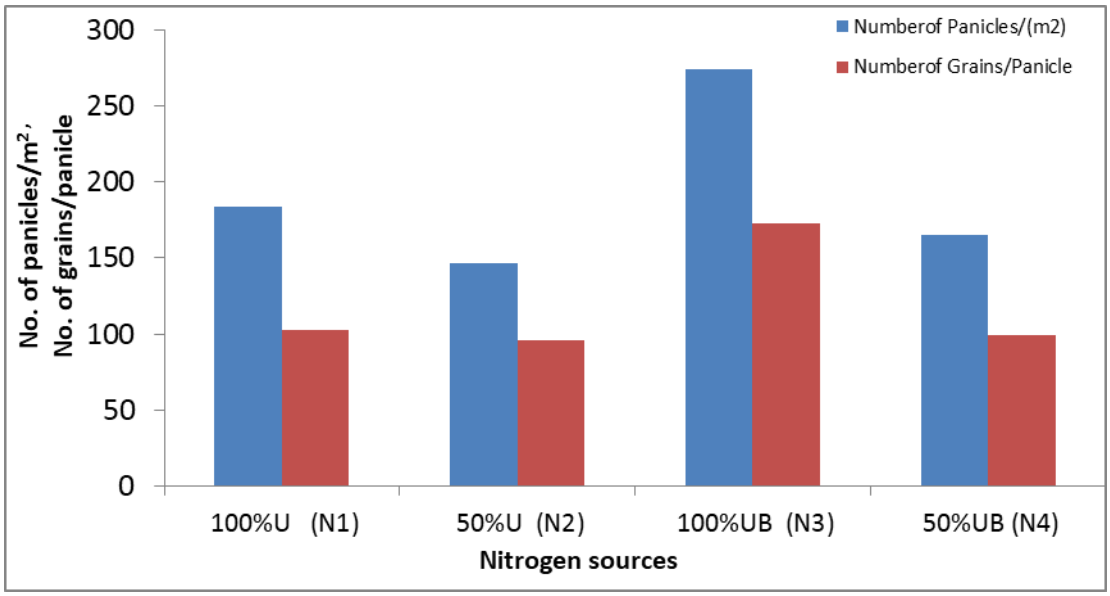

Fig 2: Effect of Nitrogen sources on no. of panicles/m^2 and no. of grains/panicle

The results of the study revealed that the highest No. of panicle (m^{-2}) under the different method of sowing was found in M1 i.e. tray method of sowing (210 m^{-2}) which was significantly higher among the all treatment combinations. Similarly the highest No of panicle under different nitrogen level and sources was found 274 m^{-2} panicles under N3 which is found significantly higher than N1 and N4 and the lowest No. of panicle was obtained in N2 (147 m^{-2}panicles), Similarly under different doses of phosphorous the highest no of Panicle was found in P1 (195 m^{-2}) followed by P2..

The highest No of grains/panicle under the different method of sowing was found in M1 which was significantly higher than other methods of sowing, Similarly the highest grains/panicle under different nitrogen level and sources was found under N3 and the lowest grains/panicle (96 panicle under N2) was obtained, Similarly under different doses of phosphorous the highest no. of Panicle was found in P1 followed by P2.Also all the interaction along with the higher order interaction are significant.

Non-significant variation in test weight of paddy was observed among the different treatment combinations.

Table 2: Effect of rice establishment and nutrient management on grain and straw yield

Treatments		Yield (q/ha)	
		Grain	Straw
Method of Sowing			
TRAY(M1)		64.02[a]	83.91[a]
SRI(M2)		59.38[b]	77.73[b]
NT(M3)		53.28[c]	70.86[c]
SEm±		1.09	1.42
CD (P= 0.05)		3.76	4.92
Nitrogen Sources			
100% (RDF) through PU (N1)		57.88[b]	76.98[b]
50% (RDF) through PU (N2)		53.25[d]	70.82[d]
100% (RDF) through UB (N3)		67.53[a]	86.50[a]
50% (RDF) through UB (N4)		56.92[c]	75.71[c]
SEm±		0.73	0.87
CD (P= 0.05)		2.32	2.79
Phosphorus Doses			
100% SSP (P1)		62.69[a]	81.72[a]
50% SSP (P2)		55.09[b]	73.28[b]
SEm±		1.20	1.60
CD (P= 0.05)		3.43	4.58
Interactions			
M × N	SEm ±	1.30	1.73
	CD (P= 0.05)	3.85	5.15
M × P	SEm ±	0.69	0.92
	CD (P= 0.05)	1.98	2.64
N × P	SEm ±	0.80	1.06
	CD (P= 0.05)	2.29	3.05
M× N× P	SEm ±	0.35	0.46
	CD (P= 0.05)	0.99	1.32
MEAN		58.89	77.50

(Means followed by same letter in the column do not differ statistically)

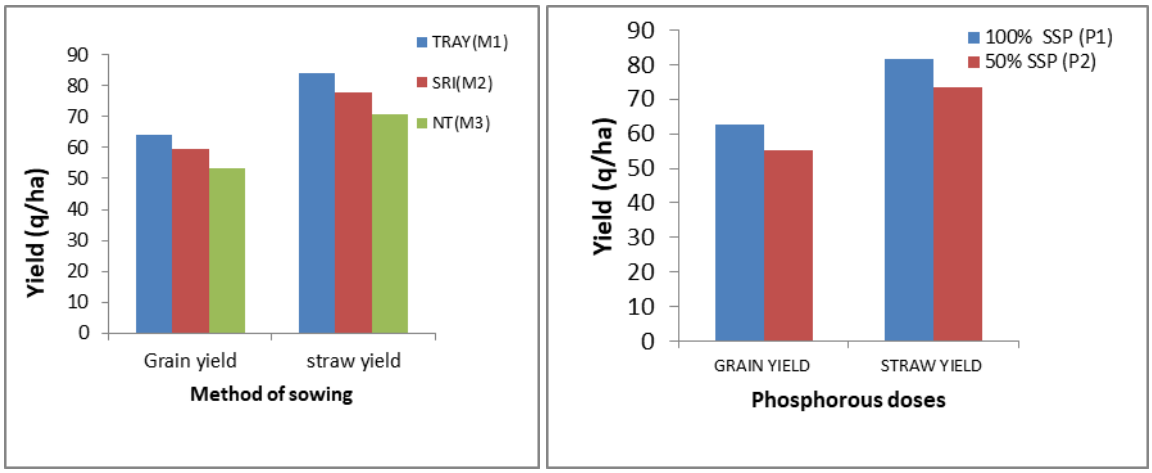

Fig 3: Effect of methods of sowing and phosphorus doses on grain and straw yield (q/ha)

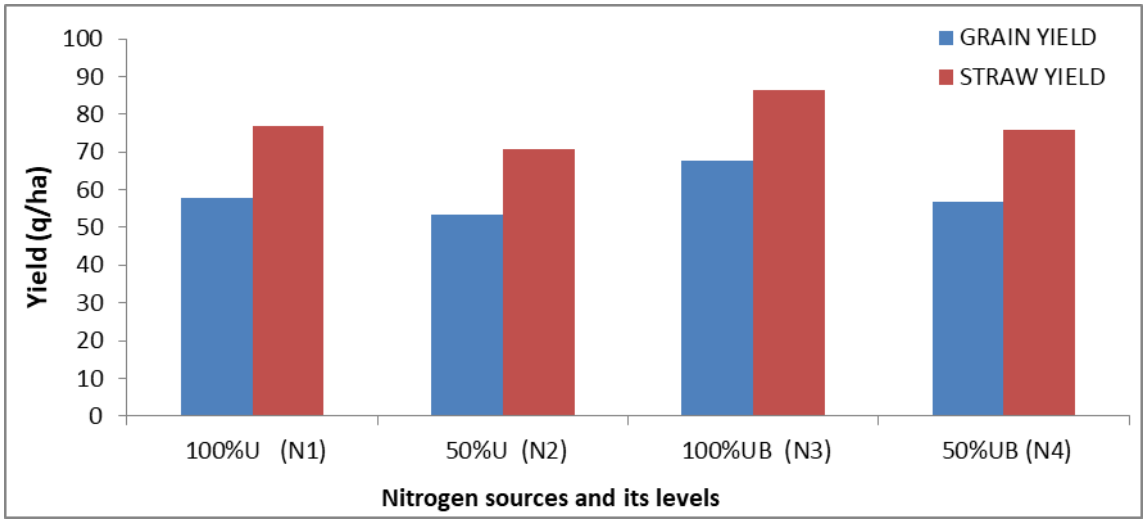

Fig 4: Effect of Nitrogen sources and its levels on grain and straw yield (q/ha)

The results of the study revealed that there were discernible variations in grain and straw yield as a result of different crop establishment method and nutrient management practices. Among the different crop sowing treatments, maximum grain yield of 64.02 q/ha and straw yield (83.91q ha^{-1}) was recorded from the plots grown under treatment M1 which is significantly higher than M2 and M3.

As regards to nutrient management, the results revealed that treatment N3 registered significantly maximum grain yield of 67.53 q/ha and straw yield of 86.50 q/ha compared to other treatment under study. However treatment N1 did not differ significantly with N4 Similarly under different doses of phosphorous statistically the higher yield obtained in P1 Also all the interaction along with the higher order interaction are significant.

Overall impression from yield data is that the straw yield and grain yield was significantly affected by the combination of establishment method with nutrient management practices, the treatments involving application of 100% urea briquette along with 100% phosphorous doses with tray method of sowing produced higher grain and straw yields

The addition of urea briquettes in treatments provides better physical, chemical and biological soil condition to plant and also increased the no. of effective tillers and no. of grain $panicle^{-1}$ and deep placement of briquettes which induces slow release of nutrient reducing the losses and thereby higher nutrients uptake and ultimtely produces higher yield. As per the above findings, M1 (tray method of sowing) N3 (100%N (RDF) through Urea briquette) and P1 (100%P(RDF) through SSP) significantly superior to other treatments combinations.

References

1. Ahmed MH, Islam MA, Kader MA, Anwar MP. Evaluation of urea super granules as source of nitrogen in transplant aman rice. Pakistan Journal of Biological Sciences. 2000; 3(5):735-737.
2. Bandaogo A, Bidjokazo F, Youl S, Safo E, Abaidoo R, Andrews O. Effect of fertilizer deep placement with urea super granule on nitrogen use efficiency of irrigated rice in Sourou Valley (Burkina Faso). Nutrient cycling in Agra ecosystems. 2015; 102(1):79-89.
3. Das S, Singh TA. Nitrogen use efficiency by rice and flood water parameters as affected by fertilizer placement techniques. Journal of Indian Society of Soil Science. 1994; 42(1):46-50.
4. Derrick BE, Etienne I, Mathusalem K. Comparative Study of Urea in Prilled and Briquette Forms on Rice Production in Marshlands of Rwanda. J Fert. Pest. 2017; 8:178.
5. Chouhan, Santosh Kumar, Samadhiya VK., Tiwari Alok, Savu RM, Saxena RR. Rice Response And Nutrient Use Efficiency to Deep Placement of Nitrogen and Sulphur Under Submerged Condition. MSc.Thesis Deparment of Soil Science and Agricultural Chemistry IGKV, Raipur, 2017, 10-11.

6. Gomez AK, Gomez AA. Statistical Procedures for Agriculture Res. A wiley-Inter Sci. Publication. Johan Wiley and Sons, New York, 1984.
7. Hasan SM. Effect of level of urea supergranules on the performance of *T. aman* rice. M. Sc. Ag. Thesis in Agronomy, BAU, Mymensingh, 2007, 72-85p.
8. Hyun-Hwoi Ku, Keiichi Hayashi, Ruth Agbisit, Gina Villegas-Pangga. Effect of rates and sources of nitrogen on rice yield, nitrogen efficiency, and methane emission from irrigated rice cultivation. Journal Archives of Agronomy and Soil Science, 2017, 63(7).
9. Islam MS, Rahman F, Hossain ATMS. Effects of NPK Briquette on Rice (*Oryza sativa*) in Tidal Flooded Ecosystem. The Agriculturists. 2011; 9(1&2):37-43. ISSN-1729-5211 A Scientific Journal of Krishi Foundation.
10. Pengfei Li, Jianwei Lu, Yang Wang, Sen Wang, Saddam Hussian, Taoren Rihvan Cong. Nitrogen losses, use efficiency, and productivity of early rice under controlled-release urea. Journal of Agriculture, Ecosystems & Environment. 2018; 251:78-87.
11. Subbiah S, Ramanathan KM, Francis HJ. Influence of neem cake-coated urea application on the yield and nutrient uptake by IR20 rice. International Rice Commission Newsletter. 1979; 28(2):15-19.
12. Zhang J, Qin J, Yao W, Bi1 L, Lai T, Yu X. Effect of long-term application of manure and mineral fertilizers on nitrogen mineralization and microbial biomass in paddy soil during rice growth stages. Plant Soil Env. 2009; 55(3):101-10.