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Evaluation of varieties for their suitability and enhancement of the productivity in different rice establishment methods

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Abstract
A field experiment was conducted in spit plot design with three replications to evaluate high rice varieties/hybrids under different rice establishment methods at Crop Research Station, Ghaghraghat, U.P. during *kharif* 2015 and 2016 The soil of experimental site was sandy loam in texture with pH 7.9, organic carbon 0.74 %, available nitrogen 260.3 Kg ha^{-1}, phosphorus 26.1 Kg ha^{-1} and potash 136.4 Kg ha^{-1}. methods of crop establishment viz. Dry Direct Seeding (M1), Dibbling of sprouted seeds (M2) and Normal transplanting (M3). In Normal transplanting rice seedling were transplanted with 20x15 cm spacing with 3 to 5 seedling per hills. The sub plot treatments of experiment were popular high yielding varieties Balwan (V1), DRR Dhan-44 (V2), Shiva – 786 (V3), Arize -6444 (V4), Mahyco -5402 (V5), 27-P-63 (V6), NDR -359 (V7) and Sarjoo-52 (V8). The results obtained during the study revealed that grain yield of the different establishment methods was in the order, normal transplanting followed by Dibbling of sprouted seeds and Dry Direct Seeding. On basis of the study it can be concluded that in areas where labour is available and cheap, normal transplanting is the best method of rice crop establishment in terms of higher grain and straw yield.

Keywords: HYV, Hybrids, Crop Establishment, Direct Seeding

Introduction
Rice is the one of the widest grown cereal crops of the world. It is not only the staple food crop of more than half of the world population but also chief source of dietary energy of the rice eating population of South and South East Asia. India is the 2nd largest producer and consumer of rice just after China. In India rice was cultivated in about 44.4 million hectares with an annual production of 104 million ton. It is also the backbone of agriculture economy of the country. Different methods of rice crop establishment have been adopted to grow the crop. For the cultivation of all high yielding varieties (HYV), improved cultural methods are recommended for optimum yield. Transplantation of seedlings is always recommended as method of crop establishment for HYV while direct seeding of short duration rice varieties was recommended where lack of irrigation facilities was observed. The challenge to researchers is to develop technologies which will increase and sustain rice production in the major rice growing countries to meet their food demands due to the growing population. The changing climatic conditions viz. drought, submergence and erratic rainfall also affect affect the crop during early establishment, vegetative and reproductive stages of rice cause significant yield reduction. Yield of transplanted rice may be more than that of direct seeded one due to suppression of weed growth and favourable agroecosystem (Shen, 1934) [23]. Transplanting has been the principal method of rice establishment since the 1950's in developing countries. At present, rice cultivation is as direct seeded is being popular in America, Western Europe, Russia, Japan, Cuba, India, Korea, and the Philippines and in some parts of Iran, due to high technology, high labour cost and shortage of skilled labour. Direct seeding technique offers a opportunity to reduce the limitations of transplanted rice. Direct seeding is being practiced in many developed countries where labour is scarce and expensive. Direct seeding can reduce the labour requirement by as much as 50 per cent. Land preparation, laddering, and weeding operations in this system are spread over several months, thus allowing farmer to make full use of family labour and to avoid labour bottlenecks. When rainfall at planting time is highly variable, direct seeding may help reduce the production risk. Direct seeding can also reduce the risk by avoiding terminal drought that lowers the yield of transplanted rice, especially if the latter is established late due to delayed rainfall. In eastern Uttar Pradesh rice is commonly grown by puddled transplanting method which is laborious and costly method. The peak period of rice transplanting is in the month of July which results in labour shortage at the time of transplanting. Labour shortage at the time of transplanting

leads to delay in transplanting and it is one of the reasons for low yields of rice. Transplanted rice in puddled field requires continuous standing water. This leads to nutrient loss through leaching. Transplanting is also useful in escaping crops to early cessation of rain and enhancing plants bear vigor plants with effective tillers; and ensures the ultimate yield. Transplanting also provides crops less competition for growth resources such as Sunlight, moisture, and nutrients; and enables easy crop management like weeding, and herbicides as well as pesticide applications.

In view of the above observations present piece of research work was undertaken to evaluate the comparative yield performance of popular high yielding varieties grown under direct-seeded and transplanted conditions

Material and Methods

A field experiment was conducted in spit plot design with three replications at Crop Research Station, Ghaghraghat, U.P. during *kharif 2015 and 2016.* The soil of the experimental site was sandy loam in texture with pH 7.9, organic carbon 0.74 %, available nitrogen 260.3 Kg ha^{-1}, phosphorus 26.1 Kg ha^{-1} and potash 136.4 Kg ha^{-1}. The experiment was comprised of following treatments, the main plot treatments of the experiment were methods of crop establishment viz. Dry Direct Seeding (M1), Dibbling of sprouted seeds (M2) and Normal transplanting (M3). In Normal transplanting rice seedling were transplanted with 20x15 cm spacing with 3 to 5 seedling per hills. The sub plot treatments of experiment were popular high yielding varieties Balwan (V1), DRR Dhan-44 (V2), Shiva – 786 (V3), Arize - 6444 (V4), Mahyco -5402 (V5), 27-P-63 (V6), NDR -359 (V7) and Sarjoo-52 (V8). Recommended dose of fertilizer Nitrogen at the rate 120 kg/ha in the form of urea, phosphorus at the rate of 60 kg/ha in the form of Di Ammonium Phosphate (DAP) and potash at the rate of 60 kg/ha in the form of murate of potash (KCL) were applied. Other cultural practices were adopted to raise the crop as per recommendations. Observation pertaining to yield contributing traits were observed periodically and recorded in Table-1

Results and Discussion

On the perusal of data presented in Table-1 clearly shows that method of crop establishment significantly influenced the yield attributing traits which varied with the varieties. Mean maximum Panicle/m^2 was recorded for Normal transplanting (308) followed by treatment dibbling of sprouted seeds (292). Different varieties significantly influenced the panicles/m^2. The panicles/m^2 was significantly highest under treatment Arize -6444 (310) on par NDR -359 (296) over the treatment 27-P-63 (291) and Sarjoo-52 (290) remaining treatments on par with each other treatments. Similar finding has also been reported by Ghasal *et al*.

No significant variation for method of crop establishment was observed while variation in panicle length was observed among varieties which may be due to their genotypic characteristic.

Normal transplanting recorded the significantly highest panicle weight (2.66 g) over the treatment dibbling of sprouted seeds (2.28 g). Among varieties significantly highest panicle weight was recorded for rice hybrid Arize 6444 (2.72 g) followed by 27-P-63 (2.64 g) and Sarjoo-52 (2.62 g).

Different establishment methods significantly influenced the 1000 grain weight (g) which was found significantly more in establishment methods normal transplanting (25.15 g) on par with each other treatments. The variety Arize 6444 (25.20) recorded significantly maximum test weight over the all treatments. Due to genotypic effect variation in grains per panicle was observed among varieties.

Data presented in table-2 clearly indicated that, the normal transplanting recorded significantly higher grain yield than other methods of crop establishments viz. dibbling of sprouted seeds and dry direct seeding. Among varieties maximum grain yield was recorded for rice hybrid Arize 6444 (33.71 q/ha) followed by NDR - 359 (32.98 q/ha) and 27-P-63 (32.07 q/ha). Similar trends for straw yield under different method of crop establishment was recorded. Mean maximum straw yield was recorded for high yielding rice variety NDR - 359 (49.31) followed by Sarjoo-52 (47.15 q/ha) and Arize 6444 (46.49 q/ha).

Table 1: Evaluation of Varieties for their suitability and enhancement of the productivity in different rice establishment methods during kharif 2015 and 2016

Treatments	Panicles/m^2	Panicle Length (cm)	Panicle wt.	Grains / panicle	Grain wt/panicle (g)	1000 grain wt (g)	LAI at 90 days
Methods of crop establishment							
Dry Direct Seeding	225	24.80	2.17	130	1.23	24.72	4.85
Dibbling of sprouted seeds	292	25.70	2.28	138	1.29	24.92	5.10
Normal Transplanting	308	25.93	2.66	159	1.40	25.15	6.18
Varieties							
Balwan	228	24.10	2.21	127	1.26	20.10	4.98
DRR Dhan-44	262	24.45	2.29	1.37	1.19	21.20	5.25
Shiva -786	260	24.41	2.32	135	1.20	21.15	5.10
Arize – 6444	310	26.15	2.72	160	1.23	25.20	6.10
Mahyco -5402	280	24.50	2.50	140	1.17	23.70	5.54
27-P-63	291	25.80	2.64	146	1.25	23.78	5.82
NDR -359	296	26.03	2.55	1.48	1.26	23.90	5.95
Sarjoo -52	290	25.91	2.62	155	1.29	24.50	5.70
CV (%)	8.29	1.04	5.38	3.08	6.08	5.95	2.24

Table 2: Effect of method of crop establishment and varieties on Grain and Straw Yield (q/ha)

Treatments	Grain Yield (q/ha)			Straw Yield (q/ha)		
	2015	2016	Mean	2015	2016	Mean
Methods of crop establishment						
Dry Direct Seeding	25.32	21.40	23.36	35.44	32.10	33.77
Dibbling of sprouted seeds	29.57	24.70	27.14	41.39	37.05	39.22
Normal Transplanting	38.89	35.30	37.10	51.20	46.60	48.90
CV (%)			12.92			14.25
Varieties						
Balwan	27.62	23.00	25.31	38.67	34.50	36.59
DRR Dhan-44	29.56	25.20	27.38	41.38	37.55	39.47
Shiva -786	30.10	24.69	27.40	41.53	33.95	37.74
Arize – 6444	35.82	31.60	33.71	49.43	43.54	46.49
Mahyco -5402	30.73	26.41	28.57	42.41	36.43	39.42
27-P-63	34.24	29.90	32.07	47.25	40.96	44.10
NDR -359	35.15	30.80	32.98	52.72	45.90	49.31
Sarjoo -52	33.89	29.72	31.81	50.16	44.14	47.15
CV (%)			10.12			13.32

Conclusion

On basis of the result obtained it was concluded that Normal transplanting is the best method of rice crop establishment in order to obtain higher grain yield. Among varieties Arize 6444, 27-P-63 and NDR -359 are well adopted to all the method of rice crop establishment in terms of grain and straw yield.

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