

COMPARATIVE STUDY OF DIFFERENT METHODS OF (DIRECT SEEDED RICE) PADDY ESTABLISHMENT IN KANPUR, CENTRAL U.P.

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Abstract: A field study was conducted during *Kharif* season of 2014, to evaluate direct seeded rice options as compared to transplanted paddy with an objective to improve farm productivity and efficiency. For fulfilling all requirements related this field experiment, paddy crop was monitored during the seasons *kharif*, 2014 & 2015. The treatment effects were evaluated in terms of growth, yield attributes and yield. The highest plant population (158.12 ha⁻¹) was recorded under sprouted seedling broadcasting in puddled condition the lowest (158.09 ha⁻¹) was recorded under dry sowing in line, the highest final plant population (350.07 m²) was recorded under sprouted seedling broadcasting in puddled condition and the lowest (327.80 m²) was recorded under dry sowing in line. The no. of shoot/m² was obtained maximum at harvesting stage under sprouted seedling broadcasting in puddled condition (337.51 cm) and lower in dry sowing in line, the number of grass weed was numerically higher under sprouted seedling broadcasting in puddled condition. The maximum number of grain/panicle (72.63) test weight (20.13g) was recorded under the sprouted seedling broadcasting in puddled condition. Sprouted seedling broadcasting in puddled condition treated plots had the maximum Biological Yield, Grain Yield and Harvest Index except Straw Yield recorded q h⁻¹.

Keywords: Direct seeded rice, *Kharif* season, Kanpur

INTRODUCTION

Paddy (*Oryza sativa* L.) is the most important single food crop of the world importance and staple food for nearly half of the world population. Paddy belongs to genus *Oryza* of Gramineae family. Rice (*Oryza sativa* L.) is widely grown in tropical and subtropical regions (Singh *et al.*, 2012). Rice is the second most important food crop of the world feeding over one half of its population, providing 20-80 per cent of the dietary energy in the average daily intake of people in Asia (Khush, 2005 and Babu *et al.*, 2014). Paddy is the major food crop in relation to production and economy and mostly grown in all ecological regions of India. Rice is cultivated traditionally through transplanting of 20-25 days old seedling in the country. Due to unavailability of suitable technology for rice cultivation, there is a huge gap of yield in rice production of India. Country has made target of much and more rice production by 2025 AD. This target can be achieved through adoption of Direct seeded rice cultivation technology of rice cultivation which also helps to adapt in the climate change scenario of India, due to issues of water scarcity and expensive labour, direct seeded rice cultivation technology is adopting world wide. Direct seeded rice is a resource conservation technology and reduces water and labor

use by 50%. Productivity of DSR is 5-10% more than the yield of transplanted rice. It offers a very exhilarating opportunity to improve water and environmental sustainability. Methane gas emissions is lower in Direct Seeded rice than with conventionally tilled transplanted puddle rice. Dry seeding into a prepared seedbed (dry seeding). Precise water management, particularly during crop emergence phase (first 7-15 days after sowing), is crucial in direct seeded rice. Furthermore, weed infestation is the major problem, which can cause large yield losses in direct seeded rice. Weed management in DSR can be done through chemical, hand weeding or stale seed bed method (Marasini *et al.*, 2016). Information on different methods of (Direct Seeded Rice) Paddy establishment under Kanpur (Central U.P.) conditions is lacking. Information on the direct seeded rice establishment is very limited. Hence, considering the importance of production and productivity of Paddy, an attempt has been made to study the best method of direct seeded rice establishment.

MATERIALS AND METHODS

An appropriate sample is one that provides an estimates or a sample value that is as close as possible to the value that would have been obtained,

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had all plants in the plot been measured. The difference between the sample and plot value constitutes the sampling error. Thus, a good sampling technique is one that gives a small sampling error. Therefore, the choice of an appropriate sampling technique is of prime concern to maintain proper balance between the size of sampling unit, sampling size and sampling design to achieve the maximum precision with the minimum cost. Single plot as a sampling unit, five plants per experimental plot as a sample size and a random sampling technique (Gomez and Gomez, 1984) were adopted for recording growth and development of the test crop at various stages of observations. The observations were made at 30 days interval depending upon crop indices only to receive a precise observation of growth analysis. Five plants from each experimental plot were selected randomly and tagged. Plant height in cm of rice plant was recorded with the help of meter scale from base of the plant to tip of upper most leaf of the plant before panicle emergence and up to the tip of panicle after heading, then averaged and expressed in cm. Number of tillers was recorded by using a meter scale in each plot at different stages of observation, and counted into number of tillers row m^{-1} . Dry matter accumulation ($g m^{-1}$ row length) was measured from two randomly selected places in plot and then cut two plant rows near ground level of 50 cm row length from each plot at different stages of crop growth. Samples were first dried in sun and then oven dried at $65^{\circ}C$ till the constant weight was achieved. After drying, the samples were weighed for recording dry weight and expressed in $g m^{-1}$ row length.

The crop was harvested when most of the panicles turned golden yellow. Harvesting was done manually by using sickle. Individual plot was harvested separately and carefully bundled and tagged. It was then brought to the threshing floor separately and allowed to dry in the sun in order to attain the

optimum moisture for threshing. After sun drying, the bundles were weighed with the help of spring balance and total biomass was recorded. The bundles were then threshed separately by laborers with the help of sticks. The grain of each plot was collected, cleaned and weighed to get grain yield $kg plot^{-1}$. The difference of grain yield and total biomass was recorded as the straw yield of each plot in kg. The yield, thus obtained, was converted in $kg ha^{-1}$. All above ground plant parts harvested from net plot area were carefully bundled, tagged and taken to the threshing floor separately. The individual bundle was weighed after complete drying in the sun and the biological yield per plot was then converted into $kg ha^{-1}$. The moisture content of harvested grain was measured by using moisture meter. The yield recorded in $kg plot^{-1}$ was standardized to 14 per cent moisture and then weight was converted into $kg ha^{-1}$. Data collection was started after fifteen days of sowing and subsequent at weekly intervals. Five plants (hill) were randomly selected from plot plants sown with NDR-359.

RESULTS AND DISCUSSION

Initial plant stand/ m^2

The initial plant population was not influenced by method of establishment but numerically the highest plant population ($158.12 ha^{-1}$) was recorded under sprouted seedling broadcasting in puddled condition the lowest ($158.09 ha^{-1}$) was recorded under dry sowing in line.

Final plant stand / m^2

The final plant population was influenced significantly under the method of establishment. The highest final plant population ($350.07 m^2$) was recorded under sprouted seedling broadcasting in puddled condition and the lowest ($327.80 m^2$) was recorded under dry sowing in line.

Table 1. Plant stand/ m^2 as influenced by weed management practices in direct seeded rice.

Treatment	Plant Population / m^2	
	Initial	Final
Method of Establishment		
Dry sowing in line	158.09	327.80
Wet sowing in line	155.76	343.70
Sprouted seedling broadcasting in puddled condition	158.12	350.07
SE \pm(m)	1.65	2.16
CD (P= 0.05)	NS	6.34

The initial population of rice variety NDR-359 did not vary significantly due to use of different method of establishment and but final plant stand influenced significantly under weed management practices. It means the population taken at initial and final stage but has not been affected by method of establishment

only initial stage. This result is supported by the finding of Bhureret *et al.*, (2013).

No of Shoot/ m^2

The data on no. of shoot/ m^2 recorded at the time of harvesting are presented in Table-2, showed that the no. of shoot/ m^2 was influenced significantly under the method of establishment. The maximum no. of

shoot/m² was recorded at harvesting stage under sprouted seedling broadcasting in puddled condition (337.51 cm) and lower in dry sowing in line. Anitha

and Mathew (2010) and Bhanet *al.*, (1980) supported neck to neck the present findings.

Table 2. Effect of weed management practices on No. of shoot/m² in direct seeded rice.

Treatment	No of shoot/m ²
Method of Establishment	
Dry sowing in line	296.42
Wet sowing in line	332.77
Sprouted seedling broadcasting in puddled condition	337.51
SE ±(m)	1.77
CD (P= 0.05)	5.20

Weed population /m²

Weed population/m² recorded at 30, 60 and harvest are represented in Table-3, showed that weed population/m² not significantly influenced by at all the stages of crop. The number of weed population/m² was numerically higher under sprouted seedling broadcasting in puddle cordite than other

three method of establishment stage. The number of grassi weed was numerically higher under sprouted seedling broadcasting in puddled condition (65.27, 52.52 & 26.68) but lower in dry sowing in line *i.e.* 61.75, 49.23 & 26.59. Similar findings were also reported by Damalaset *al.*, (2008) and Mahajanet *al.*, (2009).

Table 3. Effect of method of establishment practices on number of grassi weed

Treatment	Weed population /m ²		
	30	60	At harvest
Method of Establishment			
Dry sowing in line	61.75	49.23	26.59
Wet sowing in line	64.02	51.37	27.75
Sprouted seedling broadcasting in puddled condition	65.27	52.52	28.68
SE ±(m)	1.91	1.59	1.01
CD (P= 0.05)	NS	NS	NS

Number of grain per panicle and Test weight (g)

The data on yield attributes (No. of grain per panicle and 1000- grain weight) are presented in Table-4. The data showed that the number of grain per panicle significantly influenced by method of establishment. The maximum number of grain/panicle (72.63) was recorded under the sprouted seedling broadcasting in

puddled condition and minimum (63.79) under dry sowing in line. The maximum test weight was recorded in the treatment of sprouted seedling broadcasting in puddled condition (20.13 gm) followed by wet sowing in line (19.88 gm). The report of Khaliqet *al.*, (2011) also support the present investigation.

Table 4. Effect of method of establishment practices on No. of grain /panicle and 1000-grain weight (g)

Treatment	No. of grain/Panicle	Test weight (g)
Method of Establishment		
Dry sowing in line	63.79	17.83
Wet sowing in line	71.51	19.88
Sprouted seedling broadcasting in puddled condition	72.63	20.13
SE ±(m)	0.62	0.28
CD (P= 0.05)	1.81	0.84

Dry Matter Production

The data on yield attributes (No. of grain per panicle and 1000- grain weight) are presented in Table-5, showed that dry mater production was influenced significantly under method of establishment. The dry

matter production was recorded maximum under method of establishment from Sprouted seedling broadcasting in puddled condition (480.6g) and lower in dry sowing in line (413.5g).

Table 5. Effect of weed management practices on dry matter production (g) of paddy

Treatment	Dry mater production (g)
Method of Establishment	
Dry sowing in line	413.5
Wet sowing in line	474.0
Sprouted seedling broadcasting in puddled condition	480.6
SE \pm (m)	4.82
CD (P= 0.05)	10.52

YIELD

It is clear from the data Table-6 that grain yield were recorded significantly higher with Sprouted seedling broadcasting in puddled condition (25.98 q/ha) as compared dry sowing in line (22.35 q/ha), while stover yield was recorded maximum in wet sowing in line (48.71q/ha) which was at par with sprouted seedling broadcasting in puddled condition. In case of biological yield maximum yield was obtained Sprouted seedling broadcasting in puddled condition (74.42q/ha) which was slightly reduced in wet sowing in line (74.33 q/ha). However, the method of establishment was recorded higher harvest index under Sprouted seedling broadcasting in puddled condition (34.83%), whereas minimum in dry sowing in line (33.88%). This may be due to positive effect of method of establishment and. The improvement in

wheat yield due to application of method of establishment practiced in direct seeded rice has been corroborated by Mahajan *et al.*, (2009). Analysis is drawn between data recorded on Agronomic Practices and Different methods of paddy establishment. Based on this statistical analyzed data, the results of the investigation have been interpreted and conclusions have been drawn. It can be concluded that, all 3 methods of paddy establishment (Direct Seeded Rice), which have been discussed in this paper important and used in the crop. But, out of 3 methods, Sprouted seedling broadcasting in puddled condition maybe treated as most important method in paddy to raise a good crop to gain a big production. Natural enemies have a very important role in controlling the insect-pests in rice ecosystem.

Table 6. Effect of method of establishment & on yield (biological, grain and stover) q ha⁻¹ and harvest index (%)

Treatment	Biological yield (q/ha)	Grain yield (q/ha)	Straw yield (q/ha)	Harvest Index (%)
Method of Establishment				
Dry sowing in line	65.86	22.35	43.51	33.88
Wet sowing in line	74.33	25.62	48.71	34.41
Sprouted seedling broadcasting in puddled condition	74.42	25.98	47.91	34.83
SE \pm (m)	0.92	0.38	0.49	0.23
CD (P= 0.05)	2.72	1.12	1.44	0.67

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