

Original Research Article

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To Find Out the Suitable Time of Transplanting of Different Varieties of Basmati Rice with Respect to Yield

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ABSTRACT

The field experiment was conducted at Student's Instructional Farm, of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (U.P.), during two kharif season *i.e.*, 2016 and 2017. The designed in split-plot design with three replication. The three dates of transplanting with., first date of transplanting (03st July) D₁, yield decreasing reduced second date of transplanting (16st July) D₂, and third transplanting (30st July) D₃ conditions were allocated in the main plots and four basmati rice varieties PB-1 (V₁), PB-1509 (V₂), PB-6 (V₃), and PB-1121 (V₄), in sub plot.. The significantly maximum mean value of first transplanting times to number of tiller found in the timely first transplanting date (03st July) D₁ *i.e.*, 10.27 and 11.16 tiller hill⁻¹ at 30 DAT, 11.86 and 12.94 tiller hill⁻¹ at 60 DAT, 11.63 and 12.62 tiller hill⁻¹ at 90 DAT, 11.05 and 11.93 tiller hill⁻¹ at harvesting stage (DAT), while minimum in third transplanting date (30st July) D₃ with 9.11 and 10.26 tiller hill⁻¹ at 30 DAT, 10.35 and 11.33 tiller hill⁻¹ at 60 DAT, 10.23 and 11.86 tiller hill⁻¹ at 90 DAT, 9.61 and 10.53 tiller hill⁻¹ at harvesting stage of concerning years respectively. Observed The mean value of varieties recorded significantly higher to number of tiller hill⁻¹ with variety, (PB-1509) V₂ (10.25 and 11.27 at 30 DAT, 12.62 and 13.17 at 60 DAT, 12.40 and 13.07 at 90 DAT, 11.60 and 12.62 tiller hill⁻¹ at harvesting DAT). Next to this were, variety, (PB-1121) V₄ (9.82 and 11.03; 11.49 and 12.55; 11.66 and 11.20; 10.80 and 11.37 tiller hill⁻¹), variety, (PB-1) V₁ (9.66 and 10.29; 10.36 and 11.69; 9.97 and 11.02; 9.59 and 10.71 tiller hill⁻¹) and lower in (PB-6) V₃ (9.27 and 10.12; 9.79 and 11.01; 9.63 and 10.99; 9.21 and 10.24 tiller hill⁻¹ in year 2016 and 2017, respectively.

Keywords

Condition, Rice,
Transplanting,
Variety and yield

Article Info

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Introduction

Rice (*Oryza sativa* L.) is one of the most important cereal crops in Asia, grown under different hydrological conditions. About 90% of the world's rice is produced and consumed in Asia (FAO, 2014). It is the principal source of food for more than half of the world population (Nguyen *et al.*, 2004), particularly

in South and Southeast Asia, Latin America and Indonesia. In India, it is a dominating staple food crop of fertile and alluvial soils of North- West regions of the country, particularly Indo-Gangetic Plains (Walia and Walia, 2007). Rice contributes around 45% of the total production and being the staple food for more than two third of the population, holds the key to sustain food sufficiency in the

country (Rai and Kushwaha, 2005). India is the second largest producer of rice in the world with production of 105.48 million tonnes from 43.90 million hectares, with a productivity of 2390 kg/ha during 2015 (Economic survey, 2015-16)

Materials and Method

The present investigation entitled “Physiological studies on growth, development and yield component of Basmati rice under different planting times” was conducted at experiment Research Farm, Student’s Instructional Farm, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (U.P.) during Kharif season *i.e.*, 2016 and 2017 (Table 2).

Location and climatic conditions

Geographically Kanpur is located of 26.28° North Longitude of 80.25° East Longitude and above 127 meters sea level. It lies in the sub-tropical regions where rice is grown in Kharif seasons (Table 1).

Fertilizer application

Recommended doses of fertilizer were applied. Full dose of phosphorous (30 kg/ha) and ZnSO₄ (25 kg/ha) was applied at the time of preparatory tillage by broadcasting under transplanted plots. Nitrogen (60 kg/ha) was applied in three split doses *i.e.* 1/3rd at transplanting, 1/3rd at 21 days after transplanting (DAT) and remaining 1/3rd at 42 DAT in transplanted plots.

Irrigation schedule

Field was irrigated frequently so as to maintain the 5 cm level of standing water till 15 days after transplanting. Thereafter irrigation was given as and when required to maintain the saturated conditions of soil.

Results and Discussion

Numbers of tillers hill⁻¹

Number of tillers hill⁻¹ under each treatment was recorded by visual counting at the appropriate stage. The plants already tagged for this purpose was used and average tillers hill⁻¹ were counting at different stages. The data stated in table 3(A), (B) and (D), for number of tiller (hill⁻¹) as affected by transplanting times, basmati rice varieties, treatments and their interaction effects at 30, 60 and 90 and Harvesting stage (DAT).

Effect of transplanting dates

The significantly maximum mean value of first transplanting times to number of tiller found in the timely first transplanting time (D₁) *i.e.*, 10.27 and 11.16 tiller hill⁻¹ at 30 DAT, 11.86 and 12.94 tiller hill⁻¹ at 60 DAT, 11.63 and 12.62 tiller hill⁻¹ at 90 DAT, 11.05 and 11.93 tiller hill⁻¹ at harvesting stage (DAT), while minimum in third transplanting date (D₃) with 9.11 and 10.26 tiller hill⁻¹ at 30 DAT, 10.35 and 11.33 tiller hill⁻¹ at 60 DAT, 10.23 and 11.86 tiller hill⁻¹ at 90 DAT, 9.61 and 10.53 tiller hill⁻¹ at harvesting stage of concerning years respectively (Table 4).

Effect of varieties

The mean value of varieties recorded significantly higher to number of tiller hill⁻¹ with variety V₂ (10.25 and 11.27 at 30 DAT, 12.62 and 13.17 at 60 DAT, 12.40 and 13.07 at 90 DAT, 11.60 and 12.62 tiller hill⁻¹ at harvesting DAT). Next to this were, variety V₄ (9.82 and 11.03; 11.49 and 12.55; 11.66 and 11.20; 10.80 and 11.37 tiller hill⁻¹), variety V₁ (9.66 and 10.29; 10.36 and 11.69; 9.97 and 11.02; 9.59 and 10.71 tiller hill⁻¹) and lower in V₃ (9.27 and 10.12; 9.79 and 11.01; 9.63 and 10.99; 9.21 and 10.24 tiller hill⁻¹ in year 2016 and 2017, respectively.

Table.1 Weather parameters prevailed during experimental year 2016 at experimental farm, Kanpur

SMW	Date to Date	Temperature(C)		Relative humidity (%)		Rain Fall (mm)
		Max.	Min.	Max.	Min.	
1	02.07.2016 - 08.07.2016	31.6	25.1	92	81	126.1
2	09.07.2016 - 15.07.2016	32.8	26.1	89	82	77.6
3	16.07.2016 - 22.07.2016	31.7	26.1	88	81	30.2
4	23.07.2016 - 29.07.2016	32.6	25.9	90	76	29.9
5	30.07.2016 - 05.08.2016	32.1	25.6	91.1	74.7	70.7
6	06.08.2016 - 12.08.2016	32.3	26.2	89	74	67.9
7	13.08.2016 - 19.08.2016	31.7	25.5	92	77	33.1
8	20.08.2016 - 26.08.2016	32.7	25.2	85	70	5.6
9	27.08.2016 - 02.09.2016	34.3	26.5	87	68	8.4
10	03.09.2016 - 09.09.2016	33.8	25.9	82	64	00
11	10.09.2016 - 16.09.2016	32.8	25.0	87	69	7.0
12	17.09.2016 - 23.09.2016	32.6	25.3	89	76	7.8
13	24.09.2016 - 30.09.2016	32.6	24.1	92	66	00
14	01.10.2016 - 07.10.2016	34.9	24.8	84	59	20.0
15	08.10.2016 - 14.10.2016	33.5	21.4	84	57	14.0
16	15.10.2016 - 21.10.2016	33.7	16.6	84	38	00
17	22.10.2016 - 28.10.2016	33.7	16.6	77	35	00
18	29.10.2016 - 04.11.2016	31.5	14.0	89	38	00
19	05.11.2016 - 11.11.2016	30.3	13.2	83	42	00
20	12.11.2016 - 18.11.2016	29.2	12.1	86	42	00
21	19.11.2016 - 25.11.2016	28.8	11.8	81	42	00
22	26.11.2016 - 02.12.2016	25.6	13.1	87	62	00

Table.2 Experimental details

• Location	:	Student's Instructional Farm, Kanpur
• Statistical Design	:	Spilt-plot Design Main plot: Date of transplanting (D) Sub plot: Variety (V)
• Replication	:	Three (3)
• Single Plot Size	:	4 x 4 m ²
• Total number of plots	:	36
• Date of transplanting	:	3 (Both year on same date)
• Varieties	:	4
• Plant to plant distance	:	10 cm
• Row to row distance	:	20 cm
• Detail about treatment	:	
Dates of transplanting (D)	:	Varieties (V)
D₁: First date transplanting 03st July	:	V ₁ :PB-1
D₂: Second date transplanting 16st July	:	V ₂ :PB-1509
D₃: Third date transplanting 30st July	:	V ₃ : PB-6 V ₄ : PB-1121

Table.3 (A) Effect of different transplanting times on number of tiller hill⁻¹ at 30 (DAT) of Basmati rice varieties

Variety	Number of tiller hill ⁻¹ 30DAT			
	2016			
	D1	D2	D3	MEAN
PB-1 - (V1)	10.14	9.83	9.01	9.66
PB-1509- (V2)	10.81	10.03	9.93	10.25
PB-6 - (V3)	9.95	9.63	8.25	9.27
PB-1121 - (V4)	10.18	10.00	9.28	9.82
MEAN	10.27	9.87	9.11	
	SE (dff)		CD (5%)	
D	0.08		0.24	
V	0.06		0.14	
DXV	0.11		0.24	
VXD	0.12		0.25	

Variety	Number of tiller hill ⁻¹ 30DAT			
	2017			
	D1	D2	D3	MEAN
PB-1 - (V1)	10.47	10.18	10.23	10.29
PB-1509- (V2)	12.01	11.23	10.57	11.27
PB-6 - (V3)	10.33	10.03	10.01	10.12
PB-1121 - (V4)	11.85	11.01	10.25	11.03
MEAN	11.16	10.61	10.26	
	SE (dff)		CD (5%)	
D	0.06		0.16	
V	0.06		0.13	
DXV	0.11		0.23	
VXD	0.13		0.27	

Table.3 (B) Effect of different transplanting times on number of tiller hill⁻¹ at 60 (DAT) of Basmati rice varieties

Variety	Number of tiller hill ⁻¹ 60DAT			
	2016			
	D1	D2	D3	MEAN
PB-1 - (V1)	10.88	10.18	10.03	10.36
PB-1509- (V2)	14.03	12.63	11.22	12.62
PB-6 - (V3)	10.06	9.92	9.39	9.79
PB-1121 - (V4)	12.50	11.20	10.78	11.49
MEAN	11.86	10.98	10.35	
	SE (dff)		CD (5%)	
D	0.14		0.41	
V	0.07		0.15	
DXV	0.12		0.26	
VXD	0.16		0.33	

Variety	Number of tiller hill ⁻¹ 60DAT			
	2017			
	D1	D2	D3	MEAN
PB-1 - (V1)	12.51	11.35	11.21	11.69
PB-1509- (V2)	14.23	13.27	12.02	13.17
PB-6 - (V3)	11.28	11.17	10.58	11.01
PB-1121 - (V4)	13.75	12.39	11.51	12.55
MEAN	12.94	12.04	11.33	
	SE (dff)		CD (5%)	
D	0.17		0.48	
V	0.08		0.17	
DXV	0.14		0.30	
VXD	0.18		0.38	

Table.3 (C) Effect of different transplanting times on number of tiller hill⁻¹ at 90 (DAT) of Basmati rice varieties

Variety	Number of tiller hill ⁻¹ 90DAT			
	2016			
	D1	D2	D3	MEAN
PB-1 - (V1)	10.71	9.85	9.35	9.97
PB-1509- (V2)	13.30	12.42	11.47	12.40
PB-6 - (V3)	10.03	9.75	9.12	9.63
PB-1121 - (V4)	12.50	11.48	11.00	11.66
MEAN	11.63	10.87	10.23	
	SE (dff)		CD (5%)	
D	0.19		0.54	
V	0.13		0.27	
DXV	0.23		N.S.	
VXD	0.26		N.S.	

Variety	Number of tiller hill ⁻¹ 90DAT			
	2017			
	D1	D2	D3	MEAN
PB-1 - (V1)	12.01	11.02	11.02	11.02
PB-1509- (V2)	14.10	13.07	13.07	13.07
PB-6 - (V3)	11.12	11.00	11.00	10.99
PB-1121 - (V4)	13.26	12.35	12.35	11.20
MEAN	12.62	11.86	11.86	11.57
	SE (dff)		CD (5%)	
D	0.21		0.58	
V	0.10		0.21	
DXV	0.17		0.36	
VXD	0.20		0.44	

Table.4 Effect of different transplanting times on number of tiller hill⁻¹ at Harvesting (DAT) of Basmati rice varieties

Variety	Number of tiller hill ⁻¹ harvesting DAT			
	2016			
	D1	D2	D3	MEAN
PB-1 - (V1)	9.84	9.72	9.21	9.59
PB-1509- (V2)	12.50	11.95	10.36	11.60
PB-6 - (V3)	9.63	9.21	8.80	9.21
PB-1121 - (V4)	12.25	10.09	10.07	10.80
MEAN	11.05	10.24	9.61	
	SE (dff)		CD (5%)	
D	0.09		0.26	
V	0.11		0.24	
DXV	0.20		0.42	
VXD	0.18		0.36	

Variety	Number of tiller hill ⁻¹ harvesting DAT			
	2017			
	D1	D2	D3	MEAN
PB-1 - (V1)	11.13	10.89	10.12	10.71
PB-1509- (V2)	13.76	12.60	11.50	12.62
PB-6 - (V3)	10.51	10.20	10.03	10.24
PB-1121 - (V4)	12.34	11.29	10.50	11.37
MEAN	11.93	11.24	10.53	
	SE (dff)		CD (5%)	
D	0.14		0.39	
V	0.07		0.15	
DXV	0.12		0.26	
VXD	0.20		0.42	

Table.5 Effect of different transplanting times on Panicle length plant⁻¹ (cm) after harvesting of Basmati rice varieties

Variety	Panicle length plant ⁻¹ (cm)			
	2016			
	D1	D2	D3	MEAN
PB-1 - (V1)	23.44	21.63	20.05	21.70
PB-1509- (V2)	26.56	24.56	24.13	25.08
PB-6 - (V3)	23.06	20.76	18.12	20.64
PB-1121 - (V4)	24.94	23.13	21.23	23.10
MEAN	24.50	22.52	20.88	
	SE (dff)		CD (5%)	
D	0.81		2.24	
V	0.63		1.33	
DXV	1.10		N.S.	
VXD	1.19		N.S.	

Variety	Panicle length plant ⁻¹ (cm)			
	2017			
	D1	D2	D3	MEAN
PB-1 - (V1)	24.09	22.62	20.81	25.50
PB-1509- (V2)	27.30	25.30	24.87	25.82
PB-6 - (V3)	23.73	21.51	18.79	21.34
PB-1121 - (V4)	25.93	23.87	22.22	24.00
MEAN	25.26	23.32	21.67	
	SE (dff)		CD (5%)	
D	0.75		2.09	
V	0.72		1.52	
DXV	1.25		N.S.	
VXD	1.28		N.S.	

Table.6 Effect of different transplanting times on Number of grains/hill after harvesting of Basmati rice varieties

Variety	Number of grains/hill			
	2016			
	D1	D2	D3	MEAN
PB-1 - (V1)	355.49	335.11	293.56	328.05
PB-1509- (V2)	433.20	396.25	352.40	393.95
PB-6 - (V3)	340.26	304.31	251.17	298.58
PB-1121 - (V4)	388.50	339.37	299.10	342.32
MEAN	379.36	343.76	299.05	
	SE (dff)		CD (5%)	
D	7.39		20.40	
V	7.58		15.93	
DXV	13.13		N.S.	
VXD	14.91		N.S.	

Variety	Number of grains/hill			
	2017			
	D1	D2	D3	MEAN
PB-1 - (V1)	362.44	341.24	300.56	334.74
PB-1509- (V2)	442.14	404.80	361.41	402.78
PB-6 - (V3)	349.15	312.85	260.40	307.46
PB-1121 - (V4)	400.81	350.37	310.03	353.73
MEAN	388.63	352.31	308.10	
	SE (dff)		CD (5%)	
D	9.23		25.50	
V	9.49		19.94	
DXV	16.44		N.S.	
VXD	18.55		N.S.	

Panicle length plant⁻¹ (cm)

The data elucidated for Panicle length plant⁻¹ (cm) as affected by different transplanting times on basmati rice varieties and their interaction on have been presented in Table 5.

Effect of transplanting dates

It the mean value of transplanting times Panicle length plant⁻¹ in cm of different transplanting dates significantly influence the panicle length plant⁻¹ accumulation in (cm). The statistically maximum panicle length plant⁻¹ (24.50 and 25.26 cm) was recorded first transplanting date (D₁) and minimum (20.88 and 21.67cm) with D₃ during 2016 and 2017 respectively.

Effect of varieties

Significant effect of varieties was found for the accumulation of Panicle length plant⁻¹. Among the varieties, V₂ was recorded significantly superior (25.08 & 25.82cm) followed by V₄ (23.10 & 24.00cm), V₁ (21.70 & 25.50cm) and mean while minimum in (20.64 & 21.34cm) in year 2016 and 2017, respectively.

Number of grains hill⁻¹

The data elucidated for Number of grains hill⁻¹ as affected by different transplanting times on basmati rice varieties, and their interaction on have been presented in Table 6.

Effect of transplanting dates

It is visualized from the mean value of different transplanting dates significantly influence the number of grains accumulation in (hill⁻¹). The statistically maximum number of grains hill⁻¹ (379.36 and 388.63hill⁻¹) was recorded first transplanting date (D₁) and minimum (299.05 and 308.10hill⁻¹) with D₃ during 2016 and 2017 respectively.

Effect of varieties

Significant effect of varieties was found for the accumulation of number of grains. Among the varieties, V₂ was recorded significantly superior (393.95 & 402.78hill⁻¹) followed by V₄ (342.32 & 353.73hill⁻¹), V₁ (328.05 & 334.74hill⁻¹) and mean while minimum in (298.58 & 307.46hill⁻¹) in year 2016 and 2017, respectively.

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