

Original Research Article

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Effect of Different Transplanting Schedules on Growth, Yields and Economic Parameters of Non-Scented Rice Cultivars of Different Duration

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ABSTRACT

A field experiment was conducted during *kharif* 2015 at Rice Research Station, Kaul (Kaithal) of CCS Haryana Agricultural University, Hisar to study the effect of different dates of transplanting on growth, yields and economics of non-scented rice varieties. The experiment conducted in split plot design comprised three dates of transplanting *viz.* June 15, July 05, and July 25 in main plots and four non scented rice varieties *viz.* HKR-48, HKR-47, HKR-127 and HKR-128 in sub plots with four replications. Early transplanted crop (June 15 and July 5) showed sign of good growth having taller plants, high crop dry matter accumulation, leaf area, leaf area index, crop growth rate and relative growth rate than delayed transplanted crop (July 25). Among the different varieties growth attributes were significantly higher in medium duration varieties HKR-128 followed by HKR-127 as compared to that in mid-early HKR-47 and early duration variety HKR-48. The medium duration variety HKR-128 recorded significantly higher yield (69.67 q/ha) than HKR-127 (66.04 q/ha), HKR-47 (63.82 q/ha) and HKR-48 (52.65 q/ha). The transplanting June 15 was found beneficial with maximum net return (Rs. 24020/ha) and B:C (1.27) followed by July 05 (Rs. 22305/ha and 1.25, respectively) and July 25 (Rs. -10403/ha and 0.88, respectively). The HKR-128 gave the highest net return (Rs. 22640/ha) and B:C (1.25) as compared to other varieties.

Keywords

Transplanting,
Non-scented
variety, Rice,
Growth,
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Introduction

Apart from different inputs for yield variability the Time is the key factor which decides that how the crops behave or responded to different inputs. It not only

affects the growth and yield of crops, actually it decides the growth and yield for a crop. In rice cultivation, scheduling of times of transplanting play a vital role because different variety shows different photo sensitiveness, thermo sensitivity and

vegetative lag period for a different duration of climate. Neither too early nor too late transplanting is good for rice cultivation; it results in drastic reduction in terms of growth and yield. The selection of suitable variety for existing climatic condition is also an important input. A short duration variety may perform better from early planting than that of late planting because of the fact that those varieties complete their life cycle with in short period having less effect of photoperiod and temperature. Like that photo and thermo insensitive varieties may perform better under normal to late planting condition with limited effect on yield of crop. So, to obtain an excellent amount of yield it is necessary to choose an appropriate time for transplanting according to available varieties and seasonal climate. The present field investigations were, therefore, conducted to find out the effect of transplanting dates on different duration non-scented varieties of rice.

Materials and Methods

A field experiment was conducted during rainy *Kharif* season 2015 at Rice Research Station, Kaul (Kaithal) of CCS Haryana Agricultural University, Hisar, Haryana on a clay loam texture soil which alkaline in reaction having pH 8.1, low in organic carbon 0.32%, electrical conductivity 0.27dS/m, low in available nitrogen (161.2 kg N/ha), medium in phosphorus (16.2 kg P/ha) and high in available potassium (328.2 kg K/ha). The four non-scented varieties *viz.* HKR-48 (early duration), HKR-47 (mid-early duration), HKR-127 (medium duration) and HKR-128 (medium duration) were tested at three different dates of transplanting *viz.* June 15, July 05 and July 25. The split plot design used to carry out the experiment, keeping transplanting dates in main plots and varieties in sub-plots with four replications. The thirty days old seedlings were transplanted at spacing of 20 × 15 cm. recommended dose of

Fertilizer was applied with Zinc through zinc sulphate @ 25 kg ZnSO₄/ha as basal application before transplanting. Plant protection measures were adopted as per the recommendation. The crop was harvested at maturity and threshed as per schedule. The data for growth attributes; Plant height (cm), Dry matter accumulation (g/m²), Leaf area (cm²) were recorded at different stage of growth at 30, 60, 90 Days after transplanting and at harvest. From available different interval different growth rates; Crop growth rate (g/m²/day), Relative growth rate (g/g/day) were calculated. The grain yield is calculated from different yield attributes data *viz.* number of panicles/m², grains/panicle, 1000-grains weight at harvest.

Results and Discussion

Growth studies

Early transplanted crop (June 15 and July 5) showed greater plant height, crop dry matter accumulation, leaf area, leaf area index, crop growth rate and relative growth rate than delayed transplanted crop (July 25). This might be due to longer vegetative period of the crop under early transplanting, due to which the plants accumulated more photosynthates which were utilized for growth of vegetative organs of the plant. Jand *et al.*, (1994) and Bali and Uppal (1995) observed higher dry matter accumulation under early planting of rice.

Plant height of rice crop increased very rapidly up to 60 DAT and then the rate of increase was marginal from 60 to 90 DAT and lowest from 90 DAT to harvest (Table 1). Paliwal *et al.*, (1996) also reported that late planting reduced plant height of rice cultivars. Among the different non scented varieties HKR-128 recorded significantly taller plants which were at par to that recorded in variety HKR-127.

Table.1 Effect of different dates of transplanting on plant height

Treatments	Plant height (cm)			
	30 DAT	60 DAT	90 DAT	Harvest
Main plots (transplanting dates)				
D1: June 15	56.91	97.72	119.31	120.28
D2: July 05	55.75	96.85	118.41	119.56
D3: July 25	54.30	86.94	101.62	105.44
SEm±	0.36	0.37	0.91	1.15
CD at 5% level	1.26	1.32	3.22	4.06
Sub plots (varieties)				
V1: HKR-48	53.48	90.36	104.29	105.19
V2: HKR -47	54.79	93.11	114.33	114.60
V3: HKR- 127	57.05	94.42	115.63	117.10
V4: HKR-128	58.28	96.47	117.21	119.48
SEm±	0.43	0.62	0.94	1.04
CD at 5% level	1.26	1.81	2.75	3.04

Table.2 Effect of different dates of transplanting on plant dry matter accumulation

Treatments	Dry matter accumulation (g/m ²)			
	30 DAT	60 DAT	90 DAT	Harvest
Main plots (transplanting dates)				
D1: June 15	62.55	842.60	1275.55	1384.89
D2: July 05	61.56	823.15	1229.46	1320.23
D3: July 25	59.43	717.92	1062.46	1116.30
SEm±	0.42	3.28	3.75	1.48
CD at 5% level	1.47	11.58	13.22	5.23
Sub plots (varieties)				
V1: HKR-48	55.89	711.68	1070.29	1117.06
V2: HKR -47	60.83	782.15	1170.34	1258.37
V3: HKR- 127	63.64	831.80	1242.47	1340.17
V4: HKR-128	64.37	852.59	1273.54	1379.61
SEm±	0.51	7.28	8.04	7.96
CD at 5% level	1.50	21.23	23.44	23.23

Table.3 Effect of different dates of transplanting on leaf area

Treatments	Leaf area (cm ²)		
	30 DAT	60 DAT	90 DAT
Main plots (transplanting dates)			
D1: June 15	462.34	1609.18	1262.96
D2: July 05	458.74	1575.72	1252.16
D3: July 25	408.78	1323.69	1133.80
SEm±	1.47	14.58	5.83
CD at 5% level	5.18	51.43	20.56
Sub plots (varieties)			
V1: HKR-48	403.31	1390.68	1142.62
V2: HKR -47	443.28	1495.71	1194.98
V3: HKR- 127	459.73	1564.30	1259.13
V4: HKR-128	466.87	1590.76	1268.49
SEm±	5.65	12.78	7.75
CD at 5% level	16.47	37.28	22.59

Table.4 Effect of different dates of transplanting on leaf area index

Treatments	Leaf area index (LAI)		
	30 DAT	60 DAT	90 DAT
Main plots (transplanting dates)			
D1: June 15	1.53	5.31	4.17
D2: July 05	1.51	5.20	4.13
D3: July 25	1.35	4.37	3.74
SEm±	0.01	0.05	0.02
CD at 5% level	0.02	0.17	0.07
Sub plots (varieties)			
V1: HKR-48	1.33	4.59	3.77
V2: HKR -47	1.46	4.94	3.94
V3: HKR- 127	1.52	5.16	4.16
V4: HKR-128	1.54	5.25	4.19
SEm±	0.02	0.04	0.03
CD at 5% level	0.05	0.12	0.08

Table.5 Effect of different dates of transplanting on crop growth rate

Treatments	Crop growth rate (g/m ² /day)			
	0-30 DAT	31-60 DAT	61-90 DAT	At Harvest
Main plots (transplanting dates)				
D1: June 15	2.09	26.00	14.43	3.28
D2: July 05	2.05	25.39	13.55	2.33
D3: July 25	1.98	21.95	11.48	1.97
SEm±	0.02	0.12	0.15	0.11
CD at 5% level	0.05	0.42	0.53	0.37
Sub plots (varieties)				
V1: HKR-48	1.87	21.86	11.95	2.12
V2: HKR -47	2.03	24.04	12.94	2.44
V3: HKR- 127	2.12	25.60	13.69	2.68
V4: HKR-128	2.15	26.28	14.03	2.86
SEm±	0.02	0.24	0.32	0.17
CD at 5% level	0.05	0.71	0.94	0.51

Table.6 Effect of different dates of transplanting on relative growth rate

Treatments	Relative growth rate (g/g/day)		
	31-60 DAT	61-90 DAT	At Harvest
Main plots (transplanting dates)			
D1: June 15	86.67	13.86	2.46
D2: July 05	86.43	13.38	1.82
D3: July 25	82.98	13.05	1.59
SEm±	0.34	0.19	0.09
CD at 5% level	1.20	NS	0.30
Sub plots (varieties)			
V1: HKR-48	84.69	13.14	1.57
V2: HKR -47	85.07	13.34	2.00
V3: HKR- 127	85.60	13.46	2.08
V4: HKR-128	86.07	13.79	2.18
SEm±	0.42	0.35	0.10
CD at 5% level	NS	NS	NS

Table.7 Effect of different dates of transplanting on yield

Treatments	Grain yield (t/ha)	Straw yield (t/ha)	Biological yield (t/ha)	Harvest index (%)
Main plots (transplanting dates)				
D1: June 15	7.060	8.331	15.392	45.87
D2: July 05	6.949	8.284	15.233	45.61
D3: July 25	4.903	6.859	11.712	41.50
SEm±	.07573	.19792	.27081	0.60
CD at 5% level	.26140	.69820	.95534	2.20
Sub plots (varieties)				
V1: HKR-48	5.265	6.941	12.206	43.13
V2: HKR -47	6.382	8.014	14.396	44.33
V3: HKR- 127	6.604	8.257	14.861	44.43
V4: HKR-128	6.967	8.587	15.554	44.79
SEm±	.08879	190.15	.28426	0.70
CD at 5% level	.25771	.55472	.82925	NS

Table.8 Effect of different dates of transplanting on economics of rice

Treatments	Economics		
	Gross returns (₹/ha)	Net returns (₹/ha)	Benefit-cost ratio
Main plots (transplanting dates)			
D1: June 15	113605	24020	1.27
D2: July 05	111890	22305	1.25
D3: July 25	79182	-10403	0.88
Sub plots (varieties)			
V1: HKR-48	84797	-3923	0.96
V2: HKR -47	102839	13254	1.15
V3: HKR- 127	106407	16822	1.19
V4: HKR-128	112225	22640	1.25

The variety HKR-48 produced significantly shortest plants compared to all other varieties. These findings are in agreement with that of Dhiman *et al.*, (1995). Among the different varieties plant height, dry matter accumulation (Table 2), leaf area (Table 3), leaf area index (Table 4), crop growth rate (Table 5) and relative growth rate (Table 6) were significantly higher in medium duration varieties HKR-128 followed by HKR-127 as compared to that in mid-early HKR-47 and early duration variety HKR-48. This may be due to high yielding vigour shown by the HKR-128 followed by HKR-127. On the other hand shorter duration variety HKR-48 could not match the growth of mid-early and medium duration high yielding varieties due to comparatively less time for production and translocation of photosynthates. These findings are in agreement with that of Chaturvedi *et al.*, (2004) who reported that longer the crop duration higher was the dry matter production and growth. Samdhia (1996) found that LAI declined gradually as the planting was delayed beyond July 15. Singh *et al.*, (1996b) reported that total tillers per plant of the crop transplanted on May 16 and May 31 was significantly more than that of the crop transplanted on June 16.

Yield

The yield attributing characters are in fact a reflection of vegetative growth of a plant. The yield (grain & straw) were recorded highest in earlier transplanted crop (June 15 and July 05). The yield attributes of the crop transplanted on June 15 and July 05 were statistically similar but significantly superior to the crop transplanted on July 25 (Table 7). The highest yield under early transplanting may be attributed to cumulative effect of greater plant height, more dry matter accumulation, and yield attributes like more panicles/m² and grains/panicle. These findings are in general agreement with those

reported by Ashraf *et al.*, (1989), Singh *et al.*, (1992), Bali and Uppal (1995), Chopra and Chopra (2004), Ram *et al.*, (2005) and Chopra *et al.*, (2006). The lower yield under late transplanted crop may also be attributed to comparatively low temperature in the late planted crop. These findings are in general agreement with those reported by Bali *et al.*, (1993).

Among the varieties, medium duration varieties (HKR-128 and HKR-127) gave the highest grain and straw yields (Table 7) and proved significantly better than mid-early and early duration varieties. This was obviously due to more tillering, higher dry matter accumulation, more panicles/m² and grains/panicle in these varieties as compared to other varieties. The mid-early duration variety (HKR-47) was significantly superior in terms of grains and straw yields to early duration variety (HKR-48) because of greater number of panicles/m² and grains/panicle as well as higher dry matter accumulation as compared to HKR-48. Joon *et al.*, (1989), Ram *et al.*, (2005) and Singh *et al.*, (2005) also reported the superiority of medium duration varieties over short duration ones. The lowest yield in short duration varieties might be due to less time available to reproductive phase, distribution of photosynthates, which might have resulted in less number of panicle/m², grains/panicle and 1000-grains weight.

Economics

The early transplanted crop (June 15 and July 05) gave higher gross return, net return and benefit cost ratio as compared to the crop transplanted on July 05 and July 25 (Table 8). This might be due to higher grain and straw yields produced by early planted crop. Similar results were observed by Chaudhary *et al.*, (2011). The highest gross return, net return and benefit cost ratio were recorded by HKR-

128 as compared to other varieties under treatments which were due to higher grain and straw yield. The next economically best variety was HKR-127 followed by HKR-47 followed by HKR-48. The net return and benefit cost ratio were lowest with HKR-48, even when the cost of cultivation was less as compared to other varieties. This may be due to lower yield of HKR-48 than all other varieties.

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