Environment & Ecology 27 (1A) : 396—398, 2009
 ISSN-0970-0420

Influence of Planting Dates and Spacing Schedules on Performance of Basmati Rice Pusa Sugandh-3 under Kashmir Valley Conditions

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Abstract

A field experiment was conducted to ascertain the optimum planting dates and spacing schedules during 2006 and 2007 situated at latitude of 36^0 E and longitude of 74^0 N and altitude of 1530 m. amsl. Four planting dates viz. 25 of May, 2 June, 9 June and 16 June, were combined with four spacing schedules viz. 15 cm × 10 cm (S_1), 15 cm × 15 cm (S_2), 20 cm × 10 cm (S_3) and 20 cm × 15 cm (S_4). It revealed that delay in the transplanting beyond the last week of May resulted in significant reduction of grain yield of basmati rice. The magnitude of reduction of grain yield observed with week delay in planting beyond 25 May observed was 5.2, 9.9 and 12.3 q/ha respectively. The corresponding figures for 2007 were 4.7, 9.9 and 21.9 q/ha, respectively. Earlier planting dates of 25 May and 2 June produced higher straw yield and higher harvest index than delayed planting of 9 and 16 June.

Key words : Planting dates, Spacing schedules, Basmati rice, Performance.

Basmati rice is characterized by long slender and silky grains, typical aroma, grain elongation upon cooking and good cooking qualities. It is a special crop of some regions Indo-gangetic plains encamparising Punjab (either side of Indo-Pak border), Haryana, Uttranchal, Western UP and Jammu. The production of basmati rice in India is estimated around 2.5 million tonnes on an area of 7.85 lakh hectares, a major portion of which is exported. With increasing income there would be more demands for basmati rice in the domestic market. Kashmir valley is a non-traditional area for growing basmati rice and earlier attempts to grow basmati types failed on account of the failure of the crop to the mature. The local scented rice Mushkbudji and Kamad (land races) scumb to various diseases and furnish poor yield. Recently work on Pusa Basmati varieties was started at Rice Research and Regional Station, Khudwani and it was observed that Pusa Sugandh-2 and Pusa Sugandh-3 matured successfully and produced good grain yields. The productivity depends on several factors such as type of variety, soil fertility status, time and method of sowing, plant spacing. Time of sowing assumes greater importance owing to shorter growing season of 140—145 days available under Kashmir valley conditions. Plant population is also one of the important factors affecting the grain yield. Therefore, the present investigation was planned and conducted to find out the optimum planting date and spacing schedule for basmati rice Pusa Sugandh-3 under Kashmir valley conditions.

Methods

A field experiment was conducted during 2006 and 2007 at Rice Research and Regional Station Khudwani situated at latitude of 36^0N and longitude of 74^0E and altitude of 1,530 m amsl. The initial soil fertility status revealed that the soil was low in available phosphorus (13 kg/ha) and medium in nitrogen (250 kg/ha) and potassium (275 kg/ha) with a pH of 6.9. Four planting dates viz. 25 of May (D_1), 2 June (D_2), 9 June (D_3), and 16 June (D_4) combined with four spacing schedules viz. 15 cm × 10 cm (S_1), 15 cm × 15 cm (S_2), 20 cm × 10 cm (S_3) and 20 cm × 15 cm (S_4) were tested in randomized block design with three replications. The sowing dates were accordingly scheduled on 25 April, 2 May, 9 May and 16 May and seedling was transplanted at an age of 30 days. Economics was worked out on the basis of revenue realized from of grain and straw on the prevailing market rates.

Results & Discussion

Effect on Growth and Yield Attributes

The crop planted earlier on 25 of May and 2 of

Table 1. Growth and yield attributes of basmati rice Pusa Sugandh-3 as influenced by planting dates and spacing schedules.

Treatments	Plant height (cm)		No of panicles/m^2		Panicle length (cm)		No of grains/ panicles	
	2006	2007	2006	2007	2006	2007	2006	2007
Planting Dates								
25 May	84.78	86.00	404.41	409.75	24.28	24.87	92.44	89.86
2 Jun	86.03	83.25	369.75	387.66	22.39	22.41	86.08	85.60
9 Jun	71.23	82.00	323.33	366.41	21.83	22.05	77.71	78.03
16 Jun	66.33	79.83	302.58	314.25	20.25	21.05	69.91	69.67
CD (%)	7.93	15.52	17.58	13.06	1.60	1.29	7.79	11.79
CV (%)	10.5	12.03	13.02	11.25	8.68	9.87	13.09	17.51
Spacing Schedules (cm)								
15 × 10	77.38	84.75	367.08	386.33	21.91	21.79	80.63	79.23
15 × 15	76.55	82.75	359.16	384.08	22.91	22.68	82.95	83.48
20 × 10	76.60	80.08	353.83	378.25	22.05	22.40	81.98	82.35
20 × 15	77.85	81.50	335.00	352.41	21.89	22.51	80.58	78.10
CD (0.05)	NS	4.52	17.58	13.06	NS	NS	NS	NS
CV (%)	12.35	12.03	13.02	11.25	8.68	9.87	13.09	17.51

Table 1. Continued.

Treatments	1000-grain weight (g)		Straw yield (q/ha)		Grain yield (q/ha)		Harvest index (%)	
	2006	2007	2006	2007	2006	2007	2006	2007
Planting Dates								
25 May	27.09	27.35	78.48	77.38	50.92	48.57	39.35	38.80
2 Jun	26.73	26.80	74.77	71.16	45.68	43.91	37.92	38.57
9 Jun	25.15	25.02	65.25	69.66	35.76	38.71	35.40	36.04
16 Jun	25.06	24.70	63.88	66.66	23.41	27.11	26.81	29.35
CD (%)	0.96	1.19	10.19	7.27	3.14	3.10	2.80	2.40
CV (%)	8.5	9.4	12.32	12.25	9.69	9.40	10.5	8.45
Spacing Schedules (cm)								
15 × 10	25.45	25.33	72.39	74.60	42.37	40.46	36.92	35.16
15 × 15	26.19	26.27	70.37	67.19	40.43	41.98	36.48	38.45
20 × 10	25.89	25.70	69.0	72.79	38.35	39.56	35.72	35.21
20 × 15	26.51	26.58	70.59	70.82	34.61	36.31	32.89	34.06
CD (0.05)	0.96	1.19	NS	NS	3.14	3.10	3.80	3.40
CV (%)	8.5	9.4	17.32	12.25	9.69	9.40	10.5	8.45

June produced taller plants with significantly higher number of panicles/m^2, grains/panicle and 1,000-grain weight. The effect was more pronounced on the panicle density in respect of 25 May transplanting which recorded an increase of 33 and 30% over latter planting date of 16 June during 2006 and 2007 respectively (Table 1). Non-basmati types take about 135—140 days to mature, whereas the basmati rice Pusa Sugandh-3 took 150 days to mature. It appears that optimum growing degree days were accumulated by the crop planted on 25 of May than the latter dates of planting (Table 1).

Crop transplanted at latter dates is exposed to low temperature (23.6 C max and 12.5 C min) at flowering during the last week August to first week of September. Crop transplanted on 25 of May flowered

Table 2. Grain yield (q/ha) of basmati rice as affected by interaction between planting dates and spacing schedules during 2007.

Treatments	S_1	S_2	S_3	S_4	Mean
D_1	52.83	50.29	46.49	44.65	48.50
D_2	44.79	47.44	45.25	38.16	43.91
D_3	42.68	38.80	42.33	31.04	38.71
D_4	21.51	31.39	24.16	31.39	27.11
Mean	40.46	41.98	39.56	36.31	
CD (0.05)	6.20				
D × S					

during third week of August whereas the crop transplanted on latter dates flowered during the last week of August and first week of September. This favored the proper fertilization of earlier sown crop displaying reduced fertility and higher grain yield. These findings are in conformity with Bali et al. (1) and Bali et al. (2).In traditional basmati growing areas of Punjab, Haryana and western UP characterized by sub-tropical type of climate, transplanting beyond mid-July reduced yield considerably (3,4). Perusal of the yield data revealed that delay in the transplanting beyond the last week of May resulted in significant reduction of grain yield of basmati rice. The magnitude of reduction of grain yield observed with per week delay in planting beyond 25 May was 5.2, 9.9 and 12.3q/ha respectively.The corresponding figures for the year 2007 were 4.7, 9.9 and 21.9 q/ha respectively. Earlier planting dates of 25 May and 2 June produced higher straw yield and higher harvest index than delayed planting of 9 and 16 June.

Spacing schedules produced plants which were at par in respect of plant height except spacing of 15 × 10 cm that produced slightly taller plants during 2007. Closer spacing of 15 × 10 cm, 15 × 15 cm and 20 × 10 cm were at par with each other with regard to panicles/m^2 but significantly higher than the spacing schedule of 20 × 15 cm. Various spacing schedules did not significantly effect the panicle length and number of grains per panicle. Among the different spacing schedules closer spacing of 15 × 10 cm was at par with 15 × 15 cm which in turn was at par with 20 × 10 cm in respect of the grain yield, but all the three schedules proved to be superior to spacing of 20 × 15 cm. Spacing schedules had no significant effect on straw yield and harvest index though numerically higher harvest index was recorded for the spacing of 15 × 15 cm. Similar results were recorded during 2007 (Table 1). These findings are in conformity with that of Rao and Raju (5). Significant interaction was recorded among the different planting dates and spacing schedules during 2007. Maximum grain yield of 52.83 q/ha was recorded at planting date of 25 May and spacing of 15 cm × 10 cm (Table 2).

Table 3. Economics basmati rice Pusa Sugandh-3 as influenced by panting dates and spacing schedules.

Treatments	Production cost/ha (Rs)	Gross income/ha (Rs)	Net profit/ha (Rs)	B : C ratio
D_1S_1	31200	79245	48545	1.55
D_1S_2	31200	75593	44893	1.43
D_1S_3	31200	73313	39605	1.27
D_1S_4	31200	68468	42613	1.37
D_2S_1	31200	69675	37668	1.21
D_2S_2	31200	68625	38875	1.24
D_2S_3	31200	62003	37825	1.21
D_2S_4	31200	62385	31203	1.00
D_3S_1	31200	57975	31485	1.01
D_3S_2	31200	57623	27075	0.87
D_3S_3	31200	82830	26723	0.86
D_3S_4	31200	45435	14535	0.47
D_4S_1	31200	38370	7420	0.24
D_4S_2	31200	43988	13038	0.41
D_4S_3	31200	37050	6100	0.20
D_4S_4	31200	32010	1060	0.03

Economics. Maximum profit of Rs 84,460/ and highest B : C ratio of 1.55 were recorded for planting date of 25 May and spacing schedule of 15 × 10 cm (Table 3).

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