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Growth and yield of newly released cultivars of rice (*Oryza sativa* L.) as influenced by dates of transplanting in North Western Himalayas

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Abstract

An experiment was conducted during *Kharif* (monsoon) seasons of 2000 and 2001 to study the effect of two dates of transplanting (23rd June and 8th July) on growth, yield attributes and yield of four rice varieties (RP-2421, HPR-1064, HPR-2027 and Naggar Dhan) on a silty clay loam soil at Palampur (HP), India. Flowering and physiological maturity were delayed with delay in transplanting. Rice transplanted on 23rd June recorded significantly highest filled grains/m², grain yield and harvest index. Among varieties, HPR- 2027 took lesser number of days to flowering and maturity. HPR- 1064 recorded significantly highest panicles/m² and grains/m² and hence recorded significantly highest grain yield.

Key words: Dates of transplanting, varieties, rice growth, yield.

Introduction

Rice is one of the major food crops of Himachal Pradesh cultivated on 86,200 hectares with a production of 1,20,680 tonnes and an average yield of 1400 kg per hectare (Anonymous, 2004). With the introduction of new varieties it becomes imperative to make a comparative assessment of growth studies and their influence on grain yield under different time of transplanting. Time of transplanting, a non monetary input, tremendously influences the growth and yield of rice (Halappa *et al.* 1974). Maximum yield is achieved by planting the crop at optimum time at any specific location, which may vary from variety to variety (Babu, 1987). Keeping all this in view a field experiment was conducted for two consecutive years to determine the optimum transplanting date of newly released varieties *i.e* HPR-1064, HPR-2027 check variety RP-2421 and Naggar Dhan (Japonica type).

Material and Methods

A field experiment on rice crop was conducted during 2000 and 2001 *Kharif* seasons (July-October) at the Experimental Farm of Department of Agronomy CSKHP Krishi Vishvavidyalaya, Palampur (32° 6'N, 76° 3'E 1290.8 m elevation) in North Western Himalayas. Soils were Alifisols (Typic hapludalf). The soil texture was silty clay loam and acidic in reaction. On an average, the 0-60 cm soil layer had bulk density of 1.30 g/ cm^3 (before rice transplanting). The soil was rich in organic carbon, rated as high in total nitrogen, medium in available phosphorus and potassium in the upper 0-15 cm layer. Field experiment comprising of two dates of transplanting (23 June and 8 July and four varieties (RP-2421, HPR-1064, HPR-2027 and Naggar Dhan) was conducted in randomised block design with four replications. Twenty six days old nursery of all the varieties was transplanted with two seedlings per hills at 20 × 15 cm spacing. The crop was fertilized @ 90-40-40; of N-P_2O_5 -K_2O kg/ha, of which one third of nitrogen and whole of phosphorus and potash were applied uniformly as basal dressing and incorporated in the surface soil at the time of puddling. Remaining nitrogen was top dressed in two equal splits each at tillering (25 DAT) and panicle initiation (45 DAT) stages of crop. The crop was irrigated at regular interval to maintain proper moisture in the plots. During the crop season, mean weekly maximum temperature ranged between 23.4-32.5 °C and minimum temperature between 12.0-21.0 °C.

Results and Discussion

Growth

Rice transplanted on 8th July took significantly higher number of days to flowering and maturity during both years due to slow rate of growth on account of lower temperature. These findings agree with those of Nayak and Chaudhary (1997). Different varieties are known to have different critical

photoperiod and heat unit (degree days) requirements. On account of this phenomenon, different varieties took different number of days to flowering and physiological maturity. The order of duration of flowering and physiological maturity was HPR-2027> HPR-1064> RP-2421 and Naggar Dhan. Total dry matter accumulation at maturity was not affected significantly by date of transplanting. Among varieties, HPR- 2027 produced significantly highest dry matter than Naggar Dhan but remained at par with RP-2421 and HPR-1064.

Yield attributes

Dates of transplanting did not cause significant difference in number of panicle/m^2 but varieties exhibited significant differences. HPR-1064 produced significantly highest panicles/m^2 over the other three varieties during first year. But it did not differ significantly from RP-2421 and HPR-2027 during second year of the study. During both the years, early transplanted crop produced significantly higher number of filled grains/ m^2 than the late transplanted crop. The varietal differences were found to be significant only during 2000, when HPR-1064 and RP-2421 remaining at par produced significantly higher grains/m^2 than other two varieties, which in turn did not differ significantly from one another.

Late transplanted crop produced significantly bolder grains than early transplanted crop, probably because of significantly lower number of filled grains/ m^2 in late transplanted crop (Table 1). During second year (2001) the difference was not significant. Among the four varieties, Naggar Dhan produced significantly bolder grains than rest of the varieties.

Yield

A perusal of grain yield data in Table 2 reveals that a significant reduction in yield was recorded with delay in transplanting of crop to July 8 during both the years. The magnitude of reduction was to the tune of 13-15 per cent. Kumar (2002) also reported similar results. The differences among the varieties was found to be significant during first year of experimentation only, when HPR-1064 and RP-2421 remaining at par produced significantly higher grain yield than the other two varieties namely HPR-2027 and Naggar Dhan which may be due to significantly highest filled grains/m^2 of former varieties (Table 1). The difference between the latter varieties was also non significant.

Straw yield was significantly affected by transplanting dates and varieties. Late transplanted crop produced significantly higher straw during both the years. The increase in straw yield due to second date of transplanting over first date of transplanting was to the tune of 7 and 15 per cent. Among the varieties, HPR-2027 produced significantly higher straw yield which may be due to higher dry matter production capacity of this variety (Table 1), while

Table 1. Effect of dates of transplanting and varieties on growth and yield attributes of rice

Treatments	Days to flowering		Days to maturity		Total dry matter at maturity (g/m^2)		Panicles/m^2		Filled grains/m^2		1000-grain weight (g)	
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
Dates of transplanting												
23rd June	68	64	102	101	945.0	976.0	232	252	15469	15833	24.0	25.0
8th July	71	66	108	105	945.0	1011.0	224	245	12966	13505	25.0	25.0
CD (P=0.05)	0.58	NS	0.90	1.05	NS	NS	NS	NS	1293.1	1274.5	0.50	NS
Varieties												
RP-2421	67	64	105	104	936.0	950.0	238	254	14991	15215	23.0	24.0
HPR-1064	71	66	103	101	945.0	1010.0	273	272	16380	15715	24.0	25.0
HPR-2027	77	71	114	111	1033.0	1100.0	244	242	12660	13838	25.0	25.0
Naggar Dhan	63	60	98	96	866.0	916.0	205	227	12840	13909	26.0	26.0
CD (P=0.05)	0.82	1.60	1.28	1.5	88.01	70.00	29.1	30.5	1828.7	NS	0.70	0.80

differences among the remaining three varieties was not significant (Table 2).

During both the years a significant decrease in harvest index was observed with delay in transplanting. Harvest index is the ratio of grain to biomass yield. As the grain yield was higher in first date of transplanting which lead to higher harvest index. HPR-1064 had higher harvest index but did not differ significantly from RP-2421 during both the years. However, during second year it was significantly lowest in HPR-2027 and difference among the remaining three varieties was not significant.

Table 2. Effect of dates of transplanting and varieties on yield and harvest index of rice

Treatments	Grain yield (kg/ha)		Straw yield (kg/ha)		Harvest index	
	2000	2001	2000	2001	2000	2001
Dates of transplanting						
23rd June	3686	3815	5944	5947	0.39	0.39
8th July	3180	3214	6367	6867	0.33	0.32
CD (P=0.05)	307.4	200.3	440.0	339.9	0.02	0.01
Varieties						
RP-2421	3531	3537	5834	5989	0.38	0.37
HPR-1064	3857	3835	5590	6258	0.41	0.38
HPR-2027	3153	3231	7532	7729	0.30	0.30
Naggar Dhan	3192	3455	5667	5703	0.36	0.38
CD (P=0.05)	434.8	NS	622.3	480.7	0.03	0.02

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