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INHERITANCE OF PHOTOPERIODIC RESPONSE IN BASMATI RICE

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ABSTRACT

The inheritance pattern of photoperiod sensitivity was studied in five intervarietal crosses of basmati rice. Photoperiod response followed a qualitative inheritance with photosensitivity being dominant over photo insensitivity and it showed digenic complementary gene action in five crosses.

Basmati types are elite groups among rice varieties which are distinguished for its aroma and specific cooking and eating qualities from the rest. Because of these special qualities there is high demand for basmati rice in the international and domestic market. As a result such rice fetch high price in the market. The available basmati varieties are poor yielder, weak strawed, traditionally tall types and photosensitive whereas semidwarf high yielding non-scented genotypes are photo insensitive.

Keeping in view increasing demand of such rices there is need to develop dwarf and high yielding photo in sensitive varieties combining good grain cooking and eating qualities like traditional basmati rice.

In order to achieve this goal through efficient breeding programme, it is imperative to know the inheritance pattern of photo period sensitivity in basmati rice. Therefore, the present investigation was under taken to study the inheritance pattern in five intervarietal crosses of basmati rice.

The varieties involved in the crosses were aromatic photosensitive medium duration rice varieties Basmati 370 and HBC 19 and four non-aromatic photosensitive medium duration rice varieties HKR 86-104, PR 4141, PR 108, PR 106. To study the mode of inheritance the F1 and F2 non-aromatic rice insensitive varieties as female parents and Basmati 370 and HBC 19 as pollen parents. The parents F1 and F2 were raised at the experimental farm of CCS HAU Rice Research Station, Kaul (Kaithal) Haryana.

Since day length variation influences the flowering in rice, these materials were subjected to continuous long photoperiod duration (July to September) so that behaviour of F1 and F2 plants was identical in terms of serisitivity of flowering to day length. The plants which flowered during long day length were considered as photoinsensitive, whereas plants which flowered during short day length as photosensitive (Sampath and Seshu, 1961).

The photoinsensitive parents flowered during long day length, whereas flowering in photosensitive parents occurred short day length prevailing from first to fourth week of October (Table 1). The hybrid of all the five crosses flowered during short day length displaying the similar photoperiod response as recorded in the case of photosensitive parents and indicated the dominance of photosensitivity over photoinsensitivity. Similar results were also reported earlier Rao and Mishra, 1986 and Singh *et. al.*, 1993. On the contrary, Sampath and Seshu (1961) and Khush (1977) it was reported that photosensitivity as recessive in some cases and dominants in others. The segregation pattern of photoperiod reaction in F2 population of all the crosses reflected that flowering behaviour in terms of photosensitivity and photoinsensitivity was controlled of major genes (Table 2). The segregation pattern of all five crosses was in the ratio of 9: 7 indicating the presence of digenic complimentary epistasis gene action. Similar findings were reported by Singh *et. al.*, 1993 in varietal crosses of rainfed low land and deep water rice. Even though the bimodel distribution

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TABLE 1. Photoperiodic response of parent and crosses.

Crosses	Flowering Period			Photoperiod		
	P1	P2	F1	PI	P2	F1
HKR86-104/HBC19	1-10 Sep.	27 Sep. – 20 Oct.	10 Oct. – 30 Oct.	PI	PS	PS
HKR86-104/Bas370	1-10 Sep.	22 Sep. – 15 Oct.	27 Oct. – 25 Oct.	PI	PS	PS
PR 4141/HBC19	1-16 Sep.	27 Sep. – 20 Oct.	1 Oct. – 30 Oct.	PI	PS	PS
PR 108/HBC19	1-7 Sep.	27 Sep. – 20 Oct.	1 Oct. – 27 Oct.	PI	PS	PS
PR 106/Bas.370	6-14 Sep.	22 Sep. – 15 Oct.	27 Sep. – 25 Oct.	PI	PS	PS

PI = Photoperiod insensitive
PS = Photoperiod sensitive

TABLE 2. Segregation pattern of Photoperiod reaction in F2 population of different crosses.

Crosses	Plant tested	Observed segregation		Expected ratio (9:7)	X^2 value (9:7)	Probability
HKR86-104/HBC19	989	571	418	556.3125:432.6875	0.8864	0.50–0.25
HKR86-104/Bas370	1050	603	447	590.625:495.375	0.5927	0.50–0.25
PR 4141/HBC19	383	220	163	215.4375:167.5625	0.2208	0.75–0.50
PR 108/HBC19	1070	590	480	601.875:468.125	0.5357	0.50–0.25
PR 106/Bas.370	1142	660	482	642.375:468.625	1.1192	0.50–0.25

of F2 population and digenic interaction for photoperiod reaction has been reported by several workers, divergent views regarding type of epistasis are prevalent (Sampath and Seshu, 1961 and Khush, 1977). The present study revealed that homozygous recessive alleles at both loci or either loci produce photoinsensitive plants in basmati rice.

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