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Floral variability and correlation studies among selected male sterile lines in rice

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ABSTRACT

Ten cyto-staerile lines and their maintainers, possessing "Wild Abortive" (WA) type of cytoplasm were studied for heritability, genetic advance and correlation studies of floral traits influencing out-crossing in rice. Significant positive correlations were found between stigma breadth, anther breadth and anther size; percentage of stigma exsertion with stigma length, angle of opened florets and style length; angle of opened florets with style length; stigma length with anther length; duration of opening of floret with percentage of stigma exsertion, angle of opened florets, filament length and filament length after elongation; stigma breadth with stigma surface, anther breadth and anther size; anther breadth with anther size and filament length, filament length with filament length after elongation. Characters such as blooming, angle, filament length with breadth, stigma surface, style length, anther breadth and filament showed high broad sense heritability coupled with medium genetic advance.

Keywords: Cyto-sterile line, Correlation, Genetic advance, Heritabili

Introduction

The floral biology of CMS lines involved as seed parent is most important as hybrid seeds have to harvested from this parent and also with better floral traits in the female parents will have enhance more out crossing and seed set percentage in hybrid seeds production. Information regarding correlations among the floral traits, heritability and genetic advance is essential for effective selection.

Material Method

Ten cyto-sterile lines and their maintainers, possessing "Wild Abortive" (WA) type of cytoplasm, collected from P.A.U., Ludhiana; DRR, Rajendra Nagar, Hyderabad and NDUAT, Kumarganj, Faizabad (U.P.), constituted the materials for correlation, heritability and genetic advance studies. The cyto-sterile lines and their maintainers were grown in Randomized Block Design with three replications during *Kharif*, 1988 and 1999 in three meter spaced twenty centimeter apart. Plant to plant distance within the rows were fifteen centimeters. Cyto-sterile (A) and maintainer lines (B) were transplanted in 4:2 ratio. Recommended agronomic practices were adopted to raise a good crop. Duration of opening of florets, angle of opened florets, percentage of stigma exsertion, percentage of panicle exsertion, anther length, anther breadth, anther size, filament length, filament length after elongation, stigma length, stigma breadth, stigma surface and style length were recorded. Heritability estimate was worked out by using the formula suggested by Lush (1949) and Burton and De Vance (1953); and genetic advance as suggested by Lush (1949) and Johnson, Robinson and Comstock (1995a).

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Result and Discussion

In general higher estimates of heritability were observed in A-lines than their respective B-lines for

Table 1 Estimation of genotypic and phenotypic correlation coefficients among various floral traits in ten cyto-sterile lines of rice.

Characters	1	2	3	4	5	6	7	8	9	10	11	12	13
Duration of opening of florets	GP	0.170	-0.105	0.057	-0.502	0.391	-0.795**	0.348	-0.380	-0.082	-0.0196	0.285	0.542
			-0.133	0.080	-0.376	-0.334	-0.596	0.140	-0.307	0.054	-0.067	0.058	0.375
Percentage of stigma exsertion	GP	0.104	-0.901**	0.437	0.498	-0.984**	0.455	0.179	-0.445	-0.845**	-0.905**	-0.353	-0.182
			-0.784**	0.295	0.442	-0.812**	0.338	0.226	-0.264	-0.698*	-0.634*	-0.225	-0.137
Percentage of panicle exsertion	GP			-0.195	-0.291	0.816**	0.376	-0.383	0.256	0.918**	0.911**	0.344	0.002
				-0.183	-0.261	0.702*	0.344	-0.226	0.114	0.581	0.562	0.245	-0.069
Angle of opened florets	GP				0.148	-0.397	-0.246	0.666*	0.440	-0.298	-0.175	-0.178	-0.252
					0.129	-0.265	-0.161	0.367	0.183	-0.271	-0.199	0.037	-0.230
Stigma length	GP					-0.265	0.572	0.010	-0.222	-0.050	-0.126	-0.262	-0.437
						-0.270	0.551	0.028	-0.168	0.096	0.015	-0.165	-0.338
Stigma breadth	GP						0.632*	-0.342	0.400	0.916**	0.955**	0.434	0.124
							0.579	-0.269	0.325	0.431	0..512	0.264	-0.039
Stigma surface	GP							-0.163	0.291	0.689*	0.701*	0.035	-0.203
								-0.120	0.123	0.451	0.446	0.055	-0.281
Style length	GP								0.733	-0.020	0.158	0.004	0.283
									0.372	-0.106	-0.005	-0.165	0.052
Anther length	GP									0.208	0.477	0.258	-0.009
										0.191	0.493	0.142	0.131
Anther breadth	GP										0.959*	0.690*	0.312
											0.946**	0.412	0.334
Anther size	GP											0.677	
												0.423	
Filament length	GP												0.988**
													0.535

Table 2 Heritability and Genetic advance of thirteen floral traits in cyto-sterile lines and their maintainers.

Parameters/Traits	Heritability (h^2) (%)		G.A.		G.A. (% of mean)	
	A	B	A	B	A	B
Duration of opening of florets (min)	71.20	57.00	16.33	15.62	50.04	24.21
Angle of opened florets ($O^{o)}$	70.90	66.30	4.63	3.79	18.33	16.41
Percentage of Stigma exsertion	91.70	84.10	22.41	17.22	44.01	32.33
percentage of panicle exsertion	88.20	92.30	9.18	17.34	14.20	19.25
Stigma length (mm)	86.10	86.40	0.42	0.45	29.57	31.47
Stigma breadth (mm)	78.30	50.10	0.14	0.16	32.56	32.65
Stigma surface (mm^2)	72.10	65.90	0.20	0.23	32.78	37.09
Style length (mm)	62.30	60.10	0.21	0.19	20.78	18.45
Anther length (mm)	44.50	60.80	0.12	0.21	6.35	10.77
Anther breadth (mm)	81.40	80.40	0.07	0.15	21.21	34.88
Anther size (mm^2)	51.30	81.70	0.15	0.34	23.80	40.47
Filament length (mm)	44.00	34.90	0.19	0.19	17.92	14.84
Filament length after elongation (mm)	51.90	52.30	0.70	0.73	9.07	9.32

duration of opening of florets, angle of opened florets, percentage of stigma exsertion, stigma breadth, stigma surface, style length, anther breadth and filament length (table-1). Higher estimates of heritability indicate preponderance of additive gene action as suggested for Subramaniam and Rathinam (1984). Higher percentage of heritability was recorded for exserted stigma, spikelet length, anther length, stigma length by Virmani and Athwal (1973) and Singh (1995). Sahoo et al. (1997) observed heritability of over 90% for characters like duration of floret opening, angle of opened florets, percentage of exserted stigma, spikelet length, anther length, stigma length, etc. These earlier findings supported the

present observation. High heritability estimates well observed for stigma length, percentage of panicle exsertion and percentage of stigma exsertion. Present findings contradict the observation made by Virmani and Athwal (1973) in percentage of exserted stigma, stigma length who observed high heritability. Medium to low genetic advance expressed as percentage of mean was observed in present study. Highest values (50.04%) of genetic advance was observed for blooming of florets followed by stigma exsertion, breadth and surface. In general heritability estimates was high for these characters. But to arrive a reliable conclusion high estimates of heritability should be accompanied by high genetic advance (Johnson et al. 1955a). it may be suggested on the basis of present study that characters such as blooming angle, stigma exsertion, stigma breadth, stigma surface, style length, anther breadth and filament length showed high broad sense heritability coupled with medium genetic advance and most of these having high genotypic coefficient of variation, may be advocated for selection as traits – high out-crossing potential.

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