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Variability and character association analysis in rice (*Oryza sativa* L.)

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SUMMARY

Five midland rice varieties namely PKY HMT, SYE-2001, SYE 18-12-10, SYE35-4-16-63 and PKY Khamang were undertaken for the study and experiment was carried out during *Kharif* 2008 to study the estimates of phenotypic (PCY) and genotypic (GCY) coefficient of variation for nine yield attributing characters. The results revealed that number of fil1ed spikelets showed highest positive direct effect on seed yield plant^{-1} followed by hundred seed weight. However, harvest index and biological yield plant^{-1} exerted high negative direct effect on seed yield. Number of filled spikelets showed positive indirect effect on seed yield via plant height hundred seed weight showed negative and harvest index showed positive indirect effect on seed yield through number of tillers. It can be concluded that characters like number of filled spikelets, hundred seed weight, harvest index and biological yield are of utmost importance as these can be considered for improving the seed yield plant^{-1}.

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Key words : Harvest index, Genotypic (PCY) and Genotypic (GCY) coefficient of variation, Number of tillers, Seed yield plant^{-1}

Rice occupies a pivotal place in Indian agriculture, as it is the staple food for 70 per cent of the population. Rice, *the queen of cereals,* is one of the most important cereals that hold the key for food security. Rice is perhaps the oldest domesticated crop and provides 20 % of global human per capita energy and human consumption accounts of 85 % of its total production. Rice occupies largest area among all food crops in India. It is grown in 45 m ha area with a production of more than 93 m t. Rice contributes to 15 per cent annual GDP of India and provides 43 per cent calorie requirement for more than 70 per cent of Indians. Rice (*Oryza sativa* L.) is the world's most important food crop after wheat. It is the staple food and also a major source of livelihood for more than 250 million households. The bulk of Asian population-the urban poor, landless rural population and the marginal farmers spend more than half of their income on rice, being the dominant food staple (Singh *et al.,* 2000). Although, a marked increase in area and productivity has decades, it is still very for level of some other countries. The main reason for low productivity is the lack of high yielding rice varieties adapted to different seasons, cropping systems and agronomic conditions. Thus, there is an urgent need of developing high yielding varieties of rice so that this crop can fulfill its potential in combating the malnutrition prevalent in primarily vegetarian population of our country.

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MATERIALS AND METHODS

Five midland rice varieties namely PKV HMT, SYE-2001, SYE 18-12-10, SYE35-4-16-63 and PKV Khamang were undertaken for the study and experiment was carried out at the Zonal Agricultural Research Station, Sindewahi, Distt. Chandrapur (Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (M.S.) during *Kharif* 2008. The trial was conduced in Randomized Block Design with 3 replications. Observations on five randomly selected plants were recorded on nine yield attributing traits *viz.,* plant height, number of tillers, panicle length, number of filled spikelets, number of unfilled spikelets, hundred seed weight, biological yield plant^{-1}, harvest index and seed yield plant^{-1}.

RESULTS AND DISCUSSION

The estimates of phenotypic (PCV) and genotypic (GCV) coefficient of variation for nine yield attributing characters of midland rice varieties are represented in Table 2. Number of unfilled spikelets showed very high PCV along with high GCV followed by harvest index and seed yield plant^{-1}. Characters like number of filled spikelets, hundred seed weight and plant height also

showed high (>20%) PCV along with high GCV. Number of tillers and panicle length showed moderate (10-20%) and low (<10%) PCV and GCV, respectively. These results are in confirmation with the findings of Rather *et al.* (1998), Verma and Mani (1998) and Ganesan *et al.* (1995). Heritability estimates in broad sense (Table 2)

Table 1: Mean performance of rice varieties for 9 yield attributing characters

Source of variation	Mean sum of squares		
	Replication DF:2	Treatment DF:4	Error DF:8
Plant height (cm)	1203.59	1183.81	43.52
Number of tillers	0.69	3.48	0.52
Panicle length (cm)	0.69	8.87	2.84
Number of filled Spike1ets	12012.00	90809.08	18583.70
Number of unfilled spike1ets	8271.37	111583.31	5296.79
Hundred seed weight (g)	0.04	0.81	0.01
Biological yield per plant (g)	299.57	153030	52.38
Harvest index (%)	81.84	537.85	19.84
Seed yield per plant (g)	3.41	68.81	9.48

Table 2 : Genetic parameters of nine yield attributing characters in rice varieties

Characters	Mean	Min	Max	PCV (%)	GCV (%)	Heritability
Plant height (cm)	94.01	82.87	128.73	21.89	20.74	89.7
Number of tillers	8.45	7.07	10.07	14.56	11.75	65.2
Panicle length (cm)	22.57	21.20	24.80	9.76	6.28	41.4
Number of filled spikelets	540.08	252.20	71 7.40	38.24	28.73	56.4
Number of unfilled spikelets	312.43	156.60	647.50	64.59	60.25	87.0
Hundred seed weight (g)	2.03	1.19	2.62	26.14	25.36	94.2
Biological yield per plant (g)	39.85	30.84	47.14	23.27	14.55	39.1
Harvest index (%)	29.04	731	40.38	47.77	45.24	89.7
Seed yield per plant (g)	11.36	2.95	14.74	47.60	39.13	67.6

Table 3: Phenotypic and genotypic correlation coefficients in 9 yield attributing characters of midland rice varieties

Characters		PH	NT	PL	NFS	NUFS	HSW	BYP	HI	SYP
Plant height (cm)	G	1.000	-.002	0.845	0.759	-0.604	0.138	0.704	0.209	0.527
	P	1.000	0.045	0.619	0.610	-0.482	0.156	0.578	0.141	0.507
Number of tillers	G		1.000	-.301	-0.802	0.791	0.967**	-0.353	0.922*	-0.988**
	P		1.000	0.125	-0.366	0.775	0.855	-0.465	-0.783	-0.514
Panicle length (cm)	G			1.000	0.616	-0.694	0.164	-0.396	0.529	0.387
	P			1.000	0.665	-0.315	0.166	0.341	0.366	0.554
Number of filled spikelets	G				1.000	-0.135	0.797	0.026	0.800	0.976*
	p				1.000	-0.743	0.649	0.430	0.687	0.951*
Number of unfilled spikelets	G					1.000	-0.902*	-0.215	-0.888*	0.931 *
	P					1.000	-0.838	0.055	-0.811	-0.793
Hundred seed weight (g)	G						1.000	-0.323	0.945*	0.938*
	P						1.000	-0.132	0.878	0.803
Biological yield per plant (g)	G							1.000	-0.560	-0.123
	P							1.000	-0.297	0.330
Harvest index (%)	G								1.000	0.909*
	P								1.000	0.761
Seed yield per plant (g)	G									1.000
	P									1.000

* and ** indicate significance of values at P=0.05 and 0.01, respectively

Table 4 : Genotypic path-coefficients in 9 yield attributing characters of midland rice varieties

Characters	PH	NT	PL	NFS	NUFS	HSW	BYP	HI
Plant height (cm)	-0.161	0.001	0.020	0.674	0.053	0.097	-0.071	-0.084
Number of tillers	0.001	0.171	-0.007	-0.711	-0.070	-0.744	-0.036	0.409
Panicle length (cm)	-0.136	-0.051	0.024	0.547	0.061	0.114	0.040	-0.212
Number of filled spikelets	-0.122	-0.137	0.015	0.887	0.100	0.555	-0.003	-0.320
Number of unfilled spikelets	0.097	0.135	-0.016	-1.007	-0.088	-0.629	0.022	0.355
Hundred seed weight (g)	-0.022	-0.182	0.004	0.707	0.079	0.697	0.033	-0.378
Biological yield per plant (g)	-0.101	-0.113	0.060	-0.009	0.023	0.019	-0.225	0.224
Harvest index (%)	-0.034	-0.175	0.013	0.710	0.078	0.659	0.057	-0.400

Residual= 0.0231

were high for hundred seed weight plant height, moderate for seed yield number of tillers and number of filled spikelets. It was low for the rest of the characters. Similar results were obtained by Patil *et al.* (1993), Chaudhary *et al.* (1980). The seed yield plant^{-1} exhibited highly significant and positive genotypic correlation (Table 3) with number of filled spikelets hundred seed weight number of unfilled spikelets and harvest index whereas number of tillers was the only character which showed highly significant but negative association with seed yield plant^{-1}. Characters, hundred seed weight and numbers of tillers were the only characters which showed highly significant but positive association with harvest index but number of unfilled spikelets was the only character which showed highly significant and negative association. Likewise number of tillers showed positive and significant association and number of unfilled spikelets showed negative and significant association with hundred seed weight. Shivani and Reddy (2000) and Sing *et al.* (2000) also reported the similar pattern of the association among the characters. The direct and indirect effects for nine characters are represented in Table 4. The results revealed that number of filled spikelets showed highest positive direct effect on seed yield plant^{-1} followed by hundred seed weight. However, harvest index and biological yield plant^{-1} exerted high negative direct effect on seed yield. Number of filled spikelets showed positive indirect effect on seed yield via plant height hundred seed weight showed negative and harvest index showed positive indirect effect on seed yield through number of tillers. Likewise, number of unfilled spikelets showed negative and harvest index showed positive indirect effect on seed yield plant^{-1} through hundred seed weight. Similar results were also recorded by Ganesan *et al.* (1995) Singh *et al.* (2000) and Shivani and Reddy (2000). Thus it can be concluded that characters, number of filled spikelets, hundred seed weight, harvest index and biological yield are of utmost importance as these can be considered for improving the seed yield plant^{-1}

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