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PERFORMANCE, VARIABILITY, CORRELATION AND COHERITABILITY ESTIMATES IN RAJMASH

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ABSTRACT

Thirteen genotypes of rajmash (*Phaseolus vulgaris* L.) were assessed for variability, correlation and coheritability for yield and its attributes. The investigation revealed that among the genotypes PDR 90-18 was the highest yielder. The variability in days to flowering and pod length appeared mainly due to genotypic differences. High heritability estimates were recorded for days to flowering, pod length and seeds/pod. Additive gene effects were important in inheritance of days to flowering and seeds/pod, while nonadditive gene effects were important for remaining traits. Yield/plant showed high positive correlations with seeds/pod. Pod length and seeds/pod had higher coheritability with yield.

Key words: Variability, correlation, coheritability, rajmash.

Improvement of yield in rajmash (*Phaseolus vulgaris* L.) requires a knowledge of the magnitude of variation in available germplasm, interdependence of quantitative characters with yield, extent of environmental influence on these factors and the heritability of genotypic material. Since inheritance of yield and its components and their interdependence have not been assessed [1, 2] in detail, an experiment was conducted on these aspects.

MATERIALS AND METHODS

The experiment was conducted during the rabi season of 1994–95 at Keonjhar with 13 cultivars (PDR 14, DPR 90-6, PDR 90-18, DPR 90-14, PDR 90-8, HUR 139, HUR 141, HUR 142, HUR 15, HUR 131, HUR 133, VL 63 and Red Cloud) of rajmash in randomised block design with three replications. The seeds were sown on 28.12.94 in plot of 8.4 m^2 with 30 x 20 cm spacing. Observations were recorded from 10 random plants on 8 characters. Days to 50% flowering was recorded on plot basis. Analysis of variance was done [3] and the phenotypic and genotypic coefficients of variation, heritability in broad sense, phenotypic and genotypic correlations and coheritability were computed [4] along with genetic advance [5].

RESULTS AND DISCUSSION

PERFORMANCE OF GENOTYPES

The genotypes exhibited significant differences for the traits such as plant height, branches/plant, pod length, seeds/pod, 100-seed weight, days to 50% flowering and yield/plant (Table 1). Plant height and branches/plant were maximum in PDR 14 and minimum in DPR 90-6 and HUR 141. HUR 142 had early flowering and maximum pod length. PDR 90-18 produced maximum seeds/pod, resulting in the highest yield/plant among the genotypes. HUR 131 recorded maximum 100-seed weight and was recognized as the 2nd highest yielder.

Table 1. Performance of rajmash genotypes at Keonjhar

Genotype	Plant height (cm)	Branches per plant	Days to 50% flowering	Pods per plant	Pod length (cm)	Seeds per pod	100-seed weight (g)	Yield per plant (g)
PDR 14	53.6	7.4	51.3	15.8	5.6	3.1	39.0	18.3
DPR 90-6	42.5	6.5	45.3	12.1	5.8	3.1	36.5	12.3
PDR 90-18	43.4	6.3	45.3	12.5	6.1	7.2	39.8	35.0
DPR 90-14	47.1	6.5	44.1	9.6	7.2	2.9	40.7	11.3
PDR 90-8	40.1	5.9	44.3	11.7	5.9	3.8	42.8	18.0
HUR 139	47.0	6.0	44.7	12.0	7.4	3.4	39.3	15.7
HUR 141	48.4	5.6	44.3	10.3	7.3	3.6	40.9	15.0
HUR 142	49.0	6.2	43.7	13.1	7.6	3.2	43.8	16.3
HUR 15	47.5	6.7	47.3	13.8	6.0	3.1	34.5	14.0
HUR 131	50.1	6.7	45.0	12.4	6.7	3.7	47.2	22.3
HUR 133	49.1	6.0	46.3	11.3	6.8	3.1	46.1	15.3
VL 63	42.9	6.7	47.7	11.5	5.9	3.5	39.1	18.0
Red Cloud	49.1	6.8	48.0	12.8	6.5	2.9	44.0	14.0
C.D. (0.05)	5.3	0.8	1.1	NS	0.5	0.9	5.4	9.1

NS—Not significant.

GENETIC PARAMETERS

It is evident (Table 2) that all the traits except branches/plant and pod length exhibited wide range of variability. The phenotypic and genotypic variances were maximum for yield/plant and minimum for branches/plant. The PCV had higher estimate than

Table 2. Genetic parameters of variation for yield and its attributes in rajmash

Character	Range	Mean	Phenotypic variance	Genotypic variance	PCV (%)	GCV (%)	Heritability (%)	Genetic advance	Genetic advance (% of mean)
Plant height (cm)	42.5–43.6	47.6	16.5	6.7	8.5	5.4	40.6	3.4	7.2
Branches/plant	5.6–7.4	6.4	0.4	0.2	9.8	6.1	38.5	0.5	7.7
Days to 50% flowering	43.7–51.3	46.0	4.7	4.3	4.7	4.5	91.7	4.1	8.9
Pod length (cm)	5.6–7.6	6.5	0.5	0.5	11.3	10.3	83.3	1.3	19.3
Seeds/pod	2.9–7.2	3.6	1.5	1.2	33.8	30.7	82.9	2.1	57.5
100-seed weight (g)	34.5–47.2	41.1	20.0	9.9	10.9	7.7	49.6	4.6	11.1
Yield/plant (g)	11.3–35.0	17.4	55.8	26.6	43.0	29.7	47.6	7.3	42.2

corresponding GCV for all the characters. The small difference between PCV and GCV for days to flowering and pod length indicate that the variability was primarily due to genotypic differences. On the contrary, environmental influences were predominant for the remaining traits. Further, low PCV and GCV for days to flowering indicated less scope of its selection.

The heritability estimates were higher for days to flowering, pod length and seeds/pod and low for plant height, branches/plant, 100-seed weight, and yield/plant.

The genetic advance and expected genetic advance (as % of mean) was maximum for yield/plant and seeds/pod and minimum for pod length and plant height.

High heritability alone does not guarantee large gain from selection unless sufficient genetic advance (GA) attributable to additive gene action is present. High heritability coupled with high GA observed for seeds/pod and high heritability with moderately high GA for pod length indicate additive gene effects. High heritability combined with low GA for days to flowering, low heritability with high GA for yield/plant and low heritability with low GA for branches/plant offer less scope for selection, as they were more influenced by environment and accounted for nonadditive gene effects [6].

CORRELATIONS

Yield/plant showed high positive correlations (phenotypic and genotypic) with seeds/pod (Table 3). Branches/plant was positively correlated with days to flowering and plant height, pod length with 100-seed weight and plant height, seeds/pod with 100-seed

Table 3. Phenotypic (P) and genotypic (G) correlations for different character pairs in rajmash

Characters		Branches per plant	Pod length	Seeds per pod	100-seed weight	Days to 50% flowering	Plant height
Yield/plant	P	0.06	-0.13	0.81	0.35	0.03	0.02
	G	0.02	-0.30	1.05	-0.11	-0.06	-0.41
Branches/plant	P		-0.38	-0.20	-0.15	0.61	0.05
	G		-0.76	-0.14	-0.28	1.00	0.37
Pod length	P			-0.10	0.32	-0.57	0.20
	G			-0.20	90.50	-0.66	0.21
Seeds/pod	P				0.04	-0.16	-0.20
	G				-0.11	-0.22	-0.57
100-seed weight	P					-0.20	0.40
	G					-0.31	0.51
Days to 50% flowering	P						0.29
	G						0.36

weight (phenotypic), 100-seed weight and days to flowering with plant height. Other correlations were negative. All positive correlations exhibited higher genotypic correlations than the corresponding phenotypic correlations except yield/plant with its components, possibly due to the modifying effect of environment on association of characters at genic level [7, 8].

COHERITABILITY

Coheritability indicates the simultaneous inheritance of traits. The coheritability estimates (Table 4) of character combination of various traits with yield/plant revealed that pod length and seeds/pod had higher coheritability with yield/plant. This suggests that

Table 4. Estimates of coheritability for different character pairs in rajmash

Characters	Branches per plant	Pod length	Seeds per pod	100-seed weight	Days to 50% flowering	Plant height
Yield/plant	0.10	1.45	0.81	-0.15	-1.52	-8.09
Branches/plant		1.13	0.41	0.80	0.98	3.24
Pod length			1.62	1.02	1.02	0.60
Seeds/pod				-1.62	1.20	1.65
100-seed weight					1.08	0.57
Days to 50% flowering						0.76

selection for either of these attributes may result in simultaneous selection for other coinherited characters [9]. Further, smaller magnitude of coheritability estimates are expected due to high magnitude of environmental variances, thus resulting in poor response to selection. High coheritability values were observed for branches/plant with all the traits except seeds/pod, pod length with all characters, seeds/pod with plant height and days to flowering, 100-seed weight with all the traits and days to flowering with plant height.

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