Madras Agric. J. 88 (10-12) : 629-632 October-December 2001

https://doi.org/10.29321/MAJ.10.A00389

Genetic parameters correlations and path analysis among yield and yield characters in ricebean *(Vigna umbellata*(Thunb.) Ohwi and Ohasi)

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Abstract: The range of variation for ten characters indicated wide differences among thirty genotypes of Ricebean. The phenotypic and genotypic coefficients of variation were high for number of clusters/plant, grain yield/plant, number of pods/plant and 100 seed weight. These characters also exhibited high heritability and high genetic advance as per cent of mean indicating that the characters are under the control of additive genes. The grain yield showed positive and significant correlation with plant height, number of branches/plant, number of clusters/plant, numbers of pods/plant, pod length and 100 seed weight. Path analysis indicated that numbers of pods/plant, 100 grain weight, number of seeds/pod, pod length, plant height and number of branches/plant could be considered as reliable variables for further crop improvement in ricebean. (*Key words: Rice bean, Variability, Correlation, Path analysis).*

Ricebean *(Vigna umbellata* (Thunb.) Ohwi and Ohasi), a minor pulse crop of India is a native of South and South East Asia. The crop is cultivated mainly in the tribal areas of Eastern and North Eastern India (Arora *et al.* 1980) and to some extent in West Bengal, Orissa and Bihar where it is grown for both food and fodder. The grain yield of the crop is higher in comparison to mungbean and urdbean. Moreover, it is relatively less susceptible to pests and diseases, particularly yellow mosaic virus and has wide climatic adaptability and tolerance to drought. The crop is generally photo sensitive, shattering with semi determinate to indeterminate growth habit. The seed protein content is found to vary between 14 and 24 per cent and nutritionally it is comparable to other Indian pulses like mungbean, urdbean etc.

Being a comparatively new and under exploited pulse crop, information on its variability among various parameters has been lacking in this crop. So, an attempt was made to generate information on variability among various parameters, to study the associations between seed yield and its components and to understand the extent and nature of direct and indirect effects of yield components by path analysis so that the information could be utilized for crop improvement programmes in rice bean.

Materials and Methods

A trial with 30 genotypes of ricebean of diverse origin was conducted at the experimental farm of the Regional Agricultural Research Station, Shillongani, Nagaon. The 30 genotypes of rice bean were evaluated in a randomized block design with three replications during *kharif,* 1994-95. Observations were recorded on 10 plants at random in each replication. The characters studied were plant height (cm), number of branches /plant, number of clusters /plant, number of pods /plant,

Table 1. Variability estimates for 10 characters in rice bean

Characters	Mean	Range	PCV	GCV	GA	GA as % of mean	Heritability (h^2) %
Plant height (cm)	58.29	37.60-83.70	22.13	21.58	25.27	43.35	95.13
Number of branches/plant	2.42	1.33-3.47	24.81	22.65	1.03	42.56	83.33
Number of cluster-s/plant	10.14	4.43-19.80	37.04	36.84	7.65	75.44	98.93
Number of pods/plant	30.31	14.40-48.40	29.22	28.21	17.01	56.12	93.24
Pod length (cm)	9.80	6.57-11.47	10.46	10.36	2.08	21.22	98.09
Number of seeds/pod	8.21	6.87-9.30	8.44	8.26	1.37	16.69	95.83
100-seed weight (g)	7.23	3.21-13.20	26.83	26.77	3.97	54.91	99.47
Grain yield (g) plant	18.14	6.73-31.30	35.61	34.41	12.42	68.46	93.36
Days to 50% flowering	52.92	46.33-61.67	7.45	7.37	7.96	15.04	97.88
Days to maturity	5.34	88.33-106.00	4.34	4.31	8.39	8.80	93.37

Table 2. Phenotypic (P) and genotypic (G) correlation coefficients between different characters in ricebean

Characters		No. of branches/ plant	No. of clusters/ plant	No. of pods/ plant	Pod length (cm)	No. seeds/ pod	100 seed weight(g)	Grain yield (g/plant)	Days to 50% Flowering	Days to maturity
Plant	P	0.663**	0.187	0.466**	0.185	-0.094	0.132	0.407*	0.062	-0.073
height(cm)	G	0.737**	0.193	0.483**	0.187	-0.098	0.133	0.419*	0.067	-0.069
No. of Branches/	P		0.145	0.43 1*	0.201	-0.090	0.133	0.394*	0.079	-0.180
plant	G		0.160	0.476**	0.217	-0.108	0.144	0.432*	0.103	-0.200
No. of	P			0.757**	0.442*	0.362*	0.028	0.705**	-0.222	-0.326
clusters/plant	G			0.785**	0.453*	0.372*	0.027	0.710**	-0.221	-0.336
No. of	P				0.329	0.150	-0.082	0.725**	-0.239	-0.357
pods/plant	G				0.343	0.173	-0.083	0.750**	-0.247	-0.371*
Pod length (cm)	P					0.530**	0.074	0.483**	0.018	-0.269
	G					0.543**	0.075	0.489**	0.020	-0.270
No. seeds/pod	P						-0.234	0.194	-0.157	-0.287
	G						-0.239	0.201	-0.158	-0.294
100 seed weight	P							0.546**	0.661**	0.518**
(g)	G							0.550**	0.673**	0.525**
Grain yield	P								0.212	-0.065
(g/plant)	G								0.213	-0.064
Days to 50%	P									0.617**
Flowering	G									0.633**

Significant at 5% level; ** Significant at 1% level

Table 3. Direct (diagonal) and Indirect effects as partitioned by path analysis

Characters	Plant Height (cm)	No. Branches/ Plant	No.of clusters/ plant	No. of pods/ plant	Pod length (cm)	No.of Seeds/ pod	100 seed weight(g)	Days to 50% flowering	Days to maturity	Genot-ypic correlation with yield
Plant height (cm)	-0.017	-0.031	-0.007	0.374	0.014	-0.017	0.093	0.002	0.008	0.419*
No.of branches/plant	-0.012	-0.042	-0.006	0.369	0.016	-0.019	0.101	0.003	0.023	0.432*
No. of clusters/plant	-0.003	-0.007	-0.037	0.608	0.034	0.064	0.019	-0.006	0.038	0.710**
No. of pods/plant	-0.008	-0.020	-0.029	0.775	0.026	0.030	-0.058	-0.007	0.042	0.750**
Pod Length (cm)	-0.003	-0.009	-0.017	0.266	0.076	0.093	0.052	0.001	0.030	0.489**
No. of Seeds/pod	-0.002	0.005	-0.014	0.134	0.041	0.172	-0.167	-0.004	0.033	0.201
100 seed weight(g)	-0.002	-0.006	-0.001	-0.064	0.006	-0.041	0.699	0.019	-0.059	0.550**
Days to 50% flowering	-0.001	-0.004	0.008	-0.191	0.002	-0.027	0.471	0.028	-0.071	0.213
Days to Maturity	-0.001	0.009	0.012	-0.288	-0.020	-0.051	0.367	0.018	-0.112	-0.064
Residual effect:	0.106									

od length (cm), number of seeds/ pod, hundred eed weight (g), days to 50 % flowering, days) maturity and grain yield (g) /plant. Genotypic nd phenotypic coefficients of variations (GCV nd PCV) (Burton, 1952), heritability in broad ense (Lush, 1940) and genetic advance (GA) Johnson *et al.* 1955) were estimated. Phenotypic nd genotypic correlations were worked out ccording to Falconer (1964). Path coefficients ere worked out as suggested by Dewey and u (1959).

esults and Discussion

Significant differences among the ricebean enotypes suggested the presence of high variability for all the ten characters under study (Table 1). In general, the magnitude of PCV was higher than that of GCV for all the characters indicating the influence of environmental factors on these characters. The highest value of PCV was noticed for number of clusters/plant followed by grain yield (g) /plant, number of pods/plant and 100 seed weight (g). The minimum PCV was noticed for days to maturity, days to 50% flowering and number of seeds/pod. The GCV was highest for number of clusters/plant followed by grain yield (g)/plant, number of pods/plant and 100 seed weight as in the case of PCV. This suggests that selection based on these characters would facilitate successful isolation of desirable types. Similar findings were earlier reported by Dushyantha Kumar and Sambulinggappa (1994) for different characters in ricebean and by Lokesha and Veeresh (1993) for plant height, cluster number and pod and seed weight in some ricebean mutants.

The GCV alone is not sufficient for the determination of the extent of heritable variation. Button (1952) suggested that GCV together with heritability estimates would give a better picture of the extent of advance that can be made through selection. In the present study, high heritability was observed for all the characters. The characters *viz.* number of clusters/plant, grain yield (g) / plant and number of pods/plant which had high GCV along with high heritability could be improved through simple mass selection. High heritability estimates for plant height, total pods/ plant, cluster number and seed weight was earlier reported by Lokesha and Veeresh (1993).

According to Johnson *et* al. (1955), higher heritability along with high genetic advance render the selection effective as these characters are under the control of additive gene action. The genetic advance as percent of mean was highest for number of clusters/plant followed by grain yield (g) /plant, number of pods/plant and 100 seed weight. These characters also recorded high heritability estimates. This confirms the findings of Lokesha and Veeresh (1993). The characters pod length, number of seeds/pod, days to 50% flowering and days to maturity recorded high heritability but low genetic advance as per cent of mean. These characters are most probably governed by non-additive genes and thus could be improved through some indirect selection methods.

The genotypic correlation coefficients were, in general slightly higher than the phenotypic correlation coefficients (Table 2). Grain yield was significantly and positively correlated with plant height, number of branches/plant, number of clusters/plant, number of pods/plant, pod length and 100 grain weight at both genotypic and phenotypic levels. Positive but non-significant correlation was noticed with number of seeds/ pod and days to 50% flowering. Grain yield had negative but non-significant correlation with days to maturity. Sharma and Hore (1994) also reported significant and positive correlation of grain yield with number of pods, seeds/pod, plant height and pod length at phenotypic level in ricebean.

Among yield components, significant and positive correlation were observed between plant height and number of branches/plant and number of pods/plant, between number of branches/plant and number of pods/plant, between number of clusters/plant and number of pods/plant, pod length and number of seeds/pod, between number of pods/plant and days to maturity at genotypic level, between pod length and number of seeds/ pod, between 100 seed weight and days to 50% flowering and days to maturity. Similar findings have earlier been reported by Gadekar *et al.* (1990) and Sharma and Hore (1994).

The cause and effect relationship as indicated by direct and indirect effects of component traits on grain yield were studied by path coefficient analysis. Among the yield components, number of pods/plant exerted the highest positive direct effect on grain yield followed by 100 grain weight, number of seeds/pod and pod length (Table3). These findings are in conformity with the findings of Sharma and Hore (1994). The direct effect of days to maturity on grain yield was negative suggesting thereby that high grain yield is not necessarily associated with late maturity. Number of clusters/plant had high positive correlation with grain yield, but the direct effect of this character on grain yield was negative but very

negligible. The indirect effects of plant height, number of branches/plant, number of clusters/ plant, pod length and number of seeds/pod via number of pods/plant was high and positive. Thus it can be inferred that number of pods /plant, plant height, number of branches/plant, pod length and number of seeds/pod could be considered as reliable variables for further crop improvement in ricebean.

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(Received : September 1999; Revised: October 2001)

Madras Agric. J. 88 (10-12) : 632-635 October-December 2001

Standardisation of seed processing methods for hybrid rice

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Abstract: Standardisation of seed processing methods for hybrid rice was carried out at Department of Seed Science and Technology, TNAU Coimbatore. Considering, the high seed recovery and seed quality, 1.7 mm sieve can be used for size grading of TNRH-16 and TNRH-17 rice hybrids and 1.6 mm sieve for CORH-1 hybrid. Specific gravity separation of size graded seeds into four density grades showed the superiority of heavy, medium and light seeds over very light seeds in terms of seed quality parameters. Among the hybrids, CORH-1 showed its superiority in respect to seed quality over TNRH-16 and TNRH-17. *(Key words: Hybrid rice, Size grading, Density grading, Quality parameters).*

Availability of quality seed is one of the major constraints in increasing the productivity of agricultural crops. Among the seed quality attributes seed size and weight (density) are most important. The cleaner-cum-grader separates the seed on the basis of seed size by making use of different sieve sizes. However, this grader will not separate entirely the illfilled light seeds from the matured heavy seeds. This can be achieved in a specific gravity separator, where the heavy seeds irrespective of their size are separated from the lighter ones.

Materials and Methods

The bulk seeds of three hybrids *viz.* CORH-1, TNRH-16 and TNRH-17 were precleaned, dried to 12% moisture content and graded with 1.7 mm and 1.6 mm oblong sieves. The different fractions of seeds retained in 1.7 mm and 1.6 mm sieves and passed in 1.6 mm sieve were subjected to seed quality parameters *viz.* germination, drymatter production and vigour index. The vigour index of seedling was computed using the following formula suggested by Abdul– Baki