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Genetic variability for yield and its component traits in upland rice

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Abstract

This study consisted of 33 genotypes including two checks i.e. HPR 1156 and HPR 2656 evaluated in a Randomized Block Design with three replications for various yield traits. Analysis of variance revealed significant differences among the genotypes for all the traits studied and presence of considerable amount of genetic variability for all the traits studied. High heritability coupled with moderate genetic advance and moderate phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) was observed for panicle length, grains/panicle, yield/plant, yield/plot indicated the presence of additive gene action and sufficient variability scope for improvement through selection. On the basis of mean performance for different traits studied *viz*., HPR 2846, HPR 2875, HPR 2839, HPR 2866, HPR 2867 and HPR 2885 were the best genotypes for yield and other yield contributing traits which may be used for the further rice breeding programme.

Keywords: Rice, genetic advance, genetic variability, upland rice, heritability

Introduction

Rice *(Oryza sativa* L.) is one of the major food crops of world especially of the Asian countries like China, India, Pakistan, Bangladesh, Vietnam, and Korea. It is placed on second position in cereal production around the globe and is the staple food of Asia. More than 90% of the world's rice is grown and consumed in Asia, where 60% of the world's population lives. Rice is grown worldwide over an area 160.6 million hectares with total production of 492.2 million tones. Area under rice in India is 42.2 million hectares with production of 104 million tones (Anonymous 2016). It is a staple food for majority of the population of Himachal Pradesh where it is cultivated on an area of about 77 thousand hectares with production of 131.6 thousand metric tons with productivity of 17.05 quintals/hectare (Anonymous 2016). It is grown under various agro-climatic conditions ranging from foot-hills to an altitude as high as 2200 m above mean sea level. As a result of the great diversity of agro-climatic conditions under which rice is cultivated in Himachal Pradesh, there is a great variability in land races present in the crop and a large number of local as well as improved cultivars are available for cultivation Due to scarcity of water and unpredictable rainfall, less availability of agricultural labour and due to hilly terraces in Himachal Pradesh there is less retention of water in rice field. So it is important to develop upland/rainfed rice cultivars for direct sowing. For an effective crop improvement programme, availability of wide range of variability in the genotypes of particular plant species is the basic requirement. It is desirable to understand the nature and magnitude of genetic variability present in a particular material and the methods to make best possible use of this variability.

The investigation was carried out on 31 advance breeding lines at Rice and Wheat Research Centre, Malan, and 2 checks namely, HPR-1156 and HPR-2656. These lines were evaluated in Randomized Block Design with three replications. The observations were recorded on five randomly taken plants from each plot for days to 50% flowering, plant height, panicle length, grains/panicle, spikelets/panicle, yield/plant, 1000-grain weight, grain length, grain breadth, L:B ratio, protein content, aroma, yield/plot (with plot size of 3.50 x,1.20 m), reaction to leaf and neck blast. The data was statistically analyzed as per the procedure given by Panse and Sukhatme (1985). The genotypic, phenotypic and environmental coefficients of variation were estimated following Burton and De Vane (1953). The expected genetic advance (GA) resulting from the selection of 5 per cent superior individuals was calculated as per Burton and De Vane (1953) and Johnson *et al*., (1955).

The analysis of variance revealed significant differences among the genotypes for all the traits studied indicating the presence of wide range of variability in respect of days of 50% flowering, plant height, panicle length, grains/

panicle, spikelets/panicle, yield/plant, 1000-grain weight, grain length, grain breadth, L:B ratio and yield/plot. So the present investigation revealed sufficient variability for yield and morphological character studied. Earlier Parsad *et al.,* (2013) and Singh *et al.,* (2014) reported significant variability for yield and related traits in their studies. An assessment of variability parameters revealed that there was a lot of variation among the genotypes. In general, values of phenotypic coefficient of variation (PCV) were higher than their respective genotypic coefficient of variation (GCV) indicating considerable influence of environment on the performance of genotypes.

In the present study (Table 1), PCV and GCV were lower for days to 50% flowering, plant height, yield/plant, 1000-grain weight, grain length, grain breadth and L:B ratio coupled with high to moderate heritability and low genetic advance indicating that improvement for such traits is very limited. However, these characters can be improved by hybridization. Similar results were reported by Panwar (2005) for low PCV and GCV; Madhavilatha *et al.,* (2005) for low genetic advance and high heritability. PCV and GCV were moderate for panicle length, grains/panicle, spikelets/panicle and yield/plot coupled with higher to moderate heritability and low to moderate genetic advance indicates that these traits can further be improved through selection because of the prevalence of additive gene action. Similar results were recorded by Patil and Sarawagi (2005), who observed moderate PCV and GCV, heritability and genetic advance for grains/panicle.

Table 1: Estimates ofw parameters of variability for different traits in rice genotypes

Traits	Mean	S.E(m)	Range	PCV (%)	GCV (%)	Heritability h^2bs (%)	Expected GA (as percentage of mean)
Days to 50% flowering (No.)	86.780	±0.400	76.00-92.00	6.187	6.136	98.338	12.534
Plant height (cm)	98.102	±1.119	86.70-113.50	6.820	6.527	91.608	12.870
Panicle length (cm)	25.047	±0.334	21.78-28.68	6.166	5.735	86.508	10.988
Grains/panicle (No.)	108.206	±4.610	70.30-150.50	20.242	18.849	86.710	36.157
Spikelets/panicle (No.)	142.133	±8.650	85.20-210.67	25.281	24.071	90.656	47.213
Yield/plant (g)	10.495	±0.440	6.40-14.40	16.813	15.196	81.694	28.294
1000-grain weight(g)	26.568	±0.680	19.67-33.54	9.941	8.899	80.139	16.411
Length of grain (mm)	5.820	±0.110	5.80-7.91	5.809	5.097	77.011	9.215
Breadth of grain (mm)	2.360	±0.070	1.24-2.45	9.011	6.898	58.604	10.879
L:B ratio	3.554	±0.100	3.00-4.23	9.954	9.138	84.272	17.280
Protein content (%)	8.410	±0.100	6.05-12.06	12.643	12.468	97.252	25.328
Yield/plot (Kg)	0.923	±0.017	0.57-1.31	18.109	16.710	85.150	31.765

References

A.O.A.C.1965. Official Method of Analysis of Association of Official Analytical Chemists. 6th Edition. Washington, D C

Anonymous 2016 Economic Survey of Himachal Pradesh. Economic and Stastical Department. Government of Himachal Pradesh

Anonymous 2016. F. A. O. Statistical Year Book

Burton GW and De Vane EW. 1953. Estimating heritability in tall fescue (*Festuca arundinacea*) from replicated clonal material. *Journal of Agronomy* 45:478-481

Johnson HW, Robinson HF and Comstock RE . 1955. Estimates of genetic and environmental variability in soybean. Journal of agronomy 47:314-318

Madhavilatha L, Sekhar MR, Suneetha Y and Sirinivas T. 2005. Genetic variability, correlation and path analysis for yield and quality traits in rice (*Oryza sativa* L.). *Research on Crops* 6:527-534.

Panse VG and Sukhatme PV. 1985. Statistical Methods for Agricultural Workers. ICAR, New Delhi pp: 359.

Panwar LL. 2005. Genetic variability, heritability and genetic advance for panicle characters in transplanted rice. *Research on Crops* 6:505-508.

Parsad GS, Sujatha M, Rao LV and Chaithanya U. 2013. Studies on variability, heritability and genetic advance for quantitative characters in rice (*Oryza sativa* L.). *Annals of Biological Research* 4:372-375.

Patil PV and Sarawagi AK. 2005. Studies on genetic variability, correlation and path analysis in traditional aromatic rice accessions. *Annals of Plant Physiology* 19:92-95.

Singh A., Singh AK, Shama P and Singh PK. 2014. Characterization and assessment of variability in upland rice collections. *Electronic Journal of Plant Breeding* 5:504-510.