



Research Note

Genetic divergence in rice accessions of hill zone of Karnataka

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Abstract:

Genetic diversity among 39 Local rice genotypes was worked out using Mahalanobis D^2 statistic. On the basis of genetic distance, these genotypes were grouped into eight clusters. Cluster VI was the largest, consisting of 21 genotypes, while clusters I, II, III, IV, and V contained two genotypes each and cluster VI and VIII contained four genotypes each. Grouping of genotypes in different clusters indicated the existence of significant amount of variability among the genotypes for the traits studied. High degree of divergence was recorded between cluster IV and VIII. Based on high mean performance of the traits studied, two clusters (IV & II) which are having local rice genotypes Biliya, Doddabatta, Puttabatta and Onamer danelu may be used as parents in future breeding programme to achieve desirable segregants for tall plant stature, number of panicles per plant, panicle length and high grain yield.

Key words:

Local rice, genetic diversity, clustering pattern.

Rice (*Oryza sativa* L) is cultivated in the hill zone of Karnataka mainly during rainfed situation in *kharif* season as a mono crop in three different topographical situations *viz.*, low, mid and uplands. In view of their local preference, farmers cultivated local cultivars in nearly 30 per cent of the area in this zone. Genetic improvement mainly depends upon the amount of genetic variability present in the population. In any crop, the germplasm serves as a valuable source of base population and provides scope for wide variability. Information on the nature and degree of genetic divergence can help the plant breeder in choosing the right parents for breeding programme (Vivekananda and Subramanian, 1993). Therefore in the present study, 39 local rice genotypes were evaluated to assess the genetic diversity among these genotypes.

The experimental material consisted of thirty nine popular diverse local rice genotypes (collected from hill zone of Karnataka and listed in Table 1.). The experiment was conducted in randomized block design with three replications during *kharif* 2005 under rainfed situation at ZARS, Mudigere, Karnataka. Thirty days old seedlings were transplanted with a spacing of 20 cm and 10 cm between rows and between plants, respectively. All recommended agronomic practices were followed to ensure a normal healthy crop. Observations on different characters (Table 2) were recorded on five randomly selected plants from the two central rows of each plot. Multivariate analysis of Mahalanobis (1936) was carried out (Rao 1952). Grouping of genotypes was done as per the procedure given by Singh and Chaudhary (1977) and used by Maurya and Singh (1977).

The analysis of variances revealed the presence of significant variability among traditional rice

genotypes for all the characters studied. Based on the relative magnitude of D^2 values, 39 genotypes were grouped into eight clusters (Table 1). Cluster VII contains maximum 21 genotypes, Cluster I to V contains a minimum of two genotypes each, Cluster VI and VIII contains four genotypes each. The pattern of group constellations proved that significant amount of variability existed among the genotypes. This was in agreement with the findings of Richharia (1979) who considered Chhattisgarh region of Madhya Pradesh, as a function of variability. The Clustering pattern revealed that the rice genotypes of traditional belt of Western Ghats (hill zone) of Karnataka were distributed in different Clusters. The kind of genetic diversity found among the genotypes belonging to same geographic origin might be due to difference in adoption, selection criteria, selection pressure and environmental condition (Vivekananda and Subramanian, 1993 and Soni *et al.*, 1999).

The intra and inter-cluster distance (Table 2) revealed that the genetic diversity among the genotype in cluster I was Minimum ($D=2.70$), indicating that unidirectional selection practiced in the past might have resulted in uniform features with less divergence between the genotypes. The maximum intra cluster distance ($D=20.09$) was observed in cluster VI. Selection within this cluster might be exercised based on the highest mean for desirable traits. The relative divergence of each cluster from other cluster (Inter cluster distance) indicated high order divergence between cluster IV and VIII ($D=55.60$) followed by clusters IV and VI ($D=45.13$), cluster I and VIII ($D=44.72$) and cluster II and VIII ($D=42.67$). Thus hybridization between genotypes from these clusters will result in maximum hybrid vigor and highest number of useful segregants for traits. Hybridization between genetically distant genotypes to generate promising breeding material has been suggested by many workers like Vivekananda and Subramanian (1993) and Roy and Panwar (1993). There was a wide range of variation in the cluster mean values for most of the characters under study (Table 3). The cluster IV was characterized by long duration, tall plant height, number of panicles per plant, panicle length and high grain yield. Cluster II also exhibited more number of

panicles per plant, panicle length and high grain yield. These two clusters (IV & II) which are having highest mean value for grain yield, panicle number and panicle length and the genotypes with high mean value Biliya, Doddabatta, Puttabatta and Onamedanelu may be used as parents in future breeding programme to achieve desirable segregants for tall plant stature, high number of panicles per plant, panicle length and higher grain yield. Cluster IV & VI were characterized by lowest value for grain yield and panicle length, respectively.

The selection and choice of parents mainly depends upon contribution of characters towards divergence (Nayak *et al.*, 2004 and De and Suriya Rao., 1987). In the present study (Table 4), the plant height (45.07%) followed by grain yield (22.54%) and days to flowering (11.61%) had maximum contributions towards divergence. In addition, panicle length (8.9%) and panicle number per plant (7.29%) also contributed towards total divergence

References :

- De R. N. and Suriya Rao A.V. 1987. Genetic divergence in rice under low land situation. *Crop Improve.*, **14** (2):16-21
- Mahalanobis, P. C. 1936. On the generalized distance in statistics. *Proceed. National Institute of Sci., India.* **2**: 49- 55.
- Maurya, D.M. and Singh, D.P. 1977. Adaptability in Rice. *Indian J Genet.*, **37**:395—402.
- Nayak, A.R., Chaudhury D. and Reddy, J.N. 2004, Genetic divergence in scented rice. *Oryza*, **41**(3&4): 79-82.
- Rao, C. R. 1952. Advanced Statistical Methods in Biometrical Research, John Wiley and Sons, New York.
- Roy, A. and Panwar, D. V. S. 1993, Genetic divergence in rice. *Oryza*, **30**:197-201
- Riccharia, R.H. 1979, An aspect of genetic diversity in rice. *Oryza*, **16**:1-31
- Singh, R.K. and Chaudhary, B. D. 1977, Biometrical methods in quantitative genetics analysis, Kalyani Publication, New Delhi
- Soni, D.K., Sarawagi and Rastogi, N.K. 1999. Genetic divergence in traditional rice accession of Madhya Pradesh, India. *Oryza*, **30**(2):118-120.
- Vivekananda, P. and Subramanian, S. 1993. Genetic divergence in rainfed rice. *Oryza*, **30**, 60-62.

Table 1. Clustering pattern of 39 Local rice genotypes

Cluster No.	Number of rice genotypes	Local rice genotypes
Cluster I	2	Pankaj and P. Doddi
Cluster II	2	Puttabatta and Onamedanelu
Cluster III	2	Kemphasadi and Kirwana
Cluster IV	2	Biliya and Doddabatta
Cluster V	2	Mattalaga and Musali
Cluster VI	4	Akkalu, Bettasanna, Chippiga and Kanakam
Cluster VII	21	Bemmsale, Doddi, Doddiga, Guja Gunda, Holabatta, Honasu, Halugidda, Jaddu batta, Kaggari kirwana, Kempu sannakki, Kesari, Kirshanalila, Masale batta, Nati batta, Neerguli, N.M.Batta, P-kirwana, Siddasali, Togarsi, Udurumallige and Amrutha
Cluster VIII	4	Jalamagna, Jolaga, Makam and Mullugidda

Table 2. Average intra (bold) and inter cluster distances D^2 values

	I	II	III	IV	V	VI	VII	VIII
I	2.70	9.28	6.37	14.41	11.90	34.08	16.07	44.72
II		2.71	8.89	13.53	11.65	33.29	14.89	42.67
III			2.78	18.45	7.34	29.15	13.92	39.42
IV				3.35	23.08	45.13	23.45	55.60
V					3.56	26.08	14.45	35.29
VI						20.09	30.06	19.68
VII							19.04	38.91
VIII								12.98

Table 3. Cluster means of different characters in Local rice genotypes

	Days to Flowering	Plant height (cm)	Panicle No. /Plant	Panicle length (cm)	Grain yield (kg /plot)	Straw yield (kg/plot)
Cluster I	142.33	129.53	5.37	20.70	1.39	2.18
Cluster II	141.67	124.03	5.99	23.27	1.60	2.26
Cluster III	140.00	123.20	5.73	20.73	1.44	1.87
Cluster IV	146.17	140.67	6.03	23.93	1.58	2.17
Cluster V	143.00	113.83	5.73	20.90	1.24	1.83
Cluster VI	125.00	95.12	5.65	19.38	1.28	1.88
Cluster VII	137.97	119.16	5.57	21.90	1.32	1.94
Cluster VIII	121.58	78.52	5.97	20.10	1.44	2.24

Table.4 Relative contribution of different characters to genetic divergence

Character	Percentage of total D^2 values
Days to Flowering	11.61
Plant height(cm)	45.07
Panicle No. /Plant	7.29
Panicle length (cm)	8.91
Grain yield (kg /plot)	22.54
Straw yield(kg/plot)	4.59
Total	100