Indian Res. J. Genet. & Biotech 7(4) : 471 – 473 (2015)

Genetic Diversity for Yield and its component traits in Pearl millet [*Pennisetum glaucum* (L.) R. Br.] Hybrids.

Mukesh kumar[1], Manoj Kumar[1], P.C.Gupta[1], Ravi Kishan Soni[1]

[1]Department of Plant Breeding and Genetics, College of Agriculture, Swami Keshwanand Rajasthan Agricultural University, Bikaner -334006 (Rajasthan)

Received : September 2015; Revised: October 2015; Accepted: October 2015)

Abstract

Twenty six genotypes of pearl millet were studied for genetic divergence analysis utilizing Mahalanobis D^2 technique. The analysis of data revealed that significant difference was observed among the genotypes for all the traits. Based on the genetic distance (D^2 value), the 26 genotypes were grouped into 8 clusters. Of the 8 clusters formed, cluster I and II were the largest with 7 genotypes in each followed by cluster III with 5 genotypes. Cluster IV and VIII had maximum inter cluster distance whereas minimum inter-cluster distance was present between clusters I and cluster VII. The intra-cluster distance was maximum in cluster III followed by cluster II and cluster IV.

Keywords : Pearl millet, D^2 technique, Genetic divergence, Cluster

Introduction

Pearl millet is an important coarse grain cereal crop of dry land agriculture. It is extensively cultivated as a dual purpose crop under large areas in Africa, Asia and Australia while grown as forage crop only in sub-tropics of USA. Globally it ranks 6th cereal crop in importance followed by wheat, rice, maize, barley and sorghum. In India it is fourth most important cereal after crops like rice, wheat and sorghum. Information on genetic diversity analysis helps to identify the genetically diverse genotypes for their use in breeding programmes. Choosing genetically diverse parents will enable the expansion of genetic base and development of superior types and greater success can be achieved through judicious choice of parents for hybridization based on genetic divergence. Moll and Stuber (1971) reported that crossing between divergent parents usually produce greater heterosis than those between closely related ones. Of the several methods available Mahalanobis's generalized distance estimated by D^2 statistic (Rao,1952) is a unique tool for discriminating population considering a set of parameter together rather than inferring from indices based on morphological similarities and polygenic relationship.

Materials and methods

The material for the present investigation comprised 26 genotypes of pearl millet. The experiment was carried out in a Randomized Block Design with three replication at Agricultural Research Station Beechhwal, Bikaner during *kharif*, 2014. Each plot consisted of six rows each of 5.0 meter length. The spacing between row to row was 50 cm and between plant to plant was 15 cm. Normal and uniform cultural operations were followed during the crop

Corresponding authors- e-mail : *manoj.vishnoi108@gmail.com*
Published by the Indian Society of Genetics, Biotechnology Research and Development, Biotech Bhawan 5 E Nikhil state, DPS Road, Shastripuram, Agra 282007, Online management by www.isgbrd.co.in

season to raise a good crop. The observations were recorded on individual plant basis on 10 randomly selected plants from each replication for characters *viz.,* plant height, number of effective tillers per plant, ear length, ear head diameter, 1000-seed weight, harvest index (%), dry fodder yield per plant and grain yield per plant while characters namely days to 50 per cent flowering and days to maturity were recorded on whole plot basis. The collected data was subjected to statistical analysis using Mahalanobis D^2 statistic to assess genetic divergence. The genotypes were grouped on the basis of minimum generalized distance using the Tocher's methods Rao (1952).

Results and discussion

Analysis of variance revealed significant difference among the genotypes for all the characters studied, indicating the existence of wide genetic divergence among them. Based on D^2 values, 26 genotypes were grouped in 8 clusters, indicating the presence of large amount of diversity among the genotypes Table 1. Maximum genotypes (seven) were present in cluster I and II followed by cluster III with five, and cluster IV with three genotypes. Clusters V, VI, VII, and VIII had one genotype showing these genotypes highly divergent from each other. Present study is corroborative with the findings of Savery and Parsad (1995), Mahawar *et al.* (2004) and Vidyadhar and Devi (2007). The intra and inter- cluster D^2 values among the 8 cluster are presented in Table 2. The intra-cluster distance was maximum (8.66) in cluster III followed by cluster II (7.61) and cluster IV (5.86). These results are in agreement to the earlier findings by Vidyadhar and Devi (2007) and Govindaraj *et al*. (2011). The maximum (62.8) inter-cluster distance was observed between cluster IV and cluster VIII and minimum (10.01) inter-cluster distance was present between clusters I and cluster VII. Cluster IV and VIII may be selected for more effective crossing programme and should result in wide spectrum of variability to operate selection in segregating population. Presence of diversity among pearl millet genotypes of the present study is in accordance with earlier reports Yadav (1994) Hepziba et al. (1995).

The existence of diversity among the genotypes was also assessed by the considerable amount of variation in cluster means for different characters Table 3. Based upon the cluster mean performance the cluster VIII had high mean values for plant height (cm), number of effective tillers per plant and test weight (g). While cluster VII had high mean value for ear head length (cm), harvest index (%) and grain yield per plant. Not only this, Cluster VII had low mean values for days to 50 per cent flowering and days to maturity. Cluster V had high mean values for ear head diameter (cm) and dry fodder yield per plant (g). Based upon D^2 values, per cent contribution of different characters towards divergence was obtained. Among the ten characters studied the most important characters contributing to the divergence were days to 50% flowering (46.46%), plant height (19.36%), 1000 grain weight (13.54). These results are in agreement to the earlier findings by Vidyadhar and Devi (2007).

Table 1. Distribution of 26 pearl millet genotypes into different clusters.

Cluster	Number of genotypes	Genotypes
I	7	HHB 197, ICMV 221, HHB 223, HHB 67 Imp, HHB 226, RHB 121, and JBV 2
II	7	GHB 538, GHB 905, Dhanshakti, Raj 171, Pusa Comp. 383, GHB 558 and MPMH 17
III	5	MP 7792, GHB 732, Proagro 9444, RHB 173 and KBH 108
IV	3	Nandi 61, Kaveri Super Boss and GHB 744
V	1	86M86
VI	1	MBC 2
VII	1	HHB 234
VIII	1	RHB 177

Table 2. Average intra and inter-cluster distance based on corresponding D^2 values

Clusters	I	II	III	IV	V	VI	VII	VIII
I	5.42	10.85	23.91	32.54	22.81	12.19	10.01	12.01
II		7.61	13.13	34.08	15.34	14.2	14.67	19.09
III			8.66	25.23	12.47	21.13	33.79	16.63
IV				5.86	18.12	29.08	48.65	62.2
V					0	26.37	30.86	42.88
VI						0	12.4	29.08
VII							0	18.75
VIII								0

Table 3. Mean values of genotypes present in different clusters for different characters

	Characters									
Cluster	Days to 50 % flowering	Days to maturity	Plant height (cm)	No of effective tillers/plant	Ear head length (cm)	Ear head diameter (cm)	Test weight (g)	Harvest index (%)	Dry fodder yield/plant (g)	Seed yield/ Plant (g)
I II	45.57	76.10	147.87	1.33	21.46	2.48	9.08	26.54	22.05	7.90
III	48.62	79.00	159.67	1.29	21.55	2.42	8.16	26.44	24.67	8.76
IV	53.27	83.33	154.57	1.36	20.60	2.32	7.86	20.56	27.27	7.13
V	53.56	83.44	123.17	1.19	20.98	2.68	8.03	14.61	24.67	4.22
VI	43.33	83.67	151.27	1.20	20.73	3.13	8.15	24.45	31.67	10.33
VII	46.33	76.00	133.20	1.60	20.27	2.00	7.00	24.54	26.00	8.33
VIII	43.00	74.00	155.67	1.53	24.73	2.27	8.31	29.61	28.67	12.00
	43.67	74.67	164.47	1.80	21.73	2.33	11.11	27.97	21.67	8.33

References

Rao C.R., 1952 Advanced statistical methods in biometric research. John Wiley and Sons, Inc. New York. 390p.

Moll and Stuber C.W., 1971 Comparison of responce to alternative selection procedures initiated with two population of maize (*Zea mays* L.) *Crop Sci*. **11**:706-711.

Hepziba S.J., Teradimani M., Saraswathi R. and Palanisamy S. 1995 Genetic divergence in pearl millet [*Pennisetum glaucum* (L.) R.Br.]. *Crop Res*. **9**:96-104.

Yadav O.P., 1994 Genetic divergence in pearl millet accessions of Indian and exotic origin . *Indian J. Genet.* **54**:89-93.

Savery M.A. and Prasad M.N., 1995. Genetic diversity in pearl millet *Madras Agric. J.;* **82**: 8-11.

Mahawar R.K., Sharma K. C. and Sastry E.V.D., 2004. Genetic divergence in pearl millet (*Pennisetum glaucum* (L.) R. Br.*). Annals of Agric. Biological Res., **9:** 2, 127-130.*

Vidyadhar B. and Devi I.S., 2007. Evaluation of germplasm for genetic diversity in pearl millet (*Pennisetum glaucum* (L.) R.Br.). *J. Res., Angru*; **35:** 1, 119-123.

Govindaraj M., Selvi, B., Kumar I. and Sudhir 2011b. Genetic Diversity Studies in Indigenous Pearl Millet [*Pennisetum glauccum* (L.) R. Br.] Accessions Based on Biometrical and Nutritional Quality Traits. *Indian J. Plant Genet. Res., vol **24**(2):186-193.*