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GENETIC DIVERGENCE IN RAGI (*Eleusine coracana* L. GAERTN) FOR YIELD OF FODDER*

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Wide genetic diversity among the fifty genotypes of ragi was revealed by D^2 analysis, wherein the fifty genotypes grouped themselves into as many as twelve clusters. The clustering pattern indicated that there was no parallelism between geographical distribution and genetic diversity. The sixteen genotypes of Tamil Nadu were found scattered in different clusters with varying degrees of inter-cluster distances suggesting the availability of wide genetic diversity even within the same ecogeographical region. Fodder yield and leaf/stem ratio contributed the maximum towards the total genetic diversity among the characters taken for the study.

Ragi is one of the potential but unexploited fodder source. It is cultivated in India and wetter parts of Central Africa as a dual purpose crop. Ragi can be cultivated with advantage exclusively for fooder both under irrigation and rainfed conditions. Under irrigation, with proper management, one could expect as much as 12-14 tonnes of green fodder per hectare in about 50-60 days. Five such crops with a total production potential of 60-70 tonnes per hectare could be raised over a period of one year This fooder at the flowering stage is very succulent nutritive and highly palatable. It can be directly fed as such or as silage or hay (Kempanna, 1974). An investigation was carried out to assess the genetic divergence between the genotypes of ragi to find out the contribution of different characters towards diversity and to identify promising genotypes to be utilized as parents in hybridization programme.

MATERIALS AND METHODS

A study was carried out with fifty genotypes of ragi (*Eleusine coracana* L. Gaertn) representing seven states of varied eco-geographical regions of India at Tamil Nadu Agricultural University, Coimbatore. The observations were made on five plants in each of the three replications chosen at random when the types exhibited 50% flowering. In the present study as many as nine variables namely plant height, leaf number, leaf length leaf width, days to flowering, internodal length tiller number leaf/stem ratio and fodder yield were considered. Mahalanobis D^2 statistic was utilized as a potent tool to find out genetic divergence among the genotypes.

RESULTS AND DISCUSSION

The clustering pattern revealed that the genotypes originating from different geographical regions got themselves grouped together into diffe-

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rent clusters (Table 1). This would be due to the similarity of objectives and conditions under which the types were bred and domesticated in different localities. Differential grouping of the types indicated that factors other than geographical divergence may also be responsible for genetic divergence. The clustering pattern thus failed to indicate any relationship between genetic divergence and geographic distribution. This was in accordance with the findings of Xavier (1979) in ragi and Arunachalam and Jawahar Ram (1967) in sorghum and Mol *et al.* 1962 in maize.

In cluster II which had two genotypes from Orissa showed parellelism between geographical origin and genetic diversity. The reasons for the genotypes with similar geograhical origin to group in a single cluster might be due to the identical genetic architecture of these types. Certain geno types fell seperately into single genotype clusteres. In the present study clusters XI and XII had one genotype each. These single geno-type clusters indicated the presence of wide divergence for various characters studied. The sixteen types originating from Tamil Nadu were found scattered in nine clusters. The

Table.1 : Composition of D^2 Clusters

Cluster	No. of types	Designation and origin
I	9	PES 110 (H.P.), CO 3 (TN), MS 2720 (B), TNAU 9 (TN), B 4-10-56 (0), HR 228 (K), TAH 60-6 (K), HR 222 (K), B 7-7-43 (0)
II	2	T 20-1 (0), T 20 (0)
III	5	HR 43-3(K), HR 919(K), CO 2 (TN), PES 18(HP), T 9 AP 2(0)
IV	5	T 36 B(0), KM 1(TN), CO 1(TN), AKP 2 (AP), TNAU 151 (TN)
V	6	JNR 1008 (MP), PR 202(AP), HPB 23-6(K), CO 5(TN), HR 95 (K), IE 1010 (HP)
VI	8	PES 144 (HP), AKP 1(AP), TNAU 46(TN), MS 2698 (B), CO 10 (TN), CO 7(TN), BR 407(B), CO 11 (TN)
VII	4	CO 4 (TN), PLR 1(TN), HR 334 A(K), PES 176 (UP)
VIII	2	TNAU 152 (TN), MS 2710(B)
IX	5	K2 (TN), Indaf 3(K), HPB 7-6(K), PR 717(AP), PES 5 (UP)
X	2	K1 (TN), Sarada (K)
XI	1	MS 2721 (B)
XII	1	PES 8 (UP)

UP—Utter Pradesh TN—Tamil Nadu B—Bihar O—Orissa

AP—Andra Pradesh MP—Madhya Pradesh K—Karnataka

Table 2 : Intra (Diagonal and Inter cluster D^2 and D (within Parenthesis) values

Clusters	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
I	4.64 (2.15)	94.45 (9.72)	31.08 (5.57)	41.75 (6.46)	10.84 (3.29)	16.95 (4.12)	11.67 (3.42)	76.79 (8.76)	17.29 (4.16)	48.57 (6.97)	32.90 (5.74)	98.82 (9.94)
II		1.36 (1.16)	202.14 (14.22)	22.49 (4.74)	139.20 (11.80)	58.94 (7.68)	104.40 (10.22)	20.52 (4.53)	74.76 (8.65)	215.90 (14.69)	85.41 (9.24)	285.89 (16.92)
III			5.25 (2.29)	115.20 (10.73)	13.74 (3.71)	53.34 (7.30)	28.07 (5.30)	176.47 (13.28)	72.89 (8.54)	15.39 (3.92)	98.41 (9.92)	54.37 (7.37)
IV				6.94 (2.63)	72.42 (8.51)	25.05 (5.01)	57.61 (7.59)	14.12 (3.76)	41.15 (6.41)	137.90 (11.74)	44.64 (6.68)	196.21 (14.01)
V					7.15 (2.67)	29.47 (5.43)	13.22 (3.64)	119.60 (10.94)	29.21 (5.40)	28.39 (5.33)	54.68 (7.39)	72.31 (8.50)
VI						9.09 (3.02)	17.29 (4.16)	58.11 (7.62)	30.94 (5.56)	63.58 (7.97)	55.14 (7.43)	119.36 (10.93)
VII							5.71 (2.39)	106.03 (10.30)	28.53 (5.34)	30.59 (5.53)	64.57 (8.04)	85.58 (9.25)
VIII								3.40 (1.85)	63.28 (7.95)	211.07 (14.53)	50.27 (7.09)	271.38 (16.47)
IX									12.63 (3.55)	91.59 (9.57)	23.31 (4.83)	149.20 (12.21)
X										12.96 (3.60)	137.21 (11.71)	55.79 (7.47)
XI											—	185.04 (13.60)
XII												—

Table 3 : Cluster means for nine characters in fodder ragi

Clusters	plant height cm	Leaf number	Leaf length cm	Leaf width cm	Days to flowering	Internodal length cm	Tiller number	Leaf/stem ratio	Fodder yield g
I	102.48	11.09	44.66	1.37	60.40	16.42	3.28	0.32	126.26
II	60.50	7.93	37.07	1.38	48.48	10.37	4.37	0.48	68.79
III	100.76	9.75	46 24	1.31	62.75	17.00	2.08	0.25	125.64
IV	73.01	8.37	40.09	1.35	49.61	13.39	4.36	0.36	80.77
V	104.82	10 22	44.48	1.37	62.78	16.72	3 07	029	128.78
VI	78.16	9.08	39.99	1.30	52.17	12.87	3.77	0 35	70.66
VII	98.25	11.45	43.77	1.32	59.05	15.47	3.17	0.27	113.94
VIII	65.60	7.42	36.90	1.37	43.07	13 05	4.60	0.36	78.27
IX	109.92	12.56	44.68	1.46	66.75	17.59	3.05	0.38	158.64
X	96.14	11.50	54.03	1.35	63.90	17.93	3.10	0.37	151.12
XI	106.07	10.13	47.07	1.55	56 50	15 67	2.87	0.27	128 48
XII	107.73	10.80	46.15	1.33	65.13	16.47	3.20	0.34	167 73
Range	60.50— 109.92	7.42 – 12.55	36.90 – 54.03	1.30— 1.55	43.07 – 66.75	10.37— 17.93	2.87 4.60	0.25 0.48	68.79— 167.75
General Mean	91.95	10.03	43.76	1.37	57.55	15.25	3.49	0.35	116.59

existence of wide genetic diversity among the genotypes chosen from the same geographical region was thus obvious. Such a wide genetic diversity was reported by Xavier (1979) in ragi, Shanmughasundaram (1978) in sorghum and Manoharan (1978) in proso-millet. The wide divergence noticed in the genotypes from Tamil Nadu might also be indicative of crop adaptation for wide environmental conditions under which this crop is grown. Thus, the present study suggests that the materials available in this state are adequatly divergent enough for taking up breeding work in ragi.

Considering the inter cluster D values. cluster XII was found to be highly divergent with all other clusters. Cluster VIII was highly divergent with nine out of twelve clusters, followed by cluster II and XI with eight, III and X with seven, VI with six and IV and IX with five clusters (Table 2 The cluster with close inter cluster distance may offer only limited scope for heterosis breeding. The close inter cluster distance suggests homogenity in ecotypic differentiation. In the present study such close inter cluster distance were noted among clusters I, V and VII. Thus the genotypes from the above mentioned clusters with close intercluster distances may be avoided in selection as parents for hybridization programme.

The scrurtiny of the twelve D² clusters indicated the wide range of mean values among the clusters (Table 3) for all the characters under study except for leaf width. Cluster IX showed the highest cluster mean values leaf number and days to flowering. Leaf length and internodal length were maximum in cluster X. Cluster II, VIII and XII recorded highest cluster mean values for leaf/stem ratio, tiller number and fodder yield respectively.

K2 from Tamil Nadu, a constituent of cluster IX registered the highest mean values for fodder yield and days to flowering. In the same cluster Indaf 3 showed the maximum mean values for plant height, leaf number and internodal length The genotype K1 of cluster X recorded the maximum mean value for leaf length. In respcet of tillet number, highest mean value was accounted for by TNAU-152. The single genotype PES-8 in cluster XII had the maximum cluster mean value for foddor yield. The genotype T-20 from Orissa showed the highest mean value for leaf/stem ratio Inter crossing the types from the same region which divergent among themselves may be desirable than choosing types from other regions for crossing (Gupta and Singh, 1970). In this study, the crosses amoung genotypes from peninsular region namely Tamil Nadu, Andhara Pradesh and Karnataka may yield superior segregants adapted to these environments. In ragi, Xavier (1979) also reported that the genotypes from Tamil Nadn, Karnataka and Andhara Pradesh were found scattered in different clusters indicating their utility in pedigree breeding. The genotypes K1, K2, Indaf 3 and TNAU-152 are worth mentioning in this context. These genotypes are scattered in different clusters which are also highly divergent Following a hybridization programme these would result in better segregants with local adaptation.

REFERENCES

ARUNACHALAM, V. and JAWAHAR RAM 1967. Geographical diversity in relation to genetic divergence in cultivated sorghum. *Indian J. Genet.*, *27:* 369-376.

GUPTA, M. P. and R. B. SINGH. 1970. Genetic divergence for yield and its components in green gram *Indian J. Genet.*, *30* : 212-221.

KEMPANNA, C. 1974. Improvement of minor millets for fodder value. *Indian J. Genet.* *34* (A): 188-194.

MANOHARAN, V. 1978. An appraisal of genetic diversity in prosomillet (*Panicum milliaceum L.*). M. Sc. (Agri.) Thesis. Tamil Nadu Agricultural University, Coimbatore.

MOLL, R. H., W. S. SALBUANA and H. F. ROBINSON. 1962. Heterosis and genetic diversity in variety crosses. of maize. *Crop Sci.*, 2: 197.-198.

SHANMUGA SUNDARAM, P. 1978. D^2 analysis in sorghum (*Sorghum bicolor* (L.) Moench) M. Sc. (Agri) Thesis Tamil Nadu Agricultral University, Coimbatore.

XAVIER, G. 1979. Studies in yield and yield components and genetic divergence in ragi (*Eleusine coracana L.* Gaertn.) M.Sc. (Agri) Thesis, Tamil Nadu Agricultural Un'uersity. Coimbatore.