Journal of Crop and Weed 7(1):130-132 (2011)

Genetic divergence study for yield and quality traits in tossa jute

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Received: 29.01.2011, Revised: 23.05.2011, Accepted: 30.05.2011

Key words: Cluster analysis, *Corchorus olitorius*, D^2 statistics, divergence

Jute is one of the most important fibre crop of the Indian subcontinent second only to cotton, in providing an environment-friendly, biodegradable and renewable ligno-cellulose fibre. The jute fibre is used, as a raw material, for several products like hessians, sacs, and carpet backings. The two species of the genus Corchorus , which are cultivated as jute crop include *C. capsularis* (white jute) and *C. olitorius* (tossa jute), each with 2n = 14, although 50–60 species are widely known and 170 names are described under the genus Corchorus in Index Kewensis (Palve *et al.* 2003; Edmonds 1990). As many as 27 varieties of jute with higher productivity, improved fibre quality and resistance to biotic and abiotic stresses were released through AINP on Jute and Allied Fibres. Though the potential yield of some of the recently released jute varieties like JRO-8432, JRO-66, JRO-128, S-19 and JRC-698 is 35 to 40 q/ha, the actual realization in the farmers' field is little more than 50% of the potential yield (Biswas, 2009). Therefore, research on genetic divergence in this crop is very important in formulating a successful breeding programme for evolving cultivars superior in both yield and quality to cater to the increasing demand of value added jute products in the domestic and international markets. In the present study an attempt was made to identify suitable genotypes for a breeding programme, from a collection of 52 tossa jute germplasm accessions.

Fifty two genotypes of *Corchorus olitorius* having diverse origin were sown in Randomized block design replicated thrice, at the Instructional Farm, UBKV, Pundibari, Cooch Behar, during the pre-*kharif* season of 2007. The recommended agronomic practices were followed to obtain an optimum fibre yield. Observations were recorded from ten plants selected randomly from each replication for the six fibre yield related traits namely plant height (cm), basal diameter (mm), green weight (g plant^{-1}), fibre yield (g plant^{-1}), fibre percentage, and stick weight (g plant^{-1}). For the two fibre quality traits *viz.* fibre tenacity (g tex^{-1}) and fibre fineness (tex), data were recorded at NIRJAFT, Kolkata. Divergence was studied by multivariate analysis (Sasmal, 1978) using Mahalanobis D^2 statistics and the genotypes were grouped into different clusters by employing Euclidean method as described by Rao (1952).

The analysis of variance (Table 1) revealed that the 52 *Corchorus olitorius* genotypes differed significantly for all the eight traits. These genotypes were grouped into 21 clusters on the basis of D^2 value (Table 2). Cluster XIII consisted of the largest number of genotypes (11), cluster I with four genotypes, cluster XXI with one genotype and the remaining clusters with two genotypes each. Maximum inter-cluster distance was observed between clusters VII and XX (34.73) followed by the distance between clusters III and XX (31.15), clusters XX and XXI (29.72) and clusters I and XX (28.87). Minimum inter-cluster distance was observed between clusters IV and XIV (2.74) indicating minimum divergence between the genotypes in these two clusters. Maximum intra-cluster distance was recorded in cluster XX (14.41) indicting higher genetic diversity among the genotypes OIN 025 and OIN 050 in that cluster. Cluster VII exhibited the maximum fibre yield plant^{-1} and stick weight plant^{-1} (Table 3). Cluster III exhibited highest tenacity, cluster XVI exhibited maximum fineness whereas, cluster XIII exhibited highest green weight plant^{-1} and cluster XIX, XX and XXI exhibited highest plant height, basal diameter and fibre percentage, respectively.

A comparison between cluster means for different traits and relative contribution of the different traits to the total divergence revealed that the genotypes with the desirable traits (highest mean values) where distributed mainly in clusters III, IV, VII, XIII, XIX, XX and XXI. The maximum inter-cluster distance was observed between clusters VII and XX and intra-cluster distance in cluster XX. Thus from the cluster analysis the genotypes OIJ 245 and OIJ 270 in cluster VII and OIN 025 and OIN 050 in cluster XX were found to be distinct with the desirable characteristics and may be incorporated in breeding programs to improve fibre yield and quality of jute.

ACKNOWLEDGEMENT

The authors would like to thank Director, CRIJAF, Barrackpore, West Bengal and Principal Investigator of the Project - Technology Mission on Jute (MM-1.2), CRIJAF for providing the tossa jute germplasm accessions and fund for conducting this experiment.

Short communication

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Table 1: Analysis of variance for different characters in tossa jute

	Plant height (cm)	Basal diameter (mm)	Green weight (g $plant^{-1}$)	Fibre yield (g $plant^{-1}$)	Fibre %	Stick weight (g $plant^{-1}$)	Tenacity (g tex^{-1})	Fineness (tex)
Mean sum of square	323.99**	0.008*	349.71**	2.018*	1.702*	12.175**	4.785**	0.108**
CV (%)	4.38	8.090	11.61	17.87	13.400	14.530	5.610	8.350
SEm (±)	5.93	0.040	5.44	0.64	0.590	1.120	0.920	0.110
LSD(0.05)	16.64	0.110	15.26	1.80	1.670	3.140	2.560	0.310

**Significant at 5% probability level, ** Significant at 1% probability level*

Table 2: Distribution of 52 tossa jute genotypes in different clusters

Cluster No.	Total no. of germplasm accessions	Name of germplasm accessions
I	4	OMU 006, OEX 031, OIJ 262, OIJ 268
II	2	OIN 028, OIN 580
III	2	OIJ 229, OIJ 230
IV	2	OIJ 240, OIJ 254
V	2	OEX 002, CS 53
VI	2	OIN 261, OIN 263
VII	2	OIJ 245, OIJ 270
VIII	2	OIN 231, OIN 257
IX	2	OIJ 286, OIJ 249
X	2	OIJ 167, JRO 128
XI	2	OIJ 273, OIJ 267
XII	2	OIJ 239,OIN 219
XIII	11	OIJ 018, OIJ 023, OIJ 027, K.T., OIJ 166, OIJ 168, OIJ 170, OIJ 231, OIJ 274, OIJ 015, OIN 046
XIV	2	Palmate leaf, PPO 4
XV	2	JRO 620, OIJ 255
XVI	2	OIN 574, OIN 576
XVII	2	OIN 217, OIN 225
XVIII	2	OIN 563, OIN 572
XIX	2	OIJ 258, CO 44R
XX	2	OIN 025, OIN 050
XXI	1	JRO 878

Table 3: Cluster means for eight characters in tossa jute

Cluster No.	Plant height (cm)	Basal diameter (mm)	Green wt. (g $plant^{-1}$)	Fibre yield (g $plant^{-1}$)	Fibre %	Stick wt. (g $plant^{-1}$)	Tenacity (g tex^{-1})	Fineness (tex)
I	230.44	0.86	77.72	6.26	8.02	13.41	29.46	2.44
II	222.70	0.79	63.88	5.30	8.32	11.18	29.69	2.10
III	221.76	0.79	69.39	5.58	8.02	12.25	30.26	2.39
IV	231.72	0.87	77.18	6.79	8.83	13.32	28.70	2.64
V	228.22	0.83	73.47	5.54	7.56	10.57	28.50	2.39
VI	217.17	0.84	74.68	5.43	7.21	11.50	27.05	2.14
VII	243.27	0.86	90.69	7.50	8.24	17.06	29.19	2.55
VIII	227.81	0.86	74.76	5.13	6.84	11.65	27.71	2.23
IX	239.81	0.81	71.24	6.07	8.51	12.13	27.71	2.41
X	243.62	0.92	88.48	7.17	8.09	14.07	28.43	2.57
XI	242.90	0.82	81.92	6.45	7.84	13.58	29.65	2.33
XII	237.38	0.88	88.33	6.17	6.96	15.42	29.38	2.14
XIII	240.35	0.91	94.10	6.92	7.42	15.58	28.00	2.37
XIV	228.41	0.81	69.33	5.69	8.20	11.42	28.19	2.40
XV	246.75	0.85	77.89	6.23	7.98	12.82	25.57	2.04
XVI	234.35	0.84	89.99	6.11	6.76	12.55	27.44	1.96
XVII	219.30	0.81	69.72	4.79	6.79	10.82	28.49	2.08
XVIII	225.06	0.85	80.08	5.81	7.36	12.95	28.84	2.03
XIX	253.90	0.88	82.63	6.34	7.62	12.92	28.66	2.39
XX	236.82	0.96	75.80	5.54	7.42	13.02	27.48	2.01
XXI	224.76	0.89	75.33	6.83	9.07	11.38	27.93	2.47
Mean	**234.47**	**0.86**	**81.16**	**6.22**	**7.69**	**13.36**	**28.38**	**2.30**
Contribution to D^2 (%)	**9.73**	**5.13**	**20.36**	**8.75**	**3.32**	**14.03**	**10.26**	**28.43**

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