Studies on Divergence for Fibre Yield and its Contributing Traits in Tossa Jute (*Corchorus olitorius* L.)

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Article History

Manuscript No. c252
Received in 10th September, 2012
Received in revised form 18th May, 2013
Accepted in final form 6th June, 2013

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Keywords

Corchorus olitorius, genetic divergence

Abstract

Jute Christened as *The golden fibre* is the second most important textile fibre next to cotton. A field experiment with thirty diverse genotypes of jute (*Corchorous olitorius* L.) was undertaken at the teaching farm of Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal. For evaluation of yield characters based on D^2 analysis, 30 genotypes were grouped into eight clusters. Cluster I had highest number of genotypes (18) followed by cluster II while cluster III, cluster IV, cluster V and cluster VI accommodated 2 genotypes each whereas cluster VII and VIII included solitary genotype. Maximum inter cluster distance was observed between cluster VII and cluster VIII and closely followed by VI and VII, while the minimum inter cluster distance were observed between cluster II and cluster III. Dry fibre weight per plant^{-1} followed by dry stick weight per plant^{-1} was the maximum contributors to total genetic divergence.

1. Introduction

Jute, *The golden fibre* is the second most important textile fibre next to cotton. It is one of the strongest but cheapest natural fibres and considered as fibre of the future and the fibre is obtained from bast or bark of the plant's stem. Two cultivated species are *Corchorus capsularis* (white jute) and *Corchorus olitorius* (tossa jute). The quality of tossa jute is superior to white jute. To improve such important crop through breeding need germplasm with wide variability for important character contributing fibre yield. In the outset the present study has been outline to estimate genetic diversity present in a set of tossa jute germplasms on the basis of 14 morpho-economic characters including fibre yield, so that desirable parents could be identified for utilization in crop improvement programme to obtain maximum fibre yield.

2. Materials and Methods

The experimental material consisted of the thirty genotypes collected from Central Research Institute for Jute and Allied Fibres (CRIJAF), Barrackpore through All India Network Project on Jute and Allied Fibres, Kalyani center, Bidhan Chandra Krishi Viswavidyalaya, West Bengal, India. The experiment was conducted in a Randomized Block Design with two replications. The gross plot was divided in three blocks and each block in turn was divided into 30 equal plots. Each plot was of the size of 1.5 m×0.9 m. There were five rows in each plot for a genotype. The length of each row was 1.5 m. Thus, there were five rows of 0.9 m length at spacing of 30 cm between the rows for each genotype. Recommended interculture practices were followed. Observations were recorded from 5 randomly taken plants per replication on 14 characters. The mean of these data were used for statistical analysis (Singh and Chowdhury, 1985) and Tocher's method was followed to estimate genetic divergence and for grouping of various clusters (Rao, 1952). Leaf area was measured from the crown using the factors as proposed by Gopalkrishnan and Sasmal, 1974.Chlorophyll *a* and chlorophyll *b* were estimated following the method of Arnon. The different characters considered in the present investigation were Plant height, node number plant^{-1}, internode length, basal diameter, petiole length, leaf area, bark thickness after 90 and 120 DAS, green weight plant^{-1}, dry stick weight plant^{-1}, chlorophyll *a* and chlorophyll *b*, total chlorophyll and dry fibre weight plant^{-1}. The tests of significance for the correlated variables have been done as per Rao (1948) using 'V' statistics, which in turn utilizes Wilk's criterion.

3. Results and Discussion

The relative contribution of individual characters towards

genetic divergence was presented in Table 1. It is based on ranking of individual characters and considering the number of times a particular character appeared in first rank. Dry fibre weight plant^{-1} was higher contributor character towards the total divergence followed by Dry stick weight plant^{-1} and chlorophyll *b* content in leaf.

Thirty genotypes were grouped into eight clusters (Table 1). Cluster I had the maximum number with 18 genotypes while cluster II, cluster III, cluster IV, cluster V, cluster VI, accommodated 2 genotypes. Remaining clusters VII and Cluster VIII were monogenotypic indicating the distinctness from other genotypes for most of the characters studied. (Table 1). Results obtained with respect to intra and intercluster divergences indicated variations in the parameters (Table 2). An average intercluster distance varies from 10.342 to 58.527. When the clusters were compared for divergence, intercluster distance was found maximum between cluster VII and cluster VIII closely followed by VI and VII indicated that these cluster pairs were most divergent. Minimum intercluster distance was observed between cluster II and cluster III, indicating close relationship between constituent genotypes of these clusters. The cluster VII were digenotypic and cluster VIII were monotypic.

It was found that intra-cluster values varied from 0.00 to 22.54 (Table 2). The maximum intra-cluster distance was in cluster I indicating cluster I comprises of the most heterogeneous types followed by cluster VI.

The means of characters in different clusters are also presented in Table 3. Considerable difference between the characters had been found to persist for all the characters studied as was observed by Nayak et al. 2009. Among all the clusters, the cluster VII recorded highest mean for plant height and cluster I also showed the value closer to cluster VII. Basal diameter and green weight per plant^{-1} had recorded maximum mean in cluster VII. Dry stick weight had maximum mean in cluster III and VI respectively followed by cluster I. Dry fibre weight plant^{-1} had maximum mean in cluster VII and cluster I. Highest cluster mean for node number plant and internode length were recorded in cluster VII. While, cluster VII was also best for the chlorophyll *a*, chlorophyll *b* and total chlorophyll. Leaf area, bark thickness as 90 DAS and 120 DAS was maximum in clusters VII. Petiole length maximum in cluster VII (Table 3).

The above result of cluster mean clearly indicated that genotypes like JRO 8432, OEX 027, OEX 015, OEX 007, OIN 1049, OIN 1019, OIN 987, OIN 940, OIN 903, OIN 474, OIN 935, OIN 323, OIN 257, OIN 250, OIJ 292, JRO 524, OEX 024, OEX 011, and OIN 252 could be selected as parents for future hybridization programme.

The genotypes from the cluster VII and VIII and VI could be selected for hybridization programme to produce highly heterotic genotypes as these were found to be most divergent with a number of desirable traits.

Table 1: Grouping of genotypes of jute(*Corchorus olitorius* L.) in different clusters

Sr. No.	Cluster No.	Total No. of genotypes	Name of genotypes
1	I	18	OEX-O27, OEX-015, OEX-007, OIN-1049, OIN-1019, OIN-987, OIN-940, OIN-902, OIN-474, OIN-395, OIN-323, OIN-257, OIN-250,OIJ-292, JRO-524, OEX-024, OEX-011, OIN-252
2	II	2	OIN-1040, OIN-467
3	III	2	OIN-202, OIJ-275
4	IV	2	OIN-935, OIN-271
5	V	2	OIN-979, OIN-332
6	VI	2	OIN-1016, OIN-192
7	VII	1	JRO-8432
8	VIII	1	OIN-997

Table 2: Inter and Intra cluster (Diagonal) distance

Cluster	Clus ter I	Cluster II	Cluster III	Cluster IV	Cluster V	Cluster VI	Cluster VII	Cluster VIII
Cluster I	22.545	18.947	18.989	22.829	24.790	24.183	36.981	42.068
Cluster II		7.559	10.342	18.332	19.730	13.939	39.680	33.336
Cluster III			9.854	20.671	21.672	17.128	39.008	36.997
Cluster IV				13.023	23.840	25.015	38.049	44.725
Cluster V					14.009	26.026	36.404	37.021
Cluster VI						17.290	47.971	32.024
Cluster VII							0.000	58..527
Cluster VII								0.000

Table 3: Cluster mean of individual character in tossa jute

Characters	Cluster I	Cluster II	Cluster III	Cluster IV	Cluster V	Cluster VI	Cluster VII	Cluster VIII	Contribution (%)
Plant Height (cm)	232.58	209.25	228	183	219	210.5	300	185	5.28
Node Number Plant^{-1}	51.69	39.75	46.75	36.5	45	38.75	66	35.5	1.6
Internode Length	5.5	4.44	5.06	3.97	6.16	4.33	7.39	3.69	0.91
Basal Diameter (cm)	1.614	1.467	1.526	1.469	1.455	1.463	1.835	0.95	4.82
Petiole Length (cm)	4.89	4.85	4.22	4.47	4.7	5.35	5.2	4.85	1.14
Leaf Area (cm^2)	54.83	48.91	56.16	38.56	54.04	47.58	56.69	37.05	1.83
Bark Thickness 90 DAS	1.162	1.143	1.072	0.933	0.99	1.075	1.345	1.08	3.44
Bark Thickness 120 DAS	1.297	1.31	1.313	1.207	1.18	1.2	1.59	1.32	7.58
Green Weight Plant^{-1}	237.52	211.5	224.75	186.75	208.75	210	280	174	5.28
Dry Stick Weight Plant^{-1}	25.81	22.4	28.35	16.6	16.6	27.7	14	15.8	15.17
Chlorophyll 'a'	1.3	1.129	1.35	0.84	1.285	1.116	1.53	0.82	5.51
Chlorophyll 'b'	0.499	0.29	0.472	0.132	0.33	0.336	0.758	0.11	10.57
Total Chlorophyll	1.744	1.419	1.822	0.973	1.615	1.452	2.289	0.93	2.98
Dry Fibre Weight Plant^{-1}	12.77	10.54	12.38	8.79	10.86	10.41	17.67	8.36	33.79

4. Conclusion

The investigation confirmed presence of divergence among the collected germplasm of tossa jute. Where members from cluster VI, VII and VIII can be considered for utilization in hybridization programme to develop lines with enhanced fibre yield.

5. Acknowledgement

We are highly thankful to the AINP on Jute and Allied fibres (ICAR) to providence germplasm and funds for the concern experiment and also to Department of Plant Breeding, B.C.K.V., Mohanpur, Nadia (W.B.), India for providing every facilities to field and laboratory experiments.

6. References

Arnon, D.I., 1949. Copper enzyme in isolated chloroplasts polyphenol oxidase in *Beta vulgaris* L. Plant physiology 24, 1-5.

Gopikrishnana S., Sasmal, B.C., 1974. Determination of leaf area in jute base on linear measurements. Indian journal of agricultural sciences 44, 582-584.

Nayak, B.K., Baisakh, B., Bastia, D., 2009.Genetic divergence among the genotypes of tossa jute (*Corchorus olitorius* L.). Environment and Ecology 27(1), 86-88.

Rao, C.R., 1952. Advance statistical methods in biometrical research. John Wiley and Sons. Incl. New York, USA.

Singh R.K., Chowdhury, B.D., 1985. Biometrical methods in quantitative genetics analysis. Kalyani Publishers., New Delhi, India.