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Research Note

Stability of fibre yield and its component traits in tossa jute (*Corchorus olitorius* L.)

S.K. Roy[1*], G. Chakraborty[1], A. Roy[1], S. Haque[1], M.K. Sinha[2], S. Mitra[2] and V.A. Kale[3]
[1]AINP on Jute & Allied Fibres,
[2]Central Research Institute for Jute & Allied Fibres (ICAR-CRIJAF), Barrackpore, West Bengal – 700120,
[3]Department of Genetics & Plant Breeding, Uttar Banga Krishi Viswavidyalaya, Cooch Behar, West Bengal – 736165
Email: suvendukumarroy@gmail.com

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Abstract
Stability study for fibre yield and its attributing traits was carried out in six tossa jute (*Corchorus olitorius* L.) genotypes including two checks under four different ecological conditions of India over two consecutive years 2005 and 2006, I under All India Network Project on Jute and Allied Fibres. Six experimental entries in AVT-I and AVT-II responded differentially to the different environments as evidenced by their non significant difference for the different traits in the different environments. On the basis of the stability parameters Wi (Wricke's Ecovalence) and Di (Hanson's genotypic stability) the genotype JRO-524 (standard check) was identified as stable for fibre yield and its attributing traits over the environments. It was followed by the genotype CO-56 with high fibre yield and moderate Wi (%) and Di values. These two genotypes were identified to be suitable for high input conditions of cultivation.

Keywords
Jute, *Corchorus olitorius*, stability, fibre

Jute, popularly called the 'Golden Fibre', is a plant that yields a fibre used for sacking and cordage. Known as the raw material for sacks the world over, jute is truly one of the most versatile fibres gifted to man by nature that finds various uses from Technical textiles to Handicrafts. Next to cotton, jute is the cheapest and most important of all textile fibres. Jute is the cheapest lignocellulosic, long vegetable bast fibre available in the world. Jute cultivation provides direct employment for millions of farmers, landless labourers and industrial workers including women and provides livelihood for many more, indirectly. The occurrence of Genotype × Environment interaction is a challenge for better understanding of genetic control of variability and thus to rationalize procedures for breeding improved genotypes in crop plant (Breese, 1969). The interaction are usually present under all conditions including purelines, single cross or double cross hybrids, top crosses or any other material used for breeding (Eberhart and Russel, 1966). The relative performance of a genotype in different seasons for a given character is rarely the same which results in difficulty in the detection of superior genotypes. Therefore, it is necessary to select genotypes showing high degree of stability of performance over a wide range of environments (Das *et al*., 2010). In this context it is necessary to characterize the genotypes according to their response to varying environmental conditions for proper identification, recommendation and fulfillment of the objectives of AINP on Jute and Allied Fibres regarding development of regional specific genotypes.

This study was carried out in six tossa jute (*Corchorus olitorius* L.) genotypes including two checks under four different ecological conditions of India over two consecutive years 2005 and 2006, under All India Network Project on Jute and Allied Fibres. The genotypes of Advanced Varietal Trail-I (AVT-I) and Advanced Varietal Trail-II (AVT-II) were utilized and the experimental material consisted of four entries (genotypes) of tossa jute (*Corchorus olitorius* L.) and two standard checks JRO-524 and JRO-128 which were evaluated for two consecutive years at four AINP (Jute and Allied Fibres) centers. The locations were Cooch Behar and Nadia in West Bengal, Katihar in Bihar and Kendrapara in Orissa, each of which represented a situation differing in edaphoclimatic factors. However, four locations over two years (2005 and 2006) were considered in this study to be eight different environments with Environment-1 (E_1) and Environment-2 (E_2) in Cooch Behar, E_3 and E_4 in Nadia, E_5 and E_6 in Katihar and E_7 and E_8 in Kendrapara for the years 2005 and 2006, respectively. The entries were sown in Randomized Block Design with four replications in 15 rows of 6m length each with a spacing of 30 cm between rows and 7 cm within plants. The recommended agronomic practices were followed. The observations were recorded for three characters *viz*. plant height (cm), green weight (q/ha) and fibre yield (q/ha), out of which for plant height, data from five randomly selected plants in each replication were used whereas, the green weight and fibre yield were first recorded from the total plot (27 m^2) in each replication and then transformed into quintal/hectare (q/ha). The stability parameters were computed as per Wricke (1962) and Hanson (1970).

The analysis of variance **(**Table 1**)** for the three different traits revealed that the six entries did not differ significantly in all the eight environments. When experimental error variances are homogeneous, pooled error mean square is obtained simply as average of error mean square over all the environments, provided the degrees of freedom are also identical (Cochran and Cox, 1957). A preliminary analysis of the data using Bartlett's chi-square test for homogeneity of error variances of the eight environments confirmed that the error variances of the environments for the entire three characters *viz*. plant height, green weight and fibre yield differed significantly. Even the $\log_e$ transformed data also exhibited significant differences between the error variances of the environments for the three characters, which did not permit pooled analysis over the environments. Thus simple stability parameters proposed by Wricke (1962) and Hanson (1970) were utilized to assess the stability of the six genotypes under study. The six tossa jute strains exhibited significant difference for plant height in the environments E_6, E_7 and E_8, for green weight in the environments E_1, E_7 and E_8 and for fibre yield in the environments E_1, E_6, E_7 and E_8. There were only two environments namely E_7 and E_8, where the six genotypes differed significantly for all the three traits.

The mean performance, Wricke's Ecovalence (Wi) as percentage and Hanson's composite measures of genotype stability (Di) are shown in Table 2. As percentage of ecovalence (Wi) is inversely associated with phenotypic stability, hence a low percentage of ecovalence (Wi) indicated high stability of performance (Wricke, 1962). Similarly on the other hand lower Di values indicated smaller departure from stable mean (Hanson, 1970). A genotype is said to be stable if it performs better than the population mean along with lower Wi (%) and Di values. For plant height out of the six entries CO-57 and Bidhan-120 exhibited the lowest Wi (%) and Di value but only Bidhan-120 exhibited mean value (319.25) greater than the population mean (318.46 cm). Therefore, Bidhan-120 indicated stable performance for plant height. For green weight the standard check JRO-524 exhibited the lowest Wi (%) value of 7.56 and Di value 299.06 but its mean performance for the trait was lower than the population mean. There were three more genotypes JRO-128 (check), Bidhan-120 and CO-57 which exhibited green weight greater than population mean (492.15 q/ha) but Wi (%) and Di values of JRO-128 were very high where as Bidhan-120 and CO-57 were moderate. For fibre yield which is the most important trait, standard check JRO-524 exhibited the lowest Wi (%) value (5.53) and Di value (12.57) along with a mean performance of 27.45 q/ha which was higher than the population mean (27.39 q/ha). There was one more genotype namely CO-56 which performed better than population mean but its Wi (%) and Di value was moderate.

In the present study the standard check JRO-524 can be broadly considered as stable for fibre yield over the eight environments followed by the genotype CO-56 with high fibre yield and moderate Wi (%) and Di values. These two may be recommended for the high input conditions of cultivation. An interesting observation here is that the variety JRO-524 used as check is quite old and was bred during the seventies and still it is able to outperform several newly developed strains with respect to stability for yield and its attributing traits.

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References

Breese, E.L. 1969. The measurement and significance of genotype-environment interaction in grasses. *Heredity,* **24**:27-44.

Cochran, W.G. and Cox, G.M. 1957. *Experimental designs*. John Wiley and sons Inc., New York. 2nd Ed.

Das, S., Mishra, R.C. and Das, S.R. 2010. G × E interaction, adaptability and yield stability in mid early rice genotypes. *Ind. J. Agri. Res.,* **44**(2): 104-111.

Eberhart, S.A. and Russel, W.A. 1966. Stability parameters for comparing varieties. *Crop Sci.,* **6**: 36-40.

Hanson, W.D. 1970. Genotypic stability. *Theoret. Appl. Genet.,* **40**: 226-31.

Wricke, G. 1962. Uber eine Methode zur Erfassung der Okolo gischen Strenbreile in Feldversuchen. *Z. Pflanzenzuchtung,* **47**: 92.

Table 1. Analysis of variance in *tossa* jute for eight environments

Characters	Mean sum of squares							
	Cooch Behar (West Bengal)		Nadia (West Bengal)		Katihar (Bihar)		Kendrapara (Orissa)	
	2005 (AVT-I)	2006 (AVT-II)	2005 (AVT-I)	2006 (AVT-II)	2005 (AVT-I)	2006 (AVT-II)	2005 (AVT-I)	2006 (AVT-II)
	E_1	E_2	E_3	E_4	E_5	E_6	E_7	E_8
Plant height (cm)	233.17	178.44	841.57	952.80	239.87	450.44*	457.70**	770.68*
Green Weight (q/ha)	8326.17**	5098.08	503.21	2057.74	1213.77	311.92	12920.57**	4234.15*
Fibre yield (q/ha)	21.16**	28.70	1.48	6.91	11.94	11.11*	13.00**	12.79**

* Significant at 5% probability level, ** Significant at 1% probability level, E_1 to E_{10} = Environment-1 to Environment-10

Table 2. Mean performance and stability parameters in *tossa* jute for three characters in eight environments

Entry	Plant height (cm)			Green weight (q/ha)			Fibre yield (q/ha)		
	Mean	Wi (%)	Di	Mean	Wi (%)	Di	Mean	Wi (%)	Di
S-9793	322.09	21.50	130.65	488.78	22.97	306.17	27.27	23.35	12.95
CO-57	317.75	7.60	123.88	494.91	15.95	302.76	27.18	30.45	13.51
JRO-524 (check)	315.91	20.54	130.90	489.69	7.56	299.06	27.45	5.53	12.57
CO-56	319.94	22.95	131.07	488.99	16.09	300.64	28.03	18.16	13.12
Bidhan-120	319.25	7.87	127.54	495.30	13.65	301.59	27.18	6.92	12.64
JRO-128 (check)	315.84	19.54	128.60	495.24	23.77	308.87	27.23	15.59	12.89
Mean	**318.46**			**492.15**			**27.39**		

Wi (%) = Wricke's Ecovalence expressed as percentage, Di = Hanson's stability parameter.