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EFFECT OF FERTILIZER ON GENOTYPE x ENVIRONMENT INTERACTION IN JUTE (*CORCHORUS CAPSULARIS* L.)

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ABSTRACT

Effect of fertilizer on stability parameters of thirty five genotypes of *Capsularis* jute were evaluated for fibre yield in three successive years. Both predictable and unpredictable components of genotype x environment interactions were significant, being almost equal in magnitude at each fertilizer level. The genotypes T 2, T 8, JRC-7447 and JRC-212, were responsive to fertilizer and showed stability under high fertilizer level only. The genotypes T 1, T 8, T 24, JRC- 1108 and D-154 exhibited their stability under adverse environments only. A crossing programme is suggested using parents from the two groups for improvement of adaptability, fertilizer response, and high fibre yield in *Capsularis* jute.

Key words: Fertilizer, stability, genotypes, *Capsularis* jute.

The occurrence of genotype–environment interaction has long provided a major challenge to obtain better understanding of the genetic control of variability. The study of genotype x environment interaction in its biometrical aspect is thus important not only from genetical and evolutionary points of view, but also is very relevant to production problems of agriculture, in general, and to plant breeding, in particular [1]. However, very little work has been carried out on this line in jute [2–4]. The comparative nature of genotype x environment interaction of 35 genotypes of *capsularis* jute under two levels of fertilizers is reported in the present paper.

MATERIALS AND METHODS

In the present investigation, 35 genotypes of *capsularis* jute were tested separately over three successive years (1978 to 1980) at Mondouri Farm of Bidhan Chandra Krishi Vishwavidyalaya, under two levels of soil fertility (i.e. no fertilizer, and NPK ratio of 60:40:40). Seeds of all the strains were sown on two dates in each year in randomized block design with two replications. The first sowing was done in the third week of March and the second one month thereafter. Each entry had five 1.5 m long rows, spaced 30 cm apart. Thus, three successive years, each with two sowing dates, constituted six environments for each experiment. Plants were harvested 120 days after sowing. Data on fibre yield were recorded on 25 plants taken randomly from each plot, excluding the border plants. Mean values per entry were used for statistical analysis. The Eberhart–Russell model [5] was followed to calculate stability parameters.

RESULTS AND DISCUSSION

Joint regression analysis (Table 1) showed that the mean difference between genotypes were significant, showing the presence of genetic variability among the genotypes used. Significant mean squares due to environment and genotype–environment interactions indicate that the phenotypic expressions of genotypes varied in different environments. Partitioning of mean squares due to genotype x environment interactions into linear and nonlinear components revealed equal importance of both the components. The linear component was significant when tested against pooled error only. This indicated that the prediction of performance of the genotypes across the environments would be difficult.

Table 1. Joint regression analysis (mean squares) for fibre yield in *capsularis* jute

Source	d.f.	No fertiliser	With fertilizer
Genotypes (G)	34	1.77**	8.70**
Environments (E)	5	6.61**	10.46**
G x E	170	0.14**	0.48**
E (liner)	1	30.05**	52.31**
G x E (linear)	34	0.14**	0.55**
Pooled deviation	140	0.14**	0.48**
Pooled error	204	0.07	0.11

**Significant at 1% level.

In the experiment without fertilizer, 12 out of the 35 genotypes investigated had significant S^2di and, thus, were unstable for fibre yield (Table 2). Seven genotypes (T 1, T 2, T 8, T 24, D-154, JRC-7447 and JRC-1108) yielded significantly higher than the population mean ($\overline{X}$ = 4.59 g/plant). Only seven genotypes had significant regression coefficients for fibre yield, indicating that these strains were responsive to environmental variations. None of the genotypes deviated significantly from unity. A joint consideration of mean and stability parameters revealed that only T 1, T 8, T 24, D-154 and JRC-1108 had higher fibre yield, b = 1 and S^2di = 0. Accordingly, these five genotypes appeared promising from adaptation point of view and could be used in breeding programmes.

In the experiment with 60:40:40 kg NPK, 21 out of 35 genotypes investigated had significant S^2di hence unstable for fibre yield (Table 2). Nine genotypes (T 1, T 2, T 6, T 8, T 24, D-154, JRC- 7447, JRC-1108 and JRC-212) had significantly higher mean than the

Table 2. Mean fibre yield and stability parameters in two experiments on *Capsularis* jute

Genotype	No fertilizer			With fertilizer		
	mean (g)	bi	S^2di	mean (g)	bi	S^2di
T1	5.4	1.30*	0.01	9.7	1.8541*	0.2859**
T2	5.7	2.00*	0.41**	9.8	1.1103*	0.0033
T6	4.9	1.23*	0.01	8.5	1.3398	0.7682**
T7	4.6	1.01	0.07	7.9	1.1935	0.2025*
T8	5.1	1.42**	- 0.05	8.9	1.0172**	- 0.0773
T12	4.6	1.13	0.03	6.8	0.3273	0.4875**
T14	4.5	0.91	0.05	7.6	1.2148*	0.1582*
T17	4.7	1.31	0.05	7.7	0.9128	0.0663
T19	4.2	0.74	0.15**	7.3	0.8955	0.0831
T24	5.6	1.28	0.04	10.0	2.4009x	0.4670**
T27	4.3	1.24*	- 0.03	6.5	0.3939	0.3199**
Tripura	4.1	0.54	0.05	6.5	0.7152	0.0672
D-154	5.2	1.09	0.05	9.1	0.6413	0.2786**
D-18	2.9	0.61	0.06	3.6	0.5515	0.5322**
Fanduk	4.5	1.21*	- 0.01	7.3	1.5674*	0.0362
Japred	4.6	0.62	0.05	7.6	0.7731	0.0898
JRC-201	4.5	0.68	- 0.04	7.6	1.3877	0.1478
Maniksari	4.5	0.62	0.03	6.9	0.5442	0.9152**
JRC-4142	4.7	1.12	0.10**	7.0	1.5887	0.9197**
JRC-889	4.3	1.00	0.17**	7.2	1.7649	0.9426**
JRC-4444	4.6	0.98	0.08	7.4	1.1223	1.0982**
JRC-1172	4.9	0.47	0.03	8.1	1.7510	0.5894**
JRC-7447	5.8	1.25x	0.13**	10.2	1.8388*	0.0722
R.L.C.	4.7	0.16	0.11*	8.3	0.4305	0.4535**
JRC-6382	4.6	0.41	0.10*	7.5	- 0.0775	0.0602
JRC-5854	4.5	1.27x	0.12*	7.3	1.4089x	0.2584**
JRC-1108	5.0	1.03*	- 0.02	8.6	0.7889	0.4743**
JRC-6165	4.1	1.06	0.05	7.9	0.9113	0.6561**
JRC-412	4.5	1.08	0.08	7.6	- 0.3139	0.3724**
JRC-386	4.3	0.50	0.10*	7.6	0.9839	0.1327
C-13	3.9	0.63	- 0.04	7.2	- 0.2967	0.5597**
JRC-212	4.4	0.92	0.15**	8.5	1.3677*	0.0698
JRC-4561	4.3	1.79x	0.15*	8.4	0.8568	0.0335
JRC-321	4.2	1.16	0.15*	7.7	1.2539*	0.0206
Budbud 1	4.1	1.02*	- 0.04	7.9	0.6785	0.4098**

*,**Significant at 5% and 1% levels, respectively.

xSignificant at 5% level when tested against remainder mean square if the latter was significant.

population mean ($\bar{X}$ = 7.81 g/plant). None of the genotypes deviated significantly from unity. Simultaneous consideration of the mean and stability parameters revealed that only T 2, T 8, JRC-7447 and JRC-212 attained higher fibre yield, coupled with b=1 and S^2di = 0. Accordingly, these four genotypes appear to be highly adaptive and could be used in hybridization programme.

The present investigation clearly indicates that the genotypes T 2, T 8, JRC-7447 and JRC-212 are not only responsive to fertilizer but also stable only under higher level of fertilizer. Dargan et al [6] reported that JRC-7447 and JRC-212 showed progressive increase in fibre yield with the increase in the dose of nitrogen, up to 100 kg N/ha, the former being relatively superior. Biswas [2] also reported JRC-7447 to be the most stable variety and recommended it for general cultivation in place of JRC-212. The genotypes T 1, T 8, T 24, JRC-1108 and D-154 were although responsive to fertilizer, but showed stability only under adverse environments, where no fertilizers were applied. The importance on breeding for plant types responsive to higher levels of nitrogen as well as its role in determining the selection potential in *capsularis* jute has been reported [7, 8]. It is, therefore, suggested that genotypes from the two extreme groups mentioned above may be used in a crossing programmes to evolve genotypes with wider adaptability, greater response to fertilizer, and increased fibre yield.

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