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Variability in Fiber Development Pattern Related to Yield in Capsularis Jute (*C. capsularis* L.)

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Abstract

Variability was observed in different parameters related to fiber development among ten capsularis jute strains at six growth phases starting from day 30 day to day 105. A few strains showed slow early growth followed by faster growth later on, while other strains showed trend. The growth stages were significantly different among them. Most of the characters showed positive correlation with dry weight of fiber but negative correlative also observed in length of ultimate fiber cell. Again, the early growth stages indicate the positive future effect of dry matter accumulatiion in bark and reverse effect on quality of fiber.
Key words : Jute, Fiber, Variability, Yield.

Jute fiber found in the bark of stem is important for its bast fiber contribution. The weight and size of the bark depends on its thickness and the length which continues growth from germination to pod development stage. The bast fiber deposition in bark at different growth stages and their variability in different variety would be desirable to understand the background knowledge for quantity and quality improvement program. Actually, the partitioning of dry matter in leaves was higher in early stages of growth (1, 2), and it shows differential response with the age of the plant (3).The present investigation was made evaluate the variability present in a few *capsularis* genotypes and the pattern of fiber development at seven stages of growth during the normal season of jute cultivation.

Methods

The selfed seed of Patchy leaf (V_1), D 154 (V_2), Bud-Bud (V_3), D 18—7 (V_4), Fanduk (V_5), JRC321 (V_6), Tripura capsularis (V_7), JRC212 (V_8), Round leaf (V_9), Zao Ping (V_{10}) were sown in randomized block design with three replications in sandy-loam soil of District Seed Farm, BCKV, Kalyani, West Bengal, India. Basal diameter (cm), weight of the green bark (g), dry weight of fiber (g), fiber bundle thickness (μ) and fiber cell length (μ) of 5 randomly selected plants of each genotype from each replication were recorded at days 30, 45, 60, 75, 90 and 105 of growth after germination. The data were analyzed statistically by Fisher's analysis of variance. Fiber thickness from the transverse section of the mid-point of stem and length of the UFC (ultimate fiber cell) were measured under microscope.

Results and Discussion

The strains were significantly different with respect to basal diameter, weight of the green bark, and dry weight of fiber, fiber bundle thickness, fiber cell length at each stages of growth (Table 1). Significant difference was also observed between the two stages in those respects (Fig.1). The growth rate of base diameter was best in Bud-bud amongst the strains from day 60 to 105 while in JRC321(V_6) was comparatively high at the two initial stages followed by slow growth subsequently. Growth in diameter was observed to be generally uniform, but different strains revealed rate of acceleration at different days of growth of the crop (Fig. 1).

Maximum green weight of the bark and dry weight of fiber were achieved at later stages and recorded at harvest (105 days) in D 154 (V_2) followed by JRC212 (V_8), Budbud (V_3) and D-18-7 (V_4). The days differ significantly for these characters (Table 1). All stains except Zao Ping (V_{10}) and Fanduk (V_5) showed significant difference in bark weight between two stages of growth from the day 75 stage onwards (Fig.1).

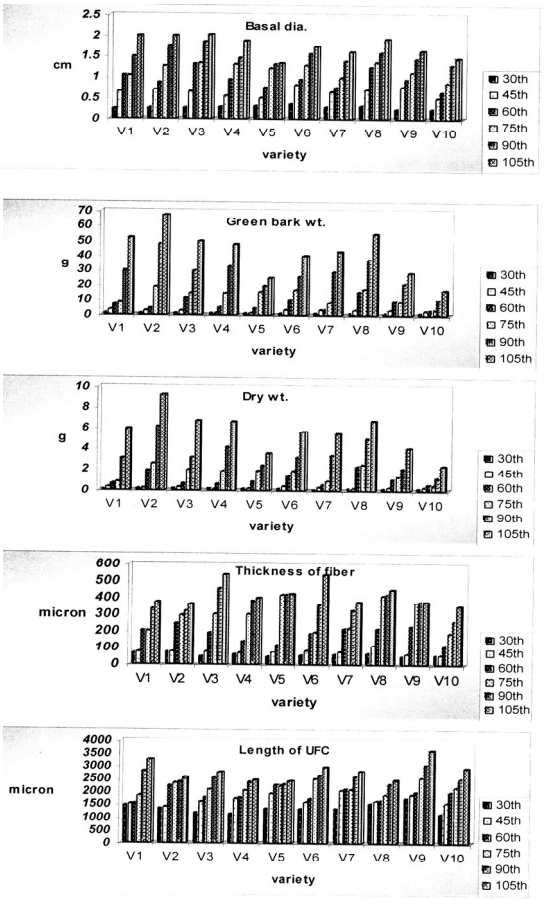

Figure 1. Growth pattern of fiber yielding characters in different varieties (average of 2 years)

The initial two growth phases of fiber thickness were insignificantly different while significant difference was observe between the succeeding phases (Table 1). D 154 (V_2) and D-18-7 (V_4) were significant at middle stages, but insignificant at later stages. At later stages, Bud-bud (V_3), Tripura capsularis and JRC 321 (V_6) were significantly different while JRC212 (V_8) and Fanduk (V_5) were insignificant (Fig. 1).

Round leaf showed significant increased UFC length at initial and last three phases of growth. Tripura capsularis and Fanduk were the best in second and third phases only. So Round leaf possess fine UFC which produced good quality textile fiber.

Correlation analysis of the data from the sample at day 105 of growth revealed that the coefficients were positive except the correlation of UFC length with the remaining characters (Table 2). Base diameter was significantly correlated with bark weight and dry fiber weight. This trait also had positive correlation with the thickness of fiber bundles.

It was reported that at early stages the capsularis jute varieties showed almost the same rate of linear growth (4). It was also observed that upto 40 days of growth the genotypes maintained more or less uniform growth rate which varied in subsequent phases of growth (5). But the recent observation showed that the fiber yield mainly dependent on the early vegetative growth of the plant because of partitioning of dry matter among stem and leaf (6). The present observation revealed significant differences in base di-

Table 1. Mean values (considering genotypes) of fiber yielding attributes at different growth stages. 2nd year values are presented within parentheses.

	Days						
Characters	30 2006 (2007)	45 2006 (2007)	60 2006 (2007)	75 2006 (2007)	90 2006 (2007)	105 2006 (2007)	CD at 5%
Base diameter (cm)	0.27 (0.28)	0.65 (0.64)	0.93 (0.75)	1.18 (0.99)	1.51 (1.38)	1.76 (1.60)	0.04 (0.13)
Green bark wt. (g)	0.46 (0.59)	2.71 (3.25)	6.99 (9.38)	12.59 (16.74)	28.17 (25.51)	42.49 (40.29)	2.29 (7.26)
Dry wt.of Fiber (g)	0.034 (0.036)	0.23 (0.30)	0.98 (0.95)	1.61 (1.26)	3.37 (2.11)	5.64 (4.13)	0.05 (0.15)
Length of UFC (μ)	1341.5 (1336.66)	1706.21 (1644.83)	1903.22 (1845.78)	2180.38 (2170.24)	2553.03 (2539.21)	2821.64 (2904.29)	10.91 (12.01)
Thickness of fiber bundle (μ)	69.25 (66.81)	77.16 (79.53)	186.16 (180.12)	292.58 (287.69)	366.87 (359.92)	422.88 (426.47)	15.31 (13.10)

Table 2. Correlation of fiber yielding characters in *capsularis*. * Significant at 5%. 2nd year values are presented within parentheses.

Characters	Green bark wt	Length of UFC	Thickness of fiber bundle	Dry wt. of Fiber
Base diameter	0.8806 (0.9451)	-0.0822 (-0.1245)	0.2117 (-0.0490)	*0.8521 (*0.8959)
Green bark wt		-0.3324 (-0.0898)	0.0921 (-0.4063)	*0.9752 (*0.9479)
Length of UFC			-0.1307 (-0.1859)	-0.3825 (0.0001)
Thickness of fiber bundle				0.1406 (0.1420)

ameter, bark weight and dry fiber weight both at the initial and late stages. The apical and intercalary meristems play dynamic role in producing fiber of a variety. The apical meristem increases the plant height while intercalary meristem increases the stem diameter by producing xylem and phloem including the fiber bundles (7, 8). The present investigation shows that irrespective of higher apical or intercalary meristem activities the bark weight and fiber yield depend on the production of fiber bundles in bark as evident in D-154 (V_2) and JRC-212 (V_8) compared to Bud-Bud (V_3) and JRC-321 (V_6).

Moreover, the significant positive correlation of fiber weight with base diameter, bark weight and dry weight and the positive correlation with fiber bundle thickness support the observation of earlier scientists (5, 9) that the yield of fiber was associated with the thickness of bark addition to plant height and basal diameter at the time of harvest. Negative correlation between UFC length and yield indicates the increasing quality of D154 will lead to loss of quality production which is related to the economic yield of the crop. So, the pattern of development in fiber yield quantity and their relation of quality in different genotypes should be the principle criteria for future breeding program.

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