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GENETIC VARIABILITY AND GROWTH PATTERN OF YIELD ATTRIBUTES IN *OLITORIUS* JUTE (*CORCHORUS OLITORIUS* L.)

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ABSTRACT

Genetic variability was observed among nine *olitorius* jute strains at 7 growth stages starting from 30th to 120th day. A few strains showed slow initial growth but had high growth rate later, while other strains showed opposite trend in respect of plant height, basal diameter, bark weight, and dry fibre weight. Tanganika was the best among the strains studied. The growth at one stage was significantly different from that in subsequent stages. Bark weight showed positive correlation with plant height, basal diameter, and dry fibre weight.

Key words: Jute, *C. olitorius*, variability, quality traits, growth pattern.

Jute is an important crop for bast the fibre deposited in its bark. The fibre content varies between 5 to 7% of the gross weight of harvested plants. The yield of fibre has remained constant since long time, and significant improvement in fibre content could not be achieved in spite of concerted efforts by the plant breeders. It would be desirable to understand the nature of growth, fibre deposition along with other features related to growth at different stages of stem elongations.

The present investigation aims at evaluating the variability present in a few selected *olitorius* genotypes and the pattern of growth of yield attributes including fibre content at 7 stages of growth on the normal season of jute cultivation.

MATERIALS AND METHODS

The seed of nine selected *olitorius* strains were sown on 26 April, 1988 in randomized block design with three replications with the usual cultural practices.

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Plant height, basal diameter, weight of green bark, fibre bundle thickness, weight of green plant, and dry weight of fibre of five random plants of each genotype from each replication were recorded on 30th, 45th, 60th, 75th, 90th, 105th and 120th days of growth. The data were analysed statistically by the Fisher's analysis of variance.

RESULTS AND DISCUSSION

The genotypes were significantly different with respect to plant height, basal diameter, gross green weight, weight of extracted bark, and dry fibre weight at each stage of growth. Significant difference was also observed between the growth stages.

Up to 75-day stage of growth, significant stem elongation was observed in the varieties Russian Red and Tanganika but at the final stage Tanganika exhibited maximum elongation, followed by Australian Red and Sudan Green (Table 1, Fig. 1).

Table 1. Plant height and basal diameter of different *olitorius* genotypes at different growth stages

Variety	Character	Observations on different days							
		30	45	60	75	90	105	120	average
JRO 620	Height	16.1	65.2	112.6	170.6	205.0	238.4	245.4	150.5
	Diameter	0.3	0.6	1.0	1.3	1.6	1.9	2.2	1.3
Russian Red	Height	20.5	74.2	129.6	186.7	216.2	237.9	252.8	159.7
	Diameter	0.3	0.7	1.0	1.3	1.4	1.5	1.8	1.1
Crumple	Height	11.0	26.4	82.8	87.5	110.2	134.1	168.6	88.6
	Diameter	0.3	0.4	0.8	1.0	1.1	1.2	1.6	0.9
Sudan Green	Height	13.9	56.6	116.1	154.1	210.7	259.7	267.7	154.1
	Diameter	0.3	0.6	1.0	1.2	1.4	1.6	2.0	1.2
Tall Mutant	Height	10.4	66.7	112.5	143.0	185.8	233.7	242.2	142.1
	Diameter	0.2	0.6	1.1	1.1	1.3	1.6	2.1	1.1
Bankok	Height	14.8	70.5	119.3	168.3	195.3	221.2	228.9	145.4
	Diameter	0.3	0.7	1.1	1.2	1.4	1.6	1.9	1.1
Australian Red	Height	19.7	71.4	124.7	167.6	211.3	253.4	271.2	159.9
	Diameter	0.3	0.5	0.9	1.0	1.5	1.7	1.9	1.1
Tanganika	Height	19.7	75.2	131.6	186.7	224.3	263.5	276.1	168.2
	Diameter	0.3	0.7	1.0	1.3	1.4	1.6	2.0	1.2
Red Palmate	Height	16.8	63.8	106.8	112.7	154.0	196.6	211.8	123.9
	Diameter	0.3	0.5	0.8	0.8	0.9	1.0	1.2	0.8
Average	Height	15.9	63.3	115.1	153.0	190.9	226.5	240.4	
	Diameter	0.3	0.6	1.0	1.1	1.4	1.5	1.9	
CD at 5% for variety	Height	1.6	3.1	4.1	3.9	3.2	5.0	2.5	1.5
	Diameter	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0
CD at 5% between two stages	Height	3.2							
	Diameter	0.1							

Plant height and basal diameter in cm.

Though Tanganika and Russian Red had maximum stem elongation, the basal diameter in these two genotypes did not increase corresponding to the elongation. On the other hand, JRO 620 with more or less average stem elongation showed significant maximum diameter on and after the 75-day stage. At initial stages of growth, different genotypes showed highest diameter at different stages, e.g. Tanganika and Red Palmate at 30-day Russian Red, Bankok and Tanganika at 45-day, and Bankok at 60-day stages. But Sudan Green and Tall Mutant had the second highest girth at later stages, though significantly different from that in JRO-620 (Table 1; Fig. 1).

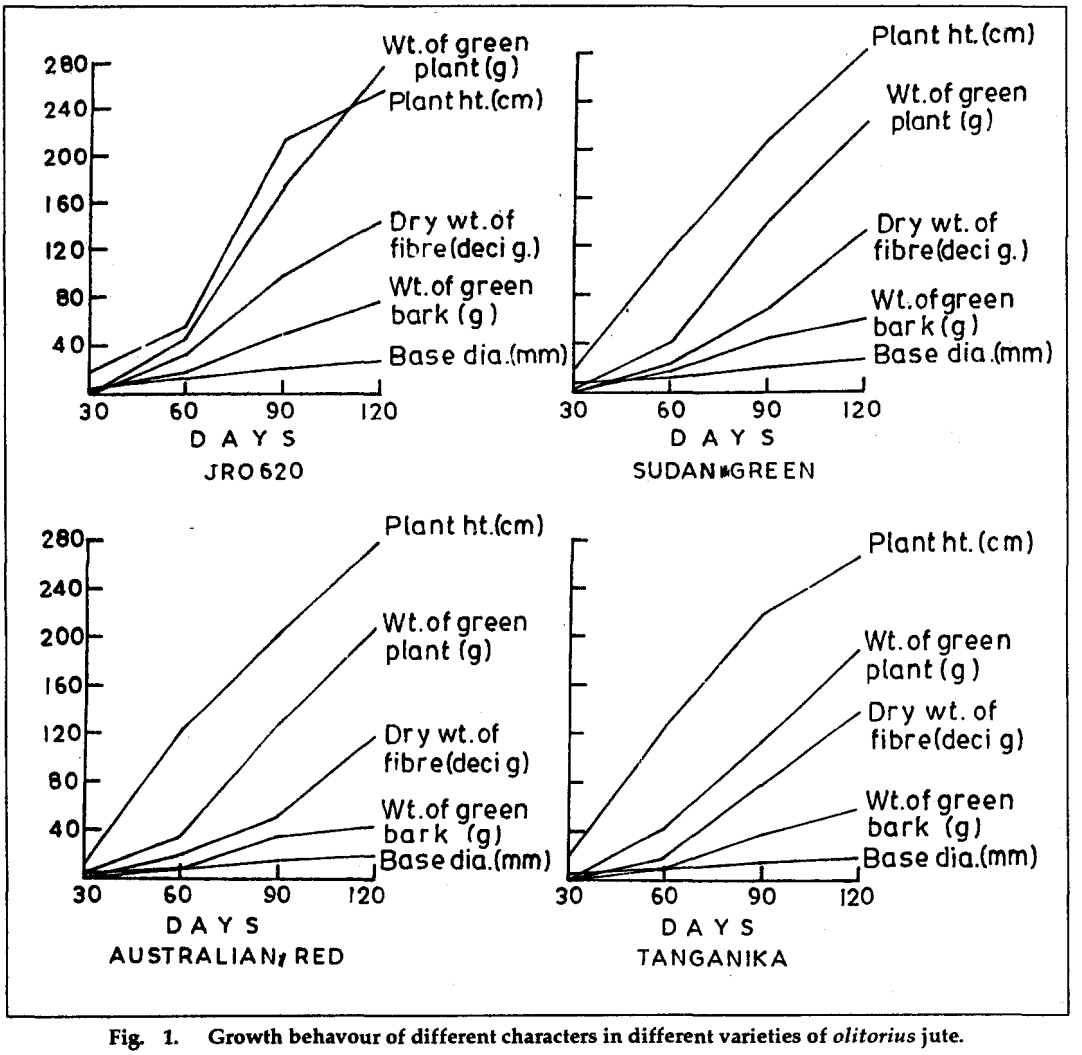

Fig. 1. Growth behavour of different characters in different varieties of *olitorius* jute.

Kundu et al. [1] observed that at early stages, *C. olitorius* show almost the same rate of linear growth. Sen et al. [2] reported a more or less sigmoid pattern of growth. In the present experiment, the individual genotype differ significantly in respect of stem elongation and basal girth. But a few genotypes showed linear and a others sigmoid pattern of growth. On an average, maximum gain in plant height was between 75–90 days of growth, while maximum increase in girth was between 105–120 days. Maity et al. [3] observed faster growth between 90–100 days in the jute strain JRO 620.

The pattern of gross weight shows JRO 620 to be the best genotype having gained substantial weight at the last three phases. Prior to that Russian Red maintained its lead in the first three growth phases. Maximum accumulation of weight in JRO 620 was observed in between 90–120 days (Table 2; Fig. 1).

JRO 620 had maximum girth and more or less average plant height, but highest green weight. This means that gross green weight is related more to basal girth than to plant height, though significant positive correlation exists between plant height and basal diameter. The observation also suggests the increased photosynthetic efficiency (at later stages of growth) and greater efficiency of JRO 620 in developing the different vegetative organs. In this respects, JRO 620 excels the other genotypes included in the present investigation.

With respect to extracted bark weight, JRO 620 exhibited maximum weight at the last two stages. In the earlier stages, it was only second to the respective best genotypes. Though Tanganika was at the top at 30-day stage, it lagged behind at later stages. Maximum gross green weight and bark weight was recorded in JRO 620. The gain in bark weight corresponded to the gain in gross green weight of JRO 620. The highest basal diameter in JRO 620 corresponded to the highest gross green weight and bark weight. On the other hand, Tanganika with the highest plant height did not show higher corresponding weight and bark weight (Table 2; Fig. 1).

Among the genotypes, Tanganika significantly exceeded others in producing dry fibre which is the economic yield. This genotype exhibited maximum dry fibre at the initial and final stages. In between these two phases, Tanganika maintained more or less substantial gain, which was significantly different from the tallest genotypes. On the other hand, JRO 620 having maximum gross green weight and bark weight exhibited second best fibre weight at the final stage, although it was the leading genotype at 75-day and 90-day growth phases. Also, Russian Red had maximum dry fibre content at the first three stages but could not maintain its lead 75-day stage onwards and was the third best genotype at the final phase (Fig. 1).

Table 2. Green weight of bark, dry fibre weight, and weight of the green plant (without leaf) in different *olitorius* genotype at different growth stages

Variety	Character	Observations on different days							
		30	45	60	75	90	105	120	average
JRO 620	Bark	0.6	3.2	15.0	27.4	44.7	62.1	74.3	32.7
	Fibre	0.0	0.4	2.6	4.9	8.9	11.3	14.9	6.1
	Plant	1.5	12.1	41.8	87.5	168.9	219.1	265.3	
Russian Red	Bark	0.8	5.5	14.9	25.4	38.2	57.4	65.2	29.8
	Fibre	0.5	0.6	2.7	4.7	8.1	10.9	13.9	5.8
	Plant	2.1	18.0	45.8	87.1	116.6	174.6	217.4	
Gumple	Bark	0.7	1.8	9.7	13.8	23.9	33.6	49.4	18.9
	Fibre	0.0	0.1	1.4	2.2	3.7	5.7	8.2	3.1
	Plant	1.3	4.2	24.4	36.3	51.9	74.8	108.4	
Sudan Green	Bark	0.5	3.0	13.2	19.2	44.0	57.3	61.4	28.4
	Fibre	0.0	0.3	2.0	2.8	6.3	10.1	13.2	4.9
	Plant	1.2	9.3	38.9	61.2	135.5	211.4	221.5	
Tall Mutant	Bark	0.4	4.2	15.9	16.9	39.9	53.4	64.1	27.8
	Fibre	0.0	0.3	2.3	2.8	6.3	9.6	12.7	4.9
	Plant	0.9	10.5	45.2	49.9	98.7	162.8	203.7	
Bankok	Bark	0.6	2.9	13.2	28.7	46.8	58.7	63.2	30.6
	Fibre	0.2	0.3	2.1	4.4	7.1	9.8	13.6	5.3
	Plant	1.6	10.5	43.7	86.0	151.7	189.7	202.6	
Australian Red	Bark	0.8	1.6	8.8	14.2	37.2	49.2	56.5	24.0
	Fibre	0.0	0.1	1.6	2.5	5.7	9.4	12.0	4.5
	Plant	2.1	12.9	33.4	50.4	131.5	159.9	202.4	
Tanganika	Bark	0.9	3.2	11.4	23.2	42.5	58.4	67.8	29.8
	Fibre	0.0	0.6	2.2	4.4	8.3	11.7	14.3	6.0
	Plant	2.0	13.4	46.3	90.4	109.7	175.8	198.8	
Red Palmate	Bark	0.7	1.8	8.6	9.3	12.6	17.6	27.2	11.1
	Fibre	0.0	0.2	1.6	1.7	2.4	3.4	6.1	2.2
	Plant	1.8	10.3	26.3	27.1	41.9	58.6	91.1	
Average	Bark	0.67	3.2	12.3	20.7	36.6	49.7	58.8	2.62
	Fibre	0.0	0.3	2.1	3.3	6.3	9.1	12.6	0.0
CD at 5% for variety	Bark	0.5	0.3	0.6	7.4	1.7	1.6	1.7	2.0
	Fibre	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0
	Plant	0.3	13.4	2.2	2.1	13.9	4.6	2.3	
CD at 5% between two stages	Bark	6.1							
	Fibre	0.1							

Weight of bark, dry fibre and green plant in g/plant.

The trend of dry fibre content points to the fact that plant height is the main criterion for high fibre content. This is evident from Tanganika, which had less basal diameter, lower gross green weight as well as bark weight. That basal diameter is a contributory factor to fibre yield is evident from the significant positive correlation between stem diameter and

fibre yield (Table 3). The trend also indicates higher efficiency in depositing dry fibre along the stem in the bark of Tanganika. Though dry fibre and bark weight have positive correlation, dry fibre content is a varietal characteristics and not a true reflection of bark weight.

Table 3. Correlation coefficients of different characters in *olitorius* jute

Characters	Base diameter	Green weight of bark	Final fibre cell length	Fibre thickness	Dry weight of fibre
Plant height	0.61	0.54	0.32	-0.63	0.78*
Base diameter		0.9*	-0.12*	-0.65	0.90*
Green weight of bark			-0.10	-0.40	0.95*
Final fibre cell length				-0.16	0.00
Fibre thickness					-0.42

*Significant at 5%.

Bhaduri et al. [4] observed that the desired plant type in jute should maintain uniform growth rate with uniform fibre deposition along the stem. Uniform growth rate was observed in JRO 620 and Tanganika. However, greater efficiency in fibre accumulation was observed in Tanganika. This observation shows plant height and efficiency in fibre laying to be the principal criteria for selection in breeding programme. This experiment isolates Tanganika to be an ideal genotype that might be used in future breeding programmes.

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