

## COMPARATIVE ANATOMICAL OBSERVATIONS OF SOME TOSSA JUTE GENOTYPES GROWN AT MANIKGANJ STATION OF BANGLADESH

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### ABSTRACT

This experiment was carried out with eleven different lines in 2019 and sixteen different lines in 2020 with check variety JRO-524 and BJRI Tossa pat-8 was grown at Manikganj station of Bangladesh. In respect of anatomical traits Acc. 1318 gave higher stem diameter, bark thickness, area of trapezoid, number of trapezoids and number of bundles/trapezoid from pooled mean data of top, middle and base portion of all jute genotypes. In respect of fiber cell, maximum length breadth ratio was found in line O-0419-3-1 which was significantly similar to JRO-524(green). It is expecting that Accession 1318 gave higher fibre yield in field condition. In respect of result from 2020, BJRI Tossa Pat-5 gave best result in all the parameter which statistically similar with advanced line O-0412-9-4, O-043-7-9(G) and variety JRO-524. Advanced line O-043-7-9 green and red line gave higher number of bundle/trapezoids and bundle layer/trapezoids followed by advanced line O-0412-9-4 and variety JRO-524.

**Key words:** Anatomical observations, tossa jute, genotypes.

### Introduction

Jute belongs to the genus *Corchorus* and family *Tiliaceae*, with chromosome number  $2n = 14$  (Kumar *et al.*, 2014). The fibre quality of jute is dependent upon several anatomical characters (Kundu *et al.*, 1959; Satya *et al.*, 2011). Jute fibre is the anatomical product of the jute plant. Quantification and histological parameters in selection process of jute variety can play vital role (Akter, *et al.*, 2003). In a breeding population, jute breeder thus rely more on indirect estimation of fibre yield by using component characters such as plant height and diameter of base, middle or top (Kumar *et al.*, 2014). The heritability and correlation of these characters have been found to be variable depending on environmental conditions, retting methods and management practices (Chaudhury, 1988). In jute, 90% of the total fibre of the plant is developed in the secondary phloem by the activity of the cambium, and the remaining 10% is formed in the protophloem region. The fibre cells developed from cambium undergo rapid change in length and breadth. The secondary wall of the young fibre cells becomes thicker by the gradual deposit of secondary layers of cellulose materials (Maiti *et al.*, 2012). Jute plant stems having fibre bundles comprising a greater number of compactly arranged long and fine ultimate cells give fibers of higher strength when retted under standard conditions (Majumdar, 2002). Therefore, in the present experiment an attempt has been made to study the anatomical characteristics and to examine fiber development patterns of some jute genotype.

### Materials and Methods

This experiment was carried out with eleven different lines in 2019 and sixteen different lines in 2020 with check variety JRO-524 and BJRI Tossa pat-8 was grown at Manikganj station of Bangladesh. Three inches long pieces of stem were cut from the top, middle and base part of each selected plant of 110 days after sowing. These materials were preserved in Formalin Aceto Alcohol (FAA) solution (10 ml of Formalin, 5ml of 85% glacial acetic acid, 50 ml of 95% alcohol and 35% distilled water) (Ruzin, 1999). The preserved sample parts were taken out and washed. About 20-25 $\mu$ m thick transverse sections (TS) were done with the help of a microtome for preparing slide and stained with safranin. The slides were studied under compound microscope (4x10 magnifications) and data recorded for stem diameter, bark thickness, number and area of trapezoid, number of fibre bundles per layer and number fibre bundles per section. For maceration technique use acetic acid 5cc and 70% alcohol 85 cc (Ali, 1989).

**Results and Discussion**

The mean performance of eleven genotypes revealed that average highest stem diameter was observed in the Acc. 1318 (Table 1). Also the highest bark thickness was observed in the Acc. 1318 having no differences with the Acc. 1306 and variety JRO-524 (R). Area of trapezoid was observed in highest in the Acc. 1318 which had difference with other lines. In fiber cell study (Figs. 1-4) maximum length breadth ratio (238.3) was found in line O-0419-3-1 without significant difference with JRO-524(G). The highest length/breadth ratio (211.20) was observed in accession no. 1497 in top part of the stem (Ali, 1989).

Table 1. Pooled mean performances on different anatomical traits of 11 selected genotypes (top, middle and basal portion of plant) (Data from 2019).

Lines/Variety	Stem diameter (mm)	Bark thickness (mm)	Area of trapezoid (sqmm)	No. of trapezoid section <sup>-1</sup>	No. of layer trapezoid <sup>-1</sup>	No. of bundle trapezoid <sup>-1</sup>	Length breadth ratio
Acc. 1306	11.29bc	1.11ab	23.01b	52.88bc	7.92bcd	62.33a	141.4cd
Acc. 1318	13.35a	1.19a	28.65a	60.55a	8.55a	64.92a	113.9d
O-043-7-9 (G)	10.16ef	0.97cd	17.31cde	53.66abc	7.59cd	55.77ab	147.6bcd
O-049-1-3	10.25def	0.99cd	17.70cde	59.33ab	8.18abc	46.96bcd	171.1bc
O-0512-6-2	10.62cde	1.00cd	15.42de	57.55abc	6.96e	37.55d	163.6bcd
O-0411-10-4	9.62fg	0.91de	18.48bcde	51.22c	7.48de	59.66ab	161.3bcd
O-0419-3-1	9.14g	0.92de	15.87de	54.55abc	7.33de	52.48abc	238.3a
BJRI Tossa pat-5	10.94bcd	1.04bc	21.72bc	57.33abc	8.40ab	57.66ab	132.2cd
JRO-524 (G)	10.31def	0.87e	13.83e	57.00abc	7.62cd	42.70cd	199.8ab
JRO-524 (R)	11.59b	1.13ab	19.73bcd	52.88bc	8.70a	61.96a	131.8cd
BJRI Tossa pat-8	9.46g	1.00cd	15.88de	51.11c	7.85bcd	58.22ab	134.4cd
Mean	10.72	1.02	18.88	55.28	7.88	54.57	157.8
LSD	0.639	8.360	4.688	6.075	0.544	11.489	47.689
CV (%)	11.098	9.580	22.524	6.075	6.899	16.028	34.125

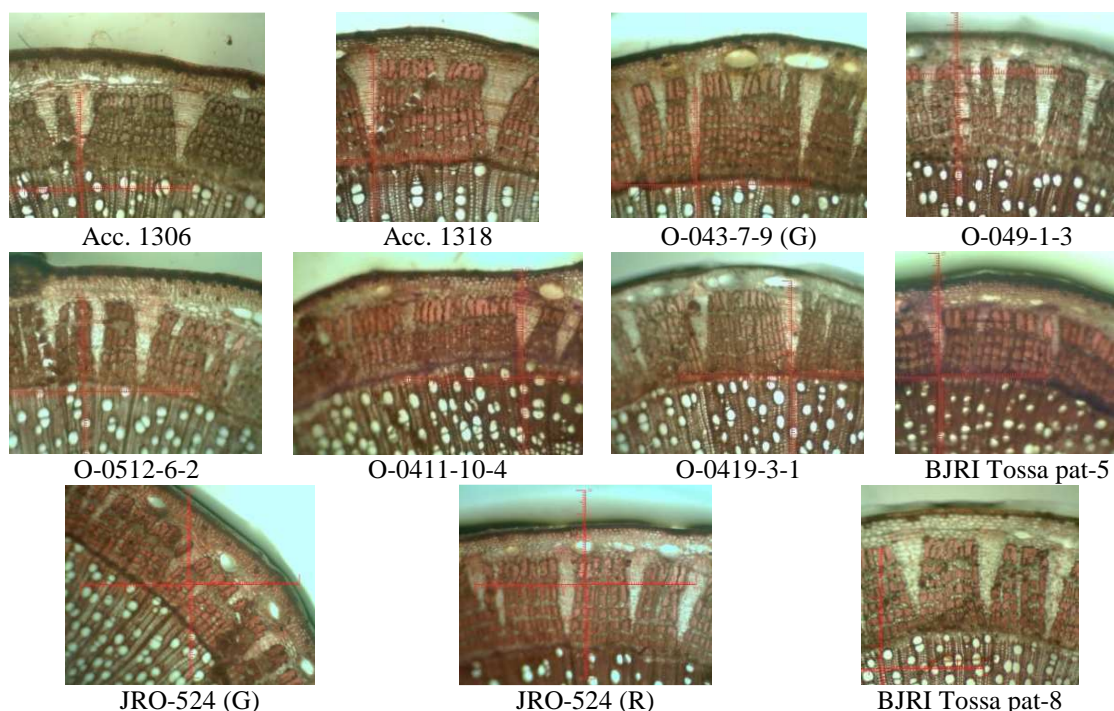


Fig 1: Distribution of fibre cells in cross section of 11 genotypes at top portion of the plant

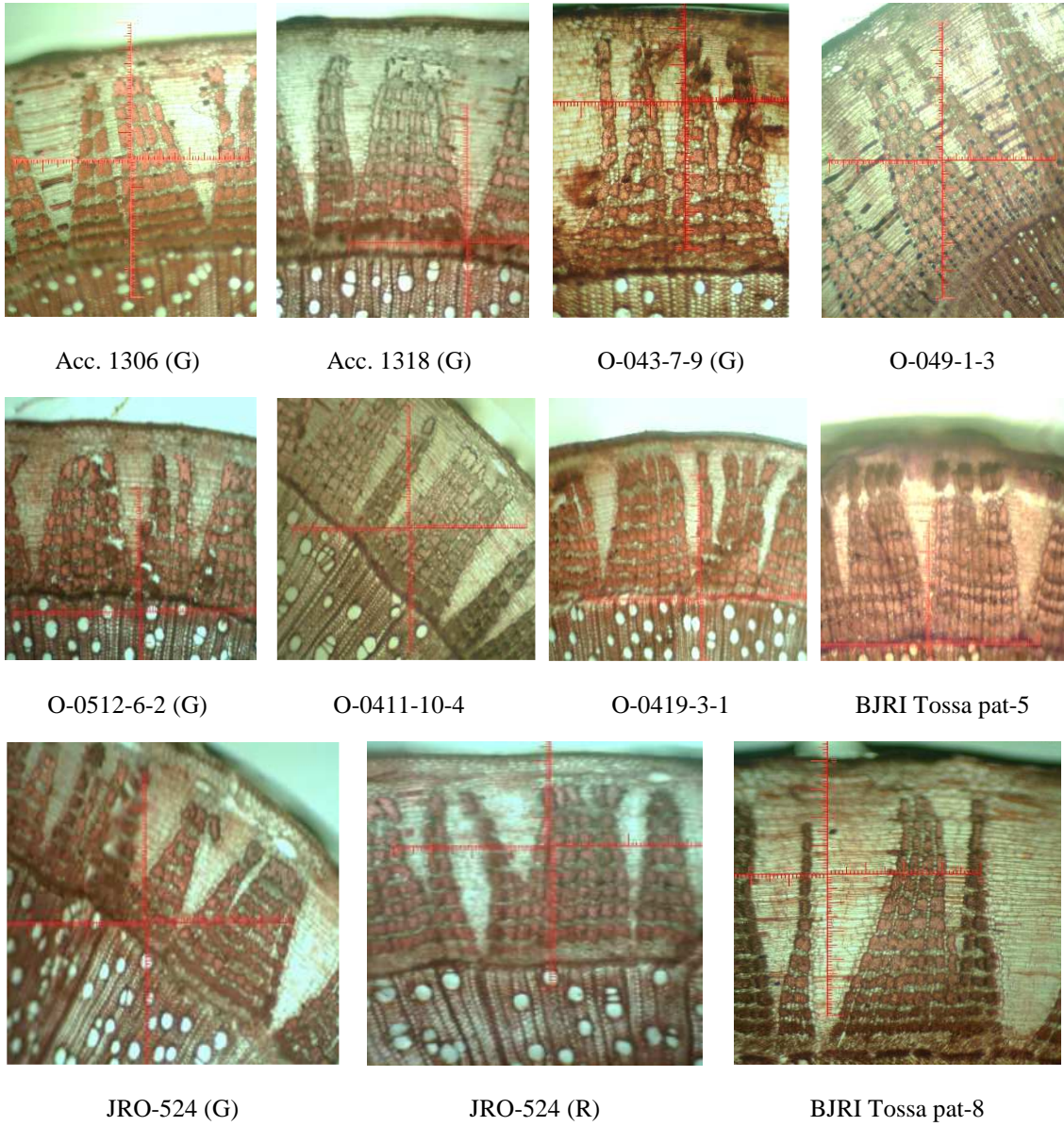
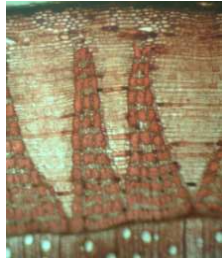
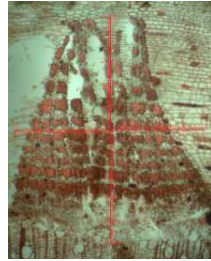


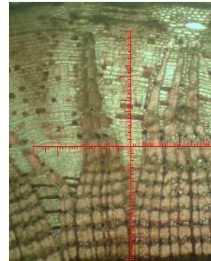
Fig 2. Distribution of fibre cells in cross section of 11 genotypes at middle portion of the plant



Acc. 1306



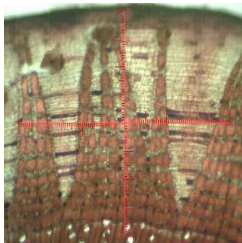
Acc. 1318



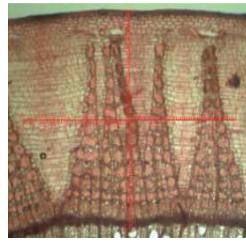
O-043-7-9 (G)



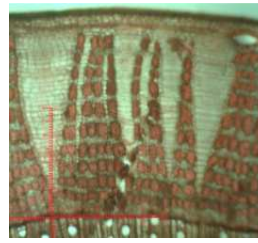
O-049-1-3



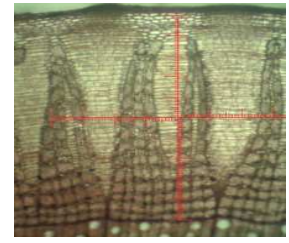
O-0512-6-2



O-0411-10-4



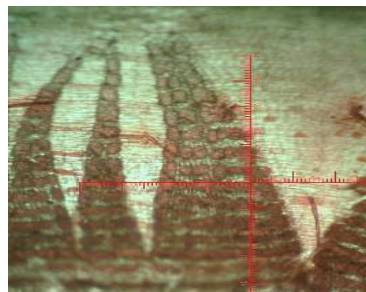
O-0419-3-1



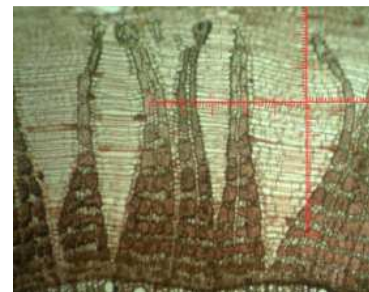
BJRI Tossa pat-5



JRO-524 (G)



JRO-524 (R)



BJRI Tossa pat-8

Fig 3. Distribution of fibre cells in cross section of 11 genotypes at basal portion of the plant

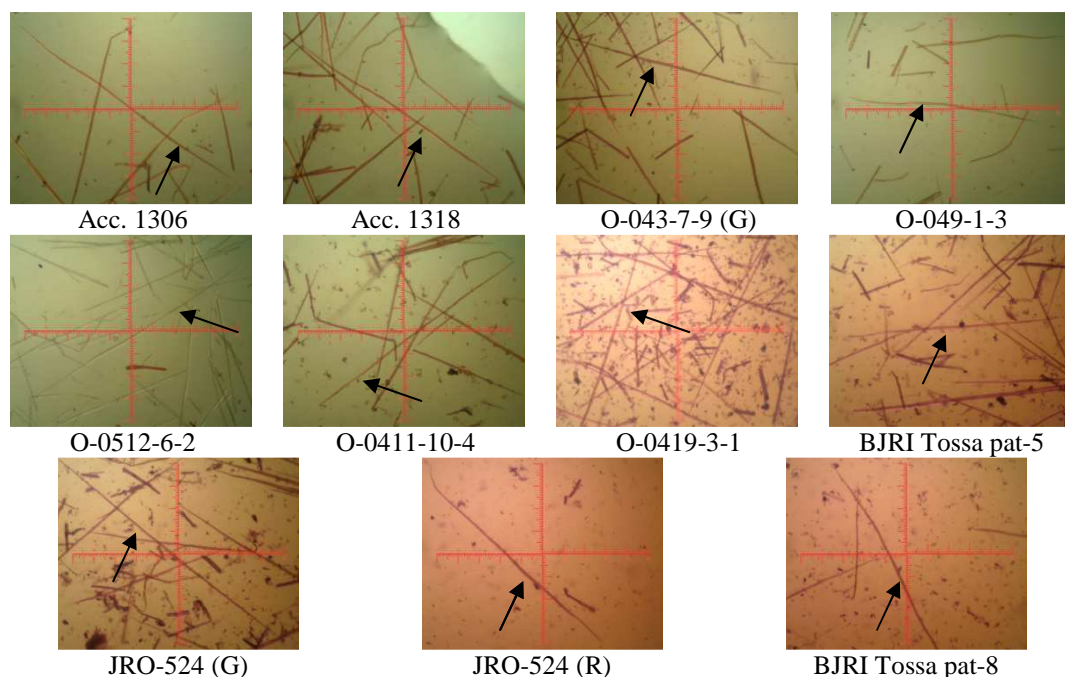


Fig. 4. Ultimate fibre cell

The study of 2020 was carried out with sixteen different lines with check variety JRO-524 and BJRI Tossa pat-8 was grown at Manikganj station for anatomical study (Table 2).

Table 2. Anatomical features of the selected 16 genotypes (Data from 2020)

Genotype	Stem dia. (mm)	Bark thickness (mm)	Number of trap-ezoids	Number of bundle/ trapez.	Bundle layer/ trapezoids	Area of Trapezoids (sq.mm)	Length (µm)	Breadth (µm)	L/B Ratio
Acc. 1306 (G)	10.78e-f	1.20a	50b	65ab	8.4a-b	28.22a	1743.5b-e	38.5abc	45.3bc
Acc. 1306 (R)	11.78c-d	0.97c-f	51b	57a-c	8.1a-c	22.30a-f	1769.2b-e	38.5abc	46.0bc
Acc. 1318 (G)	9.72 g	0.83f-g	44b	40c-d	6.4e-f	13.92g	1614.6de	43.6ab	37.9c
Acc. 1318 (R)	10.78ef	0.77g	48b	44c-d	6.2e-f	14.89e-g	1923.1a-e	48.7a	41.3bc
O-043-7-9 (G)	12.56 b-c	1.00bc-e	49b	66a	7.7b-d	23.35a-d	2128.2a-c	38.5abc	56.5bc
O-043-7-9 (R)	11.28de	1.14a-b	49b	50a-c	8.9a	21.24a-g	1769.2b-e	33.4bc	53.7bc
O-0412-9-4	12.22 c	1.05a-d	64a	65a-b	8.8a	27.27a-b	1479.2e	41.1ab	37.5c
O-0419-3-1 (G)	10.67e-f	0.92d-g	54ab	41c-d	6.6e-f	19.44b-g	2256.4a	37.2bc	60.9b
O-0419-3-1(R)	10.16f-g	0.94c-g	47b	40c-d	7.0d-e	15.30d-g	1897.4a-e	36.4bc	52.4bc
O-0419-9-4 (G)	11.11d-e	0.80f-g	52b	33d	5.6f	14.35f-g	1666.7c-e	34.90bc	48.0bc
O-0512-6-2 (R)	10.44 e-g	0.87e-g	43b	48b-d	7.1c-e	15.76d-g	1912.8a-e	40.0ab	48.5bc
O-0512-6-2 (G)	13.72 a	1.02b-e	51b	57a-c	7.2c-e	23.38a-d	2025.6a-d	41.1ab	49.6bc
O-049-1-3 (R)	11.89c-d	1.06a-d	53ab	51a-c	7.9a-d	22.59a-e	1641.0de	33.4bc	49.5bc
BJRI TossaPat 5	13.22 a-b	1.09a-c	54ab	54a-c	8.3a-b	24.50a-c	1974.3a-d	41.1ab	47.9bc
BJRI TossaPat 8	11.00 d-f	1.02b-e	50b	54a-c	8.4a-b	17.85c-g	2208.3ab	28.2c	81.2a
JRO-524	11.83c-d	1.02b-e	46 b	65a-b	8.4a-b	21.08a-g	1820.5a-e	41.1ab	44.6bc
Mean	11.447	0.982	50.645	52.243	7.569	20.339	1864.397	38.477	50.054
LSD <sub>0.05</sub>	0.807	0.146	10.194	15.086	0.938	6.858	412.67	9.298	17.640
CV %	7.552	15.880	12.073	30.940	13.272	36.127	13.275	14.494	21.138

G= Green, R= Red

In respect of anatomical traits advanced line O-0512-6-2 (G) gave higher stem diameter which was statistically similar with BJRI Tossa Pat 5. Acc. 1306 (G) gave higher bark thickness having no significant difference with O-043-7-9 (R) and BJRI Tossa Pat 5. The number of trapezoids in all genotypes, advanced line O-0412-9-4 give higher which is similar with advanced line O-049-1-3 (R) and BJRI Tossa Pat 5. Advanced line O-043-7-9 green gave higher number of bundle/trapezoids. Highest bundle layer/trapezoids were found in advanced line O-043-7-9 red and O-0412-9-4, respectively. Finally the area of trapezoids was higher in Accession 1306 (G) which is similar to Advanced line O-0412-9-4. So it is expecting this advanced line O-0412-9-4 will give higher fibre yield in field condition (Table 2).

### **Conclusion**

Considering the anatomical feature the advance line O-043-7-9 (G), O-0412-9-4, Acc. 1318 as well as variety BJRI Tossa pat-5 and JRO-524 produced good fibre yield in field condition.

### **Acknowledgement**

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