

Comparative Studies of Retting Properties of Different Released Varieties of Jute

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Abstract: Recently six varieties of jute were released from Bangladesh Jute Research Institute where two were from *C. olitorius* (OM-1 & OF-390) and four from *C. capsularis* (C-718, C-2035, C-2005 & C-2143). These varieties were compared for their retting properties, morphological differences as well as their physical properties of the fibre extracted from them. Among them, white fibre with fewer cuttings and "A" and "B" grade fibers were obtained by retting from C-718 and OF-390 varieties, respectively yielding higher quantity of fibers. Other varieties found inferior in quality in all aspects.

Key words: Jute released varieties, retting.

Introduction

Among the natural industrial fibers of the world, jute occupies second position accounting for nearly 15% of the total output of natural fibers, thus jute is a cheap textile fibre of great economic significance, next to cotton. Jute is a bast or phloem fibre, containing in the bark of stems. Each fibre bundle is composed of a large number of fibre cells cemented together by pectin and gummy substances (Deb, 1954; Mian *et al.*, 1996). This fibre is extracted from the bast layer of jute stem by a process known as retting. Biochemical studies on retting have shown that most of the pectic substances are hydrolyzed by microbes, the bacteria and fungi (Kundu, 1960). Different varieties of jute originating from *Corchorus capsularis* and *C. olitorius* are cultivated in jute producing countries. The most important point of difference between these varieties lies in the fibre quality which is in the luster, length of fibre, stiffness, etc. (Choudhuri and Islam, 1951). These qualities form the basis of competition in the jute market. All these qualities also depend on the proper period of retting. Over retting and under retting definitely affect the above mentioned qualities of jute fibers. The retting period varies with the thickness and maturity of the stem (Nandi and Basu, 1938; Debsarma, 1946). *Olitorius* jute (O-9897) has the advantage of high yield potential to early sowing (Anonymous, 1990). Islam *et al.* (1988) reported on the effect of varieties and seed age on the fibre yield of jute.

Recently, Bangladesh Jute Research Institute released some varieties namely *Corchorus capsularis* viz., C-2143, C-2035, C-718 and *C. olitorius* viz., OF-390 and OM-1. But no experimental study has been carried out so far regarding their physical properties such as strength, softness, fineness, weight, length, colour, luster, text value, bundle strength as well as retting period and morphological differences between varieties. The physico-chemical properties and retting properties of fibers play a very vital role in the processing technology as well as in selecting fibers for particular end products. Therefore current report presents the findings on the physical and retting properties of these varieties of jute.

Materials and Methods

Land for jute cultivation was selected in such a way so that there may not be any problem of getting water for jute retting after its harvest. As because the quality of jute fibre has direct relationship with the stage of harvest, plants of every variety was harvested just before flowering. While harvesting, the thick, thin, small and big jute plants were assorted and bundled separately. Transparent, clear and mild streaming

water was selected for proper retting. While preparing the jaks, the bundles of jute of each variety was arranged for getting ample space for the easy movement of water and retting microbes. Jaks were made in conventional or traditional manner. The jaks were immersed under about 10 cm water so that they do not get so deep as to come in contact with the clay of the bottom of retting pools. To keep the jaks submerged under water for about 10/12 days till the fibre were well separated and strong, concrete slabs were used. Within the stipulated period of time, few plants were taken out of the jaks and examined to ensure their proper separation and strength. Then samples from each variety were used for different experimental purposes.

In order to take the text value, 10-cm sample of each were taken and measured manually using electronic balance. Presley index was measured according to the standard method (Mohiuddin *et al.*, 1992) in order to determine the bundle strength. Fineness of the fibers was tested by standard Airflow method (Anderson, 1954; Brady and Gerard, 1982). In every case of study, two different controls of two different varieties were maintained- one from *C. capsularis*, var. CVL-1 and one from *C. olitorius*, var. O-9897. The collected data were analyzed statistically following the procedure of Duncan's New Multiple Range Test (DMRT) method (Steel and Torrie, 1960; Bishop, 1971).

Results and Discussion

Different parameters were taken for study in order to compare these varieties of jute in the present report. In the study of retting properties of these different released varieties of jute (Table 1), OF-390 and OM-1 of *C. olitorius* took same time for retting, fibre grade with less cuttings and better fibre yield without significant change of pH during retting. On the other hand, among the four varieties of *C. capsularis*, C-718 was found to be better in all its retting properties. C-718 of *C. capsularis* and OM-1 of *C. olitorius* were also seemed to be morphologically better than the other released varieties (Table 2). Physical properties, i.e., fineness, bundle strength and text value were also studied (Table 3) and it was observed that OF-390 of *C. olitorius* and C-718 of *C. capsularis* showed higher bundle strength and text value among the varieties tested. In fineness, C-718 of *C. capsularis* and both the varieties of *C. olitorius* (OF-390 and OM-1) were found lower in value which indicate better quality of fibers (Table 3).

Of all the characteristics determining quality of fibre, strength is the most important one. Although this strength could be a variety character, actually retting mostly influences it. A little

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Table 1: Comparative studies of retting properties of different released varieties of jute

Variety	Retting time (Days)	Final pH	Fibre colour	Fibre grade	Cuttings (%)	Fibre yield (kg/100 kg bark wt.)
C-718	12	6.80	White	A	2.00	10.50
OF-390	11	6.59	Golden	B	4.00	9.00
C-2035	14	7.00	Brown	C	15.00	9.00
OM-1	11	6.90	Golden	B	6.00	10.50
C-2005	14	6.77	Shamla	C	20.00	10.50
C-2143	13	6.81	Brown	C	10.00	10.50
Control-1 (CVL-1)	16	7.01	Light brown	C	25.00	11.05
Control-2 (O-9897)	17	7.00	Light golden	C	30.00	10.75
*Level of significance	0.01	0.01	**NS	*		

*Mean followed by a common letter are not significantly different at the 5% level of DMRT.

*NS=Non Significant

Table 2: Morphological differences between different varieties of jute plant

Variety	Plant height (m)	Base diameter (mm)	Green weight of jute (kg)
C-718	3.32	13.60	42.00
OF-390	2.89	16.30	38.00
C-2035	3.22	13.00	56.00
OM-1	3.40	19.00	51.00
C-2005	3.14	21.30	45.00
C-2143	3.15	21.17	31.00
Control-1 (CVL-1)	3.17	13.20	-
Control-2 (O-9897)	3.30	16.00	-

Table 3: Physical properties of different fibers extracted from different varieties

Variety	Fineness (μ)	Bundle strength (lbs/mg)	Text value
C-718	36.50	9.50	2.62
OF-390	41.30	11.18	2.28
C-2035	37.00	8.76	2.09
OM-1	41.30	10.11	2.08
C-2005	39.00	6.94	2.39
C-2143	37.70	9.13	2.17
Control-1 (CVL-1)	38.10	8.42	2.33
Control-2 (O-9897)	40.20	10.03	2.27

over-retting greatly weaken the fibre. The end-point of retting can be easily determined by the determination of pH value of the retting liquor (Bhattacharyya and Basu, 1981). Towards the end of retting, if this value is around neutrality, the end-point is expected to have been reached. Usually, a good quality fibre has lower value of fineness and bundle strength in the range of 5.6 to 14 μ ; C-718 and OM-1 were also found to be within this range. The bundle weight of average jute plant should normally be about 10 Kg, which was also observed in present report. Many workers studied the ultimate fibre cells in jute and other fibre plants and also on the differences in their length and breadth. Ultimate fibers in jute varied between 500 to 6,500 μ and 10 to 30 μ , respectively. Shaikh *et al.* (1977) analyzed induced mutants of both *C. capsularis* and *C. olitorius* and observed wide variability in the length and breadth of ultimate fibre cells where they identified that some mutants with longer and thinner ultimate fibers than the parental cultivars viz. D-154. They also stated that quality of jute fibers is associated with the retting and the length and breadth (L/B) ratio of fibre cells (Ali and Haque, 1984; Dastidar and Das, 1980). Wahhab *et al.* (1978) and Hassain and Wahhab (1981) obtained higher base diameter in *Capsularis* (D-154) compared to *Olitorius* (O-4). In respect of production of fibre and stick weight per plant, the variety D-154 produced the maximum result; higher weight was found in *Capsularis* (Wahhab *et al.*, 1978; Hassain and Wahhab, 1981; Shah abuddin *et al.*, 1996). From Table 3, through bundle

strength and text values it can be concluded that thicker fibers have got the higher breaking elongation (Kar, 1954; Lunaik, 1953). Moreover, slightly under retted fibers are better than over retted fibers. Statistical analysis were made among the varieties following the analysis of variances technique and in question of significant F-Test mean differences were adjudged following DMRT where distinct differences were observed in C-718 of *C. capsularis* and OF-390 of *C. olitorius*. Usually a good *C. olitorius* under standard agronomic practice yields about 46,000 Kg/ha of whole green plants (excluding roots) comprising of 17,802 Kg (38.70%) green ribbons or 5,111 Kg (11.11%) of dry ribbons with dry fibre yield of 3,128 Kg (6.8%), leaves about 5,060 Kg (11.00%) green or 1,242 Kg (2.70%) dry and 23,138 Kg (50.30%) green sticks or 7,636 Kg/ha (16.60%) of dry wood (IJO-FAO, 1993). Considering all these results, thus it can be conclude that from white jute varieties (*C. capsularis*), C-718 and from tossa jute varieties (*C. olitorius*), OF-390 are found quite superior in respect to the retting, morphological and physical properties of fibers than the other recently released varieties from Bangladesh Jute Research Institute.

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References

- Ali, M. A. and K. S. Haque, 1984. Length, breadth and L/B ratios of ultimate fibre cells of some Land races of *Corchorus capsularis*-L. Bangladesh J. Jute Fib. Res., 9: 65-70.
- Anderson, S. L., 1954. The wira fibre fineness meter. J. Text. Inst., 45: 312.
- Anonymous, 1990. Improved varieties of jute. Bangladesh Jute Research Institute, pp: 1-13.
- Brady, J. E. and E. H. Gerard, 1982. General chemistry principles and structure (3rd edi.); John Wiley and Sons, New York, pp: 245-251.
- Bhattacharyya, S. K. and M. K. Basu, 1981. Quality improvement of retted jute by fungal culture. Jute Development J., 22-24.
- Bishop, O. N., 1971. Statistics for biology. Longman Group Ltd., London, pp: 154-174.
- Choudhuri, S. D. and M. A. Islam, 1951. A comparative study of kenaf (*Hibiscus cannabinus*) and altissima (*Hibiscus sabdariffa* var. altissima). Pakistan J. Sci., 3: 124-131.
- Deb, P. K., 1954. A comparative study of Jute. K. M. Deb Calcutta, pp: 207.
- Debsarma, G. D., 1946. Biochemical investigation on jute retting. Ind. J. Agric. Sci., 16, 453-458.
- Dastidar, K. K. G. and P. K. Das, 1980. Inheritance of leaf length, leaf breadth and internode length in an eight-parent diallel cross of *Corchorus Capsularis*-L. Bangladesh J. Jute Fib. Res., 5: 5-12.
- Hossain, M. A. and M. A. Wahhab, 1981. Demonstration-cum-assessment of recommendation and farmers technologies in jute cultivation. Ann. Rep. Bangladesh Jute Res. Inst., pp: 81.
- IJO-FAO, 1993. Regional project on improved retting and extraction of jute, In: Improved retting and extraction of jute and kenaf. Proceedings of regional workshop held at research institute for tobacco and fibre crops, Manila, Indonesia, GCP/RAS/122/IJO, pp: 45-436.
- Islam, M. A., M. K. Hassan and S. M. A. Hossain, 1988. Effect of varieties and seed age on the fibre yield of jute. Bangladesh J. Jute Fib. Res., 13, 7-12.
- Kundu, A. K., 1960. Studies on the microbiological retting of jute. Ph.D. Thesis. Calcutta University, India.
- Kar, S. N., 1954. The jute fibre. Book Society of India Ltd., 2 College Street, Calcutta, India, pp: 8.
- Lunaik, B., 1953. The identification of textile fibres. Sir Issac Ptierman and Sons. Ltd., Pitman House, Parker street, Kings way, London, pp: 88.
- Mohiuddin, G., S. H. Talukder, L. B. Lutfar, M. A. Sobhan and M. K. Kabir, 1992. Up gradation of low-grade jute and cuttings of jute fibers by means of enzymes. J. Text. Inst., 83: 537-541.
- Mian, M. H. A., M. A. Samad and N. N. Sarker, 1996. Comparative study on the physico-mechanical properties of jute, kenaf and mesta-Part-V. Bangladesh J. Jute Fib. Res., 21: 71-80.
- Nandi, H. K. and J. N. Basu, 1938. Structure and development of jute fibre and the factors determining yield and quality. Sci. Culture, 3: 397-401.
- Shaikh, M. A. Q., F. S. N. Khan and F. Khatoon, 1977. Introduction of variability in the ultimate fibre cell characteristics of jute through nuclear techniques. Proc. 3rd Int. Congress. SABRAO, Canberra, Australia, 2: 9-16.
- Steel, R. G. D. and J. H. Torrie, 1960. Principles and procedures of statistics. McGrawHill-Hill Book Co., Inc., New York, pp: 107-109.
- Shahabuddin, M. A. S. Sheikh and M. K. Kabir, 1996. Comparative study of physical properties of jute, cotton and union fabrics. Bangladesh J. Jute Fib. Res., 21, 47-54.
- Wahhab, M. A., M. A. Rahman, M. A. Hossain and M. S. Akbar, 1978. Studies on the yield performance of *Capsularis* and *Oltorius* grown in same field in the same season. Ann. Rep. Bangladesh Jute Research Institute, pp: 116-117.