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Study of Physical and Mechanical Parameters of Some Tossa Jute (*Corchorus olitorius*) Varieties Released by India and Bangladesh

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Abstract: The physical and mechanical parameters of some exotic tossa Jute (JRO 632, JRO-878, JRO-524) and recommended tossa Jute of Bangladesh Jute Research Institute (O-9897, OM-1, O-4) were studied. The variety O-9897 (*Corchorus olitorius*) produced the highest fiber yield (4.29) ton ha^{-1}. The same variety produced higher grade fibre (BTB+) with the lowest percentage of cutting (7.50%) significantly. The highest value of fibre strength was observed in the same variety (10.98 lbs mg^{-1}). Fibre strength varied from 6.65 to 13.38 lbs mg^{-1}. Some exotic variety showed poor germination, pre mature flowering and disease infestation.

Key words: Fibre yield, fibre quality, fibre strength, seed quality, tossa jute

Introduction

Jute (*Corchorus* sp.) is the fibre yielding crop. It is the main industrial crop of Bangladesh (Ali Mian, 1994) The importance of Jute cultivation in the economy of Bangladesh is all too pronounced. It is so because on an average some 15 lakh acres of cultivable land is used for this crop every year (The Bangladesh Observer, 1998). The acreage for jute remains around 15% of the cultivable area. Around 50 lakh tons of jute is produced every year (The Bangladesh Observer, 1998). The proportion of deshi and tossa Jute area are 36:64 (Morshed, 1999) Between two species of *Corchorus*, C*orchorus olitorius* is grown in high and medium high land areas of Bangladesh (Islam *et al*., 1994). In Jessore and Rangpur zone the farmers are growing some exotic (Indian) tossa Jute varieties (JRO-632 JRO-878 JRO-524) in addition to the recommended tossa varieties (O-9897, OM-1, O-4) of Bangladesh Jute Research Institute. Why the farmers are using the exotic vanities are not known. The farmers of Bangladesh facing serious problem in producing jute seed. In jute, fiber yield can be increased up to 20% through the use of high quality seeds. The seed requirement of jute in Bangladesh is about 4000 tons (Morshed, 1999). Only 16% certified seed in supplied by Bangladesh Agriculture development corporation. The rest of the required seeds are produced or purchased by the farmers. Seeds available from the market bear no testimony to the quality, varietal identity and source. The market supply of jute seeds are composed of both local and exotic seeds (Indian). Some exotic variety bear varietal admixture, disease and produced premature flower and poor germination. Jute quality of seeds play an important role to a large extent on the agricultural productivity. Poor germination and poor crop establishment causes low yield and some times crop failure. In 1998, certified seed price of tossa jute (BADC) was 51.60 Tk/kg and average market price of tossa Jute seed (Exotic) was 30-50 Tk/kg. The physical and mechanical properties of fibre play a very vital role in the processing technology as well as in selecting fibers for particular end products (Ali Mian, 1994). Principal use of jute has been for ropes, bagging, wrapping, manufacturing yarn, carpets, blanket, geo-textiles and clothes (Ali Mian *et al*., 1993). The quality of fibre is very important parameter for jute (Asaduzzman *et al*., 1983). The quality of jute is usually judged for its suitability for the production of various types of yarns and its behaviour in the manufacturing processes (Shaha *et al*.,1994). Depending on the quality of fiber, jute fibre is classified in six different grades such as BTSPL, BTA, BTB, BTC, BTD and BTE where B stands for Bangladesh, T stands for tossa and SPL stands for special (Shaha *et al*., 1994). Quality assessment is generally done by grades, colour, strength of fibre and percentage of cuttings (Asaduzzaman *et al*., 1983). The bottom portion of jute fibre (20-30 cm of the base) which are not well retted are usually coarse and hard are known as cuttings (Rahman *et al*., 1994). The comparative study of physical and mechanical properties have not yet been undertaken. No information gathered about their physical and mechanical properties. So it is very essential to study the fibre yield, fiber quality and strength of fibre of the exotic and recommended tossa varieties. Therefore, this study was undertaken, to estimate the fibre yield, to assess the fibre quality and to determine the strength of the fibre.

Materials and Methods

This study was conducted at Monirampur Jute Research Sub-Station, Jessore during the year 1997-1998. Three exotic varieties JRO-632, JRO-878 and JRO-524 were collected from Jessore zone and three recommended varieties O-9897, OM-1 and O-4 collected from Bangladesh Jute Research Institute. The experiment was conducted in a randomized complete block design (Islam *et al*., 1994). The plants were grown in the field by usual agronomic practices. Relevant data was recorded as per technical programme. Percentage of germination was recorded in laboratory in petridish. Varietal admixture, premature flowering and disease were recorded in the field. The plants were harvested after 130 days and stacked for three to four days for removing the leaves. After removing the leaves the basal parts of the plants were kept standing under water at about 45 cm depth for about 4 to 5 days before the final submersion (Asaduzzaman *et al*., 1983). Then whole plants were submersed under water for final retting. The progress of retting was checked carefully. When the basal parts retted properly without over retting, the fibers were extracted. After washing, the fibers were dried in the sun and sufficient amounts of fibre samples were collected for testing. The fibre quality of different varieties was assessed and percentage of cuttings were measured by microbiology and biochemistry division of BJRI. Testing department tested the bundles strength. Bundle strength (Pressley index) of fibre for each grade was determined by pressley fibre bundle strength tester using zero gauge length. The flat bundle approximately 6.35mm (¼ inch) width was held by a pair of clamps. All protruding ends of fibers were then shared off even and tension applied to separate the clamps and there by to break the fibers. The broken bundle was weighted in a precision balance. The resulting strength (Pressley index) was then computed from the breaking load in pounds and the weight of the bundle in milligram (Ali Mian, 1994).

Pressley index = Breaking load (lbs)/Bundle weight (mg).

Results and Discussion

The highest percentage of germination was observed in variety O-9897 (97%) which also showed minimum percentage of varietal admixture (3%) (Table 1). The variety 0-9897 did not produce premature flowering and showed no disease infestation. Analysis of variance revealed that some difference existed among the physical and mechanical parameter of the studied vanities. The

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Table 1: Percentage showing germination, admixture, premature flowering and disease

Varieties	Percentage of germination	Percentage of varietal admixture	Percentage of premature flowering	Percentage of disease
JRO-632 (Exotic)	59	26	24	19
JRO-878 (do)	68	17	21	17
JRO-524 (do)	86	08	12	8
O-9897 (BJRI)	97	03	0	0
OM-1 (BJRI)	93	05	0	0
O-4 (BJRI)	91	0	11	7

Table 2: Physical parameters of some exotic and recommended tossa jute of BJRI

Varieties	Plant height (m)	Base diameter(mm)	Fibre weight (ton ha^{-1})	Fibre colour	Fibre grade	Percentage of cuttings
JRO-632 (Exotic)	4.12	17.54	4.00	Golden white	BTB	9.50
JRO-878 (do)	4.05	18.12	3.88	-do-	BTB-	8.25
JRO-524 (do)	4.10	17.45	4.03	-do-	BTB-	8.50
O-9897	4.18	18.69	4.29	-do-	BTB+	7.50
OM-1	4.13	18.61	4.19	-do-	BTB+	7.75
O-4	4.00	17.60	4.05	-do-	BTB-	8.50
LSD at 5%						0.94*
level CV (%)	3.26NS	4.51NS	3.75NS	-	-	8.65

*Indicates significant at 5% level, BTB = Indicates Bangladesh Tossa B bottom grade, NS = Non significant

Table 3: Bundle strength of some exotic and recommended tossa jute fiber of BJRI

	Bundle strength lbs/gm	
ute samples	Mean ± S.D.	CV (%)
JRO-632(Exotic)	8.20 ± 1.43	17.40
JRO-878(do)	9.80 ± 1.41	14.37
JRO-524(do)	9.84 ± 0.53	15.36
O-9897	10.98 ± 1.35	13.84
OM-1	10.31 ± 1.31	14.81
O-4	8.16 ± 1.38	16.30
LSD at 5% level	053*	
CV (%)	0.88	

* = Indicates significant at 5% level.

results indicated that (Table 2) the variety O-9897 gave the highest plant height (4.18m) base diameter (18.6mm) and fibre yield (4.29 ton ha^{-1}). The variety O-9897 also gave less amount of cuttings (7.50%) significantly when compared to other varieties. The highest percentage of cuttings was observed in the variety JRO-632 (9.50%). The variety O-9897 and OM-1, gave higher grade (BTB+) and good quality fibre. All the variety produces golden white colour fibre. Recommended variety of BJRI, namely O-9897 and OM-1 produce better quality fibre (BTB+) grade than the exotic varieties. These two varieties produce fibre with less amount of cutting significantly (7.50 and 7.75%).

The varieties O-9897 and OM-1 showed higher value of bundle strength (pressley index) 10.98 and 10.31 lbs mg^{-1} respectively (Table 3), which were significant at 5% level of probability. Bundle strength varied from 6.65 to 13.38 lbs/gm.

Plant height base diameter and fiber yield was higher in O-9897. Similar results were found by Islam *et al*. (1995). Chaudhury (1981) and Weng *et al*. (1990) reported that in jute, plant height and base diameter has got positive correlation with fiber yield. We found BTB grade fibre. These findings disagreed with the findings of Islam *et al*. (1995). Talukder (1990) reported that the optimum yield and good quality jute is usually harvested at an average flowering time (120 to 135 days). These finding is in agreement with the finding of Talukder (1990).

Bundle strength of our finding was in agreement with the finding of Ali Mian *et al*. (1996). The physical and mechanical properties of fibers play a very vital role in the economy and in the processing technology as well as in selecting fibers for containing particular end products (Ali Mian, 1994). The higher grade of fibre with less cuttings will give maximum price of fibre. Not only this, it will be highly suitable to use in the industry. It can be concluded here, that the recommended variety of BJRI (O-9897) produce higher fibre yield and better quality fibre than the exotic varieties which also produce fibre with higher value of fibre strength. The exotic variety (Indian) showed poor germination, premature flowering and disease infestation.

Although Bangladesh Jute Research Institute has developed improved Tossa variety (O-9897) with higher fibre yield and better quality fibre but the farmers of border areas are not getting sufficient seeds of improved jute variety by lower price and in proper time. So, the farmers are using Indian jute seeds.

It can be recommended here that BADC should take necessary action for supply of sufficient jute seeds at jute growing areas in proper time by lower price. To cultivate O-9897 (*Corchorus olitorius*) variety awareness should be create among the farmers and extension workers.

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