SPINNABILITY STUDY OF WHITE JUTE GROWN-UP IN DISSIMILAR REGION OF BANGLADESH

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ABSTRACT

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This exertion was carried out at the Mechanical Processing Division of Bangladesh Jute Research Institute in 2008. Both in spinning and weaving technology fibre strength is an important factor. Moreover, to improve some textile properties of jute fibre it is subjected to different chemical treatment to make it suitable for blending. The jute fibre loses its strength to some extent when it is chemically treated. So, initial fibre strength is an essential physical property to be known before its chemical treatment. Moreover, under any condition the proper utilization of materials becomes key factor in economic production. Quality of jute yarn based on strength of fibre from different places will be known and may be helpful to all concerned. Bundle strength in terms of Pressley Index (PI) value of white jute fibres of different jute growing areas were measured for the assessment of quality of yarn. Samples were collected from different local jute markets of Faridpur, Shariatpur, Rangpur, Naogaon, Kishoregonj, Jamalpur, Hajigonj, Khulna and Jessore. Only the Corchorus capsularis (White Jute) variety was taken for this study. Experiments were carried out using Pressley Fibre Strength Tester. It was found from this study that the fibre of Tarail in the district of Kishoregonj possessed the highest Pressley Index value amongst all and the fibre of Dumuria of Khulna district possessed the lowest mean value of Pressley Index value. In terms of variability all the five samples of Shariatpur district showed better results than that of Faridpur district. The findings indicate that the white jute, grown in Kishoreganj have the better spinnability in terms of fibre strength and yarn quality.

Keywords: Spinnability, Quality Ratio and white jute

INTRODUCTION

For the purpose of export or use in factories, jute is classified into different grades according to quality. In case of jute, there are two types of grading viz. kutcha and pucca. In Bangladesh two varieties of jute namely a) *Corchorus capsularis* (White Jute) and (b) C*orchorus olitorius* (Tossa Jute) are grown abundantly. Tossa jute mainly grows in high land and white jute grows in low land (Chakravarty, 2004). So characteristics of these two varieties are some how different. Jute grows in almost all the districts of Bangladesh. But some districts like Faridpur, Shariatpur, Rangpur, Naogaon, Kishoregonj, Jamalpur, Hajigonj, Khulna, Jessore etc. are famous for producing good quality jute in large scale. The soil, weather, climate, cultivating process, water availability, retting system and drying system of all these districts are not exactly the same. The districts of north Bengal such as Rangpur, Dinajpur, Naogaon etc. are comparatively colder part of the country and the southern area of Bangladesh is saline based. In this circumstance quality of the crops, which grow in all those different places, may vary with each other. At present white jute is not cultivated abundantly like tossa jute due to various reasons and it is not randomly available in the market. Yet, it is a prominent variety that grows more and has great demand after tossa jute. Both the varieties i.e. white and tossa are classified into six grades by the graders according to the customers' demands. These six grades are named as special, A, B, C, D & E. So, for white jute these are called BWSPL, BWA, BWB, BWC, BWD, & BWE and for tossa jute these are called BTSPL, BTA, BTB, BTC, BTD & BTE where SPL stands for special, W for White and T for Tossa (Kar, 1954).

The consumers always judge quality of a product when it is bought. Consumers' judgment and the price of a sellable product are mostly dependent on its visual appearance and strength. Like all other goods it is also applicable for raw jute and its final product. Jute is an important exportable commercial item of Bangladesh. Bangladesh earns a lot of foreign currency by exporting raw jute and jute products. Like other fibres, the producers also judge raw jute fibre based on its colour and strength for its suitability in producing various types of yarns and its behaviour in the manufacturing process. The graders in assorting the raw jute also consider fineness, density, reed length and other defects but colour and strength are given more importance. Between these two important properties, strength is the most preferable physical property to produce durable jute product.

Previously jute was used for producing conventional products like Sacking, CBC & Hessian cloth etc., which needed strong fiber and brighter colour (Abdullah, 1979). At present diversified use of jute fiber has increased remarkably. Thus jute fiber is being used in manufacturing fine yarn for making different types of light fabrics for diversified uses. To produce fine products fine yarn is needed and to produce fine yarn strong fibre is needed, as weak fibre cannot produce a strong yarn. Individual fibres must also have sufficient strength to withstand normal mechanical strain in the processing (Shaha *et al 1994*).

Both in spinning and weaving technology fibre strength is an important factor. Moreover, to improve some textile properties of jute fibre it is subjected to different chemical treatment to make it suitable for blending. The jute fibre loses its strength to some extent when it is chemically treated. So, initial fibre strength is an essential physical property to be known before its chemical treatment. Moreover, under any condition the proper utilization of materials becomes key factor in economic production. With this point of view, these studies on fibre strength of white jute of different places were undertaken. From this study the quality of jute yarn based on strength of fibre from different places will be known and may be helpful to all concerned.

MATERIALS AND METHODS

Raw jute samples were collected from several markets of nine famous jute-producing districts like Faridpur, Shariatpur, Rangpur, Naogaon, Khulna,Jessore, Kishoregonj, Jamalpur and Chandpur in the year of 2008. Raw jute of the different qualities were collected from Kanaipur, Talma and Nakulhati of Faridpur district; Bhajeswere, Burirhat and Dogri of Shariatpur district; Kawnia, Ranipukur, Jagirhat, Mirjapur of Rangpur district; Pajorebhanga; Satihat and Kirtipur of Naogaon district; Dawlatpur and Dumuria of Khulna district; Noapara and Kashobpur of Jessore district; Bawshi and Aramnagar of Jamalpur district; Tarail, Karimgonj and Katiadi of Kishoregonj district; Kachua, Faridgonj and Hajigonj of Chandpur district.

In this study fibre strength denotes Bundle strength i.e. Pressley Index (PI) value and it was measured by Pressley Fibre Strength Tester. Though bundle strength represents the strength of a very little portion of the whole jute fibre yet, it is a recognized term for fibre strength worldwide.

Bundle strength

Using zero gauge length, bundle strength of the samples was measured[5]. Suitable amount of flat bundle of fibers were placed in between the jaws and then tied. Protruded fibers beyond the jaws were cut off with a sharp razor (Karim *et al* 1977). Then the jaws were placed into the fixed place of the tester and tension was applied and thereby the bundle of the fibers was ruptured. The broken fibers were taken out and weighed by a precision balance (Booth, 1968). Bundle strength was calculated from breaking load and weight of the sample using the formula given below:

$$\text{Pressley index} = \frac{\text{Breaking load (lb)}}{\text{Bundle weight (mg)}}$$

RESULTS

Bundle Strength of 45 independent samples of jute fibre was done and obtained results are shown in the following tables:

Table 1. Pressley Index Values of the samples collected from Faridpur district

Sample	Name of Place	Range	Minimum	Maximum	Mean	S.E.	SD	CV%	Variance
0001	Talma	2.50	7.78	10.28	9.28	0.127	0.682	7.35	0.465
0002	Talma	4.54	7.91	12.45	10.03	0.447	1.415	14.11	2.00
0003	Nakulhati	5.51	7.83	13.34	10.70	0.234	1.281	11.97	1.640
0004	Kanaipur	4.13	7.61	11.74	9.78	0.228	1.251	12.78	1.567
0005	Kanaipur	3.11	8.94	12.05	10.87	0.310	0.978	8.99	0.958

Table 2. Pressley Index Values of the samples collected from Shariatpur district

Sample	Name of Place	Range	Minimum	Maximum	Mean	S.E.	SD	CV%	Variance
0006	Dogri	2.59	9.06	11.65	10.08	0.254	0.804	7.97	0.646
0007	Dogri	2.49	9.92	12.41	11.32	0.264	0.835	7.37	0.698
0008	Burirhat	1.20	9.66	10.6	10.04	0.112	0.353	3.51	0.125
0009	Bhajesware	1.25	8.82	10.07	9.37	0.119	0.378	4.03	0.143
0010	Bhajesware	1.29	8.93	10.22	9.53	0.140	0.443	4.65	0.197

Table 3.Pressley Index Values of the samples collected from Jamalpur district

Sample	Name of Place	Range	Minimum	Maximum	Mean	S.E.	SD	CV	Variance
0011	Aramnagar	2.03	9.50	11.53	10.57	0.21	0.673	6.37	0.453
0012	Aramnagar	3.71	8.64	12.35	10.70	0.38	1.224	11.4	1.498
0013	Aramnagar	2.07	8.72	10.79	9.89	0.18	0.587	5.93	0.345
0014	Bawshi	2.68	8.14	10.82	9.719	0.23	0.744	7.65	0.554
0015	Bawshi	2.99	9.66	12.65	10.68	0.26	0.825	7.72	0.681

Table 4. Pressley Index Values of the samples collected from Kishoregonj district

Sample	Name of Place	Range	Minimum	Maximum	Mean	S.E.	SD	CV%	Variance
0016	Karimgonj	1.33	9.57	10.90	10.33	0.151	0.479	4.64	0.230
0017	Karimgonj	3.74	9.73	13.47	11.02	0.337	1.066	9.67	1.136
0018	Katiadi	4.33	7.14	11.47	9.75	0.503	1.592	16.33	2.535
0019	Tarail	2.76	10.22	12.98	11.78	0.275	0.870	7.38	0.758
0020	Tarail	2.25	8.99	11.24	9.75	0.239	0.755	7.74	0.570

Table 5. Pressley Index Value of the samples collected from Jessore district

Sample	Name of Place	Range	Minimum	Maximum	Mean	S.E.	SD	CV%	Variance
0021	Noapara	2.46	8.71	11.17	10.27	0.206	0.653	6.36	0.426
0022	Noapara	4.72	7.80	12.52	10.06	0.209	1.147	11.38	1.315
0023	Kashobpur	3.06	8.57	11.63	9.93	0.3547	1.122	11.27	1.258
0024	Kashobpur	2.87	8.91	11.78	10.02	0.293	0.928	9.26	0.863
0025	Kashobpur	1.83	8.10	9.93	8.90	0.179	0.565	6.367	0.320

Table 6. Pressley Index Value of the samples collected from Khulna district

Sample	Name of Place	Range	Minimu	Maximum	Mean	S.E.	SD	CV%	Variance
0026	Dawlatpur	2.16	9.56	11.72	10.62	0.203	0.643	6.05	0.413
0027	Dawlatpur	3.24	7.82	11.06	9.85	0.331	1.047	10.63	1.097
0028	Dawlatpur	2.57	8.99	11.56	10.90	0.244	0.772	7.62	0.596
0029	Dumuria	6.06	4.10	10.16	7.89	0.523	1.650	20.91	2.724
0030	Dumuria	2.67	7.76	10.43	8.25	0.280	0.875	9.77	0.765

Table 7. Pressley Index Value of the samples collected from Naogaon district

Sample	Name of Place	Range	Minimum	Maximum	Mean	S.E.	SD	CV%	Variance
0031	Pajhorbhanga	3.27	8.66	11.93	9.98	0.164	0.901	6.03	0.811
0032	Pajhorbhanga	4.17	9.41	13.58	10.46	0.149	0.819	7.83	0.671
0033	Kirtipur	3.50	6.85	10.35	8.12	0.342	1.083	13.34	1.173
0034	Satihat	4.53	8.60	13.13	10.39	0.374	1.184	11.40	1.402
0035	Satihat	2.66	8.37	11.03	9.85	0.278	0.880	8.93	0.774

Table 8. Pressley Index Value of the samples collected from Rangpur district

Sample	Name of Place	Range	Minimum	Maximum	Mean	S.E.	SD	CV%	Variance
0036	Ranipukur	2.12	8.95	11.07	9.72	0.183	0.607	6.24	0.369
0037	Ranipukur	4.26	8.39	12.65	10.60	0.527	1.667	15.72	2.779
0038	Kawnia	1.31	9.88	11.19	10.64	0.141	0.446	4.19	0.199
0039	Mirjapur	1.84	10.17	12.01	10.90	0.183	0.580	5.32	0.336
0040	Jagihat	1.86	7.75	9.61	8.40	0.190	0.630	7.5	0.397

Table 9. Pressley Index Value of the samples collected from Chandpur district

Sample	Name of Place	Range	Minimum	Maximum	Mean	S.E.	SD	CV%	Variance
0041	Hajigonj	4.96	6.87	11.83	9.73	0.445	1.406	14.45	1.978
0042	Kachua	3.72	9.76	13.48	11.48	0.333	1.052	9.16	1.108
0043	Kachua	2.26	7.26	9.52	8.35	0.204	0.644	7.71	0.415
0044	Kachua	3.74	8.46	12.20	10.34	0.373	1.182	11.43	1.396
0045	Faridgonj	2.08	8.60	10.68	9.306	0.202	0.639	6.86	0.409

Table 10. Physical properties of 8lbs/spy jute yarn produced from different jute growing areas in Slip Draft spinning Frame.

District	Nominal Count lbs/spindle	Actual Count lbs/spindle	Tensile Strength in Kg			Quality Ratio %
			Mean	SD	CV %	
Faridpur	8	8.15	3.65	0.421	11.53	98.73
Shariatpur	8	8.11	3.55	0.415	11.69	96.50
Jamalpur	8	8.17	3.22	0.477	14.81	86.89
Kishoreganj	8	8.12	3.45	0.438	12.70	93.67
Jessore	8	8.19	3.41	0.491	14.40	91.79
Khulna	8	8.05	3.61	0.495	13.71	98.86
Naogaon	8	8.11	3.71	0.489	13.18	100.85
Rangpur	8	8.14	3.45	0.486	14.09	93.44
Chandpur	8	8.12	6.59	0.492	13.70	97.47

DISCUSSION

It was found from the table 1 that the sample 0005 of Kanaipur having Pressley Index (PI) value 10.87 lbs/mg appears to be better than the other samples of the same area i.e. Faridpur district. Sample 0001 taken from Talma had the lowest PI value 9.28 lbs/mg but with lower variance and lowest percentage of co-efficient of variation (CV %), indicating the lowest variation within this sample.

From table 2 it was seen that the sample 0007 taken from Dogri showed the highest mean PI value with higher CV% & variance and the samples 0009 & 0010 taken from Bhajesware had the lowest mean PI value having lower CV% and variance.

It was found from the table 3 that the sample 0011 & 0012 from Aramnagar and 0015 from Bawshi showed almost same results of PI value and the sample 0013 & 0014 taken from Aramnagar and Bawshi respectively showed lower mean PI value around 9.7-9.8.

From the table 4 it was observed that the sample 0019 of Tarail possessed the highest mean of PI value i.e.11.78 lbs/mg and the sample 0018 & 0020 taken from Katiadi and Tarail respectively showed the lowest mean PI value of 9.75 lbs/mg. Sample 0020 from Tarhail exhibited less variation within itself from its lower variance. However, sample 0018 of Katiadi showed very high variance indicating lack of uniformity within the fibre.

It revealed from table 5 & 6 that the samples of Noapara were found better in term of mean PI value with lowest variance than the samples of Kashobpur of Jessore district and the sample 0028 of Dawlatpur occupied higher mean PI value where the sample 0029 taken from Dumuria having the lowest mean P.I. value with highest variation appeared to be lowest quality fibre of Khulna district (Shaha *et al 1997*).

Sample 0032 shown in table 7 of Pajorebhanga of Naogaon district possessed significantly higher maximum PI value with higher mean and lower variance emerged better fibre quality. The sample 0034 of Satihat exhibited almost same mean PI value but with higher variance causes less quality fibre.

It is observed from table 8 that 0039 sample of Mirjapur of Rangpur district possessed the highest mean PI and the sample 0040 of Jagirhat showed the lowest mean PI value. Sample 0037 Ranipukur appeared to be lower quality fibre bearing the highest range, variance and CV%.

From table 9 it is observed that sample 0042 from Kachua emerged to be better quality fibre having the highest mean PI value than those of others.

From these observations it was found that a sample 0019 collected from Tarail of Kishoregonj district possessed the highest mean PI value i.e. 11.78 lbs/mg and the sample 0029 of Dumuria of Khulna district exhibited the lowest mean PI value amongst all (7.89 lb/mg). Besides this the samples of 0007 collected from Dogri of Shariatpur

district; sample 0017 collected from Karimgonj; sample 0042 collected from Kachua of Chandpur district also showed higher PI value i.e. above 11 lbs/mg.

For better production, uniform raw jute is very essential. Same quality fibre may give objective type of end product. Much variation within the raw jute used in product development may hamper the suitable end product. In this point of view sample of samples 0008, 0009, 0010 and 0038 having almost same variance were found better than those of others. Moreover, all the five samples of Shariatpur district showed lower variances, which were below 1.Samples 0008, 0009 and 0010 showed negligible variances, which were below 0.2. To obtain better product this type of uniform fibers are always useful and productive. On the other hand sample 0002 of Talma of Fardpur; sample 0018 of Katiadi, Kishoregonj; sample 0025 of Kashobpur of Jessore;sample 0033 of Kritipur of Noagaon; sample 0037 of Ranipukur of Rangpur were found most irregular due to their highest (CV%) and variance.

It is said from table 10 that yarn quality ratio of Faridpur district are better than those of other districts. However, from this study it was found that in case of white jute Shariatpur district produces better fiber than that of Faridpur district in respect of low variation. Sariatpur district is a low land area having better retting facilities and it may be the cause of production of better quality white jute. On the other hand, both the samples 0029 & 0019 produced in high land area such as Dumuria of Khulna district and of Katiadi of Kishorgonj district respectively were found as low quality fibre in terms of higher variance, CV% and range.

CONCLUSION

Finally, it could be concluded that the white jute of Kishorgonj, Noagaon, Faridpur and Shariatpur districts were found as better quality fibre in terms of quality ratio where the white jute of high land area possessed lower Pressly Index value.

REFERENCES

Abdullah, Abu Md. 1979. ``Some practical problems of productivity in the Textile Industries of Bangladesh.'' Management Development Vol-8, No.-3,P-251.

Booth, J.E. 1968. Principles of Textile Testing. *Butterwrth Heinemann Ltd.* UK. 0-592-06325-9, P 75.

Chakravarty, A.C.2004. ``Fibre character involved in raw jute grading and their estimation'' Tex.Trends, 16(2) 55.

Kar, S.N., 1954 ``The Jute Fibre'' Book Society, 2 College Square Calcutta, P-12.

Karim, K.M.A and M.Kabir, 1977. ``Quality assessment of raw jute in relation to its colour.'' B.J.Jute Fib.Res.2 (1): 14-18.

Saha, N.G., M. Rahman, M.A.Samad, M.A.Aziz Mia, A.Islam, Taher Baksh and G.M.Talukder, 1994; ``Importance of lustre and strength of jute fibre in Grading.''B.J.Jute Fib.Res.19 (1) 59-64.

Saha, N.G., Latifa B. Lutfar, M.M. Rahman, N.N.Sarker and M.A.Sobhan Sheikh,1997 `` Assessment of commercial grading of jute in the light of measurable Textile parameter.'' B.J.Jute Fib.Res.22 (1&2) 98-102.