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ANALYSIS OF THE PROPERTIES OF JUTE/COTTON BLENDED FABRIC AFTER DIFFERENT WASHING PROCESS

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ABSTRACT

Ahmedullah ANM, Ahmed M, Foisal ABM, Patuwary AI (2018) Analysis of the properties of jute/cotton blended fabric after different washing process. *J. Innov. Dev. Strategy*. 12(1), 7-10.

The aim of this work is to investigate the properties of Jute/Cotton 20/80 (20% Jute & 80% Cotton) blended denim raw fabric after several washing process such as Enzyme, Stone and Acid wash. It is observed the properties changes in Jute/Cotton blended 3/1 twill denim fabric after three different wash. The changes in GSM, Shrinkage%, Mechanical strength, Abrasion, Pilling, Colour fastness to wash and rubbing after different washes are evaluated. The use of fabrics made from Jute/Cotton blended yarns would surely strength our economy by cutting a part of the cost incurred for importing cotton and enhancing the value addition due to locally produced cheaper jute as a raw material.

Key words: raw denim, enzyme, stone and acid wash

INTRODUCTION

Denim washing has totally changed the market potential and demands of denim fashion around the world. Garment is uncomfortable to wear without washing due to its weaving, dyeing and printing effects. It essentially needs a finishing treatment to make it softer and smooth which enhance wearer's comfort that is why washing is one of the most widely used finishing treatments due to its effects on appearance and comfort. There have been many attempts to use chemicals in denim garment washing. The most commonly used denim washing methods are enzyme wash, bleach wash, acid wash, stone wash etc. Many researchers are engaged in research to investigate the effect of various washing on physical, mechanical and colour fastness properties of cotton and stretch denim fabric. (El-Dessouki 2015), (Hafeezullah *et al.* 2014), (Solaiman 2015), (Hasan *et al.* 2017), (Sarker *et al.* 2016), (Hossain *et al.* 2017), (Ahmedullah 2012).

In the present work, a few properties of Jute/cotton blended denim fabrics after different wash has been evaluated. The objective of this study is to assess the effect of different wash on the various properties of Jute/cotton denim fabric. Denim washing was carried out with enzyme wash, stone wash and acid wash at Jeans Concept Limited, Bangladesh. After different washes the properties like GSM, shrinkage, tensile strength, abrasion, pilling, wash and rubbing fastness were evaluated to study the washing characteristic of denim fabric.

MATERIALS AND METHODS

GSM and Shrinkage%

The GSM (Gram per Square Meter) was measured by cutting the fabric sample with GSM Cutter. Then the weight of cut sample was measured by electronic balance. After that the weight was multiplied with 100 and the result was found. Shrinkage was determined by a glass template put on fabric sample which was square in size. There were six marks on glass template and distance between two marks was 50 cm. marking the sample fabric by unchangeable marker. Then samples were sewn by hand sewing machine and washed at 60°C temp for 90 min. After washing the fabrics were taken out and dried.

Tensile strength

Universal Testing Machine was used to determine the breaking force of the fabric samples. Strip test and Grab test methods ASTM D5035-11 were used.

Abrasion and Pilling

Martindale Abrasion & Pilling Tester was used to determine the abrasion and pilling of the sample fabrics. Abrasion and pilling tests were carried out at maximum 1000 cycles and 2000 cycles respectively. After regular intervals the sample fabrics were collected, weighted and compared with the sample fabric weight before abrasion and pilling.

Colour fastness to wash and rubbing

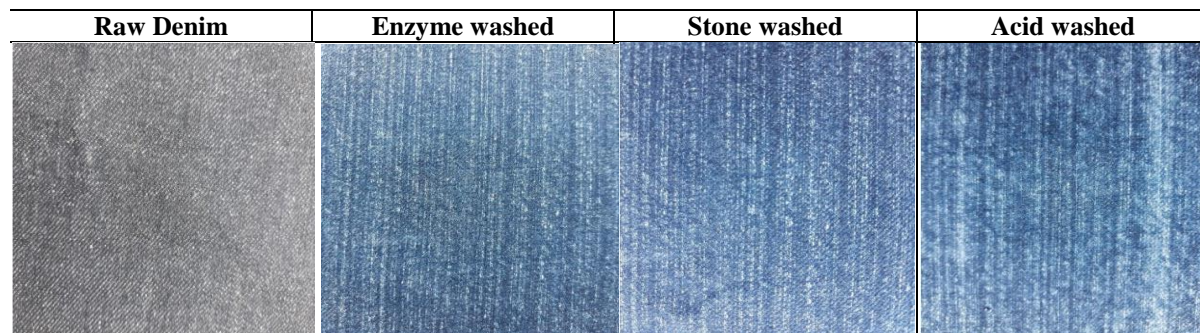
Color fastness to wash was determined according to the test method ISO 105 C06. To determine the color fastness to Rubbing, Crock Meter was used. Color Fastness to Rubbing was followed according to test standard ISO 105 X12:2002.

RESULTS AND DISCUSSION

Photos of Denim fabric

Table 1 shows the photos of raw denim and different washed denim fabric samples such as enzyme, stone and acid washed.

Table 1. Photos of different washed denim fabric samples



GSM and Shrinkage%

Table 2 shows the changes in GSM and the shrinkages of the fabric samples. The average weight of the raw sample was 346, after the enzyme wash sample was 336, the stone wash sample was 330 and finally the acid washed sample was 324. The shrinkages in warp way was -1% for raw and enzyme while the stone and acid washed fabric samples' shrinkage was -2%. In weft way the shrinkage was 2% both for raw and enzyme washed fabric, in stone washed the shrinkage was found 4% and in acid wash it was 5%.

Table 2. Changes of GSM and Shrinkages of different washed fabric

Types of Denim		Raw	Enzyme	Stone	Acid
GSM		346	336	330	324
Shrinkage	Warp way	-1%	-1%	-2%	-2%
	weft way	2%	2%	4%	5%

Tensile strength

Table 3 represents the breaking forces of the denim fabric samples in strip and Grab test method. The strength was determined for raw, enzyme washed, stone washed and acid washed fabric samples in warp and weft wise.

Table 3. Changes in strength of the fabrics after different washes

Breaking Force N	Direction	Strip Method				Grab Method			
		Raw	Enzyme wash	Stone wash	Acid wash	Raw	Enzyme wash	Stone wash	Acid wash
	Warp way	980.39	841.07	802.87	691.92	561.6	545.25	452.04	405.28
	Weft way	428.25	421.31	413.29	323.5	244.97	240.11	239.86	180.11

It was found that the warp wise breaking forces were greater than the weft wise. And the washing samples were weaker than the original raw sample. The tensile strengths were decreased gradually after Enzyme, stone and acid washed samples in both the warp way and weft way.

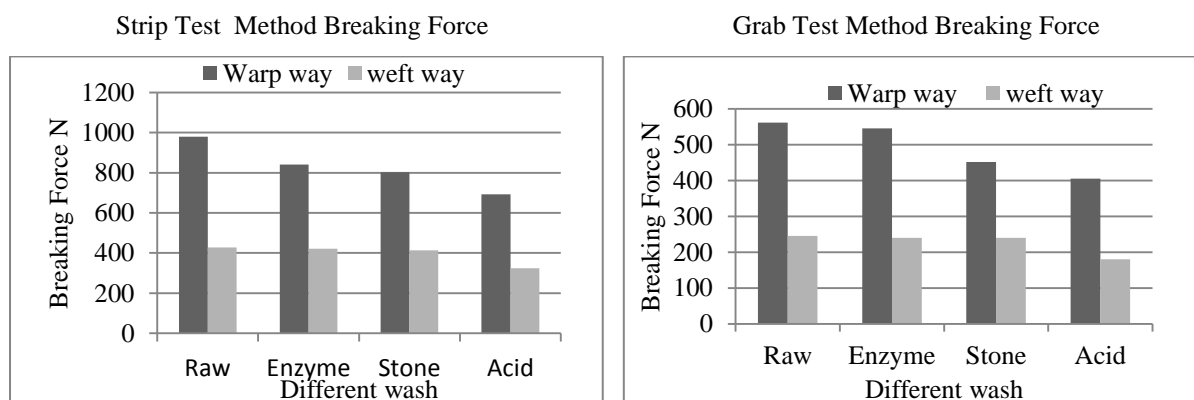


Fig.1. Graphical representation of breaking forces of different washed fabric

According to Figure 1 in Strip test method, it was found that breaking force of the raw denim was 980.39N along the warp direction. The breaking forces were after enzyme wash 841.07N, stone wash 802.87N and acid wash 691.92N. The weft wise breaking force of the raw denim fabric samples was 428.25N the enzyme, stone and acid wash were 421.31N, 413.29N, 323.5N respectively.

In Grab test method, it was found that breaking force of the raw denim was 561.6N along warp direction. The breaking force after enzyme wash 545.25N, stone wash 452.04N and acid wash was 405.28N. The breaking force along the weft direction was 244.97N, 240.11N, 239.86N, and 180.11N for raw, enzyme, stone and acid washed fabric samples respectively. It indicates the strength was declined with the different wash effect.

Abrasion and Pilling

Table 4 shows the results of abrasion tests of the raw denim, enzyme, stone and acid washed fabric samples for 100, 250, 500 and 1000 cycle intervals. It was seen that the weight has been decreased with the cycle intervals. The weight of the fabric samples (before abrasion) raw, enzyme, stone and acid was 390, 376, 370 and 365 mg respectively.

After 100, 250, 500, 1000 cycles the weights of the raw denim sample were 387, 387, 386 and 385 mg, the weights of the enzyme washed were 374, 373, 371 and 369 mg, the weights of the stone washed fabric samples were 368, 367, 365, 360 mg and the acid washed fabric samples were 362, 360, 359, 357 mg respectively. It was clearly observed that the weights were decreased with the increase of abrasion cycles interval.

Table 4. Changes of weight of the fabrics after different washes due to abrasion

Abrasion Test	Cycle interval	Wt. of fabric in mg before test	Raw	Enzyme	Stone	Acid
			390	376	370	365
	100	Wt. of fabric in mg after interval	387	374	368	362
	250		387	373	367	360
	500		386	371	365	359
	1000		385	369	360	357

Table 5 shows the results of pilling test of the raw and different washed fabric samples in different cycle intervals. It was measured in 125, 500 and 2000 cycles. It was seen that after 125 cycle, the raw and enzyme washed fabric samples' rating was 5, which indicates no pilling on fabric. The stone and acid washed fabric shows the result 4-5 rating, indicating slightly pilling or no pilling on the fabric surface. The pilling rate for all the fabric samples were 4-5 at 500 cycles. Again after 2000 cycle the rating of raw fabric was 3-4 which indicate the moderate pilling. The results were 4 rating for enzyme, stone and acid washed fabric samples which indicate slightly pilling.

Table 5. Changes the fabrics after different washes due to pilling

Pilling Test	Cycle interval	Interpretation of pilling grade	Raw	Enzyme	Stone	Acid wash
	125	5= No Pilling	5	5	4-5	4-5
	500	4-5= Slightly pilling or no pilling 4= Slightly Pilling	4-5	4-5	4-5	4-5
	2000	3-4= Moderate to Slight pilling	3-4	4	4	4

Colour fastness to wash and rubbing

Table 6 shows the wash and rubbing fastness of different washed fabric samples. The staining on Di acetate fabric was 4 for enzyme washed fabric, the stone washed and acid washed fabric samples were 4-5. The bleached cotton was 3-4 for enzyme washed and 4 were in stone and acid washed fabric sample. In polyamide the staining rate was 4 for enzyme washed and 4-5 was for stone washed and acid washed fabric. For polyester and wool the staining rate was 4-5 for all the washed fabric samples. For acrylic, the staining rate was 4 for enzyme washed sample, 3-4 in stone washed and 4-5 in acid washed fabric samples. The change in colour of the enzyme washed fabric sample was 3-4. The stone and acid washed fabric samples' change in colour was 4. The results of dry rubbing fastness rating was 4 both for enzyme and acid washed fabric sample, the rating was 3-4 for stone washed fabric. The wet rubbing fastness was 1-2 both for enzyme and stone washed fabric samples and 2 for acid washed fabric.

Table 6. Results of wash and rubbing fastness of different washed denim fabrics

Wash and rubbing fastness test	Staining on different fiber	Enzyme wash	Stone wash	Acid wash	Interpretation of grey scale rating
CF to wash	Di Acetate	4	4-5	4-5	5= Excellent 4= Good 3= Average 2= Poor 1= Very poor
	Bleached Cotton	3-4	4	4	
	Poly Amide	4	4-5	4-5	
	Polyester	4-5	4-5	4-5	
	Acrylic	4	3-4	4-5	
	Wool	4-5	4-5	4-5	
	Change in Color	3-4	4	4	
CF to Rubbing	Dry	4	3-4	4	
	Wet	1-2	1-2	2	

CONCLUSION

The properties of the jute-cotton blended fabrics were evaluated after three different washes such as enzyme, stone and acid. The study reveals that, the changes in the properties such as GSM, shrinkages, tensile strength, abrasion, pilling, wash and rubbing fastness of blended yarn denim fabric are not remarkable and can be comparable with 100% cotton denim fabric. It may reduce the dependability on importable cotton fiber. It can be said that, not only depending on the cotton fiber but also jute-cotton blending may reduce the dependability on 100% cotton yarn. The use of fabrics made from Jute-Cotton blended yarns as well as wash effects would surely strengthen our economy by cutting a part of the cost incurred for importing cotton and enhancing the value addition due to locally produced cheaper jute as a raw material, an opportunity to integrate the blended yarn into the production of jute-cotton denim and other heavy fabrics also.

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REFERENCES

- Ahmedullah ANM (2012) An investigation on the effect of machine parameters of spinning machine on the physical properties of blended yarn, PhD Thesis, Jahangirnagar University, Dhaka, Bangladesh.
- El-Dessouki DHA (2015) Effect of Different Washing Methods on Mechanical Properties of Egyptian Denim Fabrics, *International Design Journal*, Volume 5, Issue 3, pp 1099-1107.
- Hafeezullah M, Ali KN, BuYing W, Chengyan ZHU (2014) Effect of different types of washing processes on the strength and weight loss of the Denim fabric, School of Materials and Textiles, Zhejiang Sci-Tech University, Hangzhou 310018, P. R. China, Asia-Africa Science Platform Program on Neo-fiber Technology, Seminar Series 9. Conference Paper. November 2014, DOI: 10.13140/RG.2.1.1117.1042.
- Hasan MZ, Mamun MAA, Siddiquee MAB, Asif AKMH, Kauser MA (2017) Effect of Various Washing Process On Properties Of Four Way Stretch Denim Fabric, *American Journal of Engineering & Natural Sciences (AJENS)*, Volume 1, Issue 2, January 2017.
- Hossain M, Rony MSH, Hasan KMF, Hossain MK, Hossain MA, Zhou Y (2017) Effective Mechanical and Chemical Washing Process in Garment Industries, *American Journal of Applied Physics* 2017, 2:1-25.
- Sarker S, Rakesh MSR, Alam MM, Roy A (2016) Effects of Dry Washing Process on Denim Garment, *Chemical Science International Journal* 17(4): XX-XX, 2016; Article no.CSIJ.29399, Previously known as *American Chemical Science Journal*, ISSN: 2249-0205, science domain international, www.sciencedomain.org
- Solaiman, Rouf A, Rasel S, Khalil E (2015) Investigation of Different Washing Effects on Physical and Mechanical Properties of Cotton Knitted Garments, *Journal of Textile Science and Technology*, 2015, 1, 101-109, Published Online November 2015, SciRes. <http://www.scirp.org/journal/jtst>, <http://dx.doi.org/10.4236/jtst.2015.13011>.