Investigation on the Real Properties of Local Apparel Products

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Abstract: The work reported in this journal about the properties of fabrics used in local market for making dresses. In this regards fabrics were collected from local market or tailoring shops and tested for various properties. It was observed that the average EPI & PPI of the fabrics were as follows; EPI were between 45 and 60 & PPI were between 53 and 98. The GSM were found to be between 118 and 397. The stiff nesses were in the range of .9 N and 8.2 N. All the samples were either 100% cotton or cotton polyester blend. The static drape co-efficient were between 51.72 and 82.61 & the range of dynamic drape co-efficient were between 45.95 and 187.57. The CPI & WPI knit fabrics were as follows; CPI were between 53 and 54 & the range of WPI was between 32 and 33. The fabrics were either rib or S/J structure. The GSM of the knitted fabrics were between 280 and 332. The fabrics were between 0.0 N and 0.8 N. Most of the fabrics were made of 100% cotton and few of them had Cotton+Spandex fiber. The drape co-efficient were between 4.22 and 27.85 & the range of dynamic drape co-efficient were between 72.72 and 73.34.

Index Terms: CPI, Fabric stiffness, Fiber identification, GSM.

I. INTRODUCTION

Fabric testing is very essential to judge the desire quality of apparel products. For this different types of fabric properties testing are used worldwide such as EPI & PPI, Drape testing, GSM, Fiber identification etc. Fabric is a cloth produced by weaving various cotton, nylon, wool, silk, or other threads together. It is generated by knitting or weaving textile yarns. The fabrics are made of different raw materials obtained from nature either artificially created or blended with both. Various types of yarn are used to produce fabric. Such as cotton, Nylon, silk or the combine yarn. The properties of a fabric depend on the yarn that is used to produce the fabric. Also the structures of the fabric affect the quality of the fabric. Generally Fabric can be three types i) woven, ii) knitted and iii) non-woven. Woven fabrics are always generated on a loom by interlacing a warp and a weft yarns [1]. Functionally the woven fabrics is made through the interlacing of two or several threads with each other at the right angles. This is only extends diagonally in the direction of bias (between the direction of the weft and the direction of warp), unless the threads are elastic [2]. Usually Woven fabrics may not extend as quickly as knit fabrics that can make them useful for many applications. Woven Fabrics are made in various widths depending on their end use. The fabrics are used for apparels basically contain 90 cm width [3]. The Sheeting materials are generally produced having a width of 160 cm/140cm and 150cms/180 cm. Several kinds of woven fabrics are Buckram, Cambric, Cheese Cloth, Chiffon, Crepe, Denim, Drill, Flannel, Gabardine, Georgette, Kashmir Silk, Lawn, Muslin, Organdy, Poplin, Sheeting, Velvet etc.

Knitted fabric is such a textile created by knitting. The qualities are individual from woven fabric in which it is further stretchable and can be easier to create into lesser pieces, making it suitable for hats and socks. Its properties differ from nonwoven fabric in which it is extra durable but requires more resources to create, making it desirable for multiple uses. Types of some knitted fabric Rib, Interlock, Fleece, Jersey, Double etc.

Non-woven fabrics are generally made by felting or bonding. In this fabric various kinds of fibers rather than yarn can be used. It is not very strong and do not fray. It can also be made from recycled fibers [4]. Mainly non- woven fabric can be used in healthcare, filtration, geo textile etc. The limitations of the fabrics are constructed with bonding two or more fabric together. Many fabrics need extra protection but as a result this fabric can't give this desire quality [5].

Ends per inch (EPI) are determined by the number of woven fabric warp threads per inch [6]. Generally speaking the better the fabric is, the larger the ends per inch. Picks per inch / inch (PPI) relates to the quantity of weft threads per inch of woven fabric. A pick is a single thread on a weft, hence the term broadly speaking the higher the picks per inch, the finer the fabric is. The overall number of Wales per inch (WPI) in one inch of knitted fabric. WPI is one of the essential parameters for establishing fabric GSM and other properties of fabrics Courses per inch (CPI) reflect the sum of knitted courses per inch of fabric. Similarly, CPI is the most essential parameters for determining GSM of knit fabric and other characteristics of fabric.

The GSM is one type of fabric configuration that is quite important to a textile engineer to recognize and produce garments. GSM' means' Gram per square meter' which is the fabric weight in gram per square meter. With this can be compared with the heavier and lighter fabrics in unit area. GSM is one of the primary variables had to assess the fabric quality and GSM based on WPI, CPI, yarn

count (Ne) and stitch size. The GSM cutter is a very popular and simple-to-use GSM testing method used in most trimming farms. This cutter is very simple to construct It is 100 square cm circular disk with a sharp blade attached to its edge So 100 square cm of fabric can also be easily cut by it and measured to get GSM reading at the electric balance. Drape is a fabric's ability to maintain a glamorous appearance when using it. Drape is the term for describing how a cloth hangs under its own weight. It has a substantial effect on the way a garment looks decent in use. The draping qualities required of the fabric will differ fully depending on its last use. A provided meaning for a drape cannot thus be rated as either good or bad [7].

Stiffness is a special property of fabric. It's the fabric's ability to stand without any support. It's a key factor in fabric handle research and drape study Three specimens are usually examined in warp way and three in weft, and since the relative humidity can affect the results, the test should be taken out in a standard test atmosphere. The instrument's horizontal platform is supported by two side parts made of plastic. A mirror is attached to the instrument which enables the operator to view the dual index lines from a suitable place. The instrument's scale is classified in centimeters of bending length and also serves as a model to cut specimens to size.

Fiber identification is a necessary component among other aspects for the textile industry, forensic science, fashion designers and the automotive industry. Modern technology is now used to identify fiber. But sometimes, the best from under advanced technology is old method. Those involved in the textile industry need to know about the identification of fibers, particularly for textile engineers and clothing designers [8]. The fiber can be placed at a specific temperature in a liquid, and the solubility will confirm the fiber type. Various type of chemical is used in fiber identification test for various types of fabric. Such as-Cotton: 75% Sulphuric Acid, Wool and Silk: 5% Sodium Hydrochloride and 5% NaOH at boil, Viscose: 60% Sulphuric Acid, Acetate: Glacial Acetic acid, Triacetate: Acetone, Polyester: Chloro Phenol or Nylon: Hydrochloric acid or formic, etc. [9]

II. METHODS AND MATERIALS

We had collected ten Woven Fabric and two knit fabric from local market for analyzing different properties of them. In that case EPI & PPI (in case of woven fabric), WPI & CPI (in case of knit fabric), GSM, Stiffness, Fiber identification & Drape test of woven and knit fabrics are done.

Measurement of EPI & PPI (in case of woven fabric), WPI & CPI (in case of knit fabric) with multiplier magnifying glass setup:

- i. Taken the woven and knitted fabric & marking 1 inch with the ball pen according to the warp & Weft wise of the woven fabric and knitted fabric.
- ii. Then the marking point had been set with the multiplier scale & counting in 1 inch the EPI & PPI of woven fabric and knitted fabric WPI and CPI. Ends per inch, Picks per inch, Wales per inch and Courses per inch were counted by the magnifying counting glass.
- iii. Ten different woven fabric samples and two different knitted fabric samples were tested. For each fabric five reading were taken for warp and five readings had been taken for weft.
- iv. The average of these results was taken as consideration.

Measurement of GSM



Figure 1: GSM Cutter

- i. GSM cutter cut a fabric sample for measurement of GSM. Then electric balance takes on weight.
- ii. Hence the weight can be found in gram per one square meter in fabric.
- iii. Here GSM of the fabrics was obtained via the GSM converter by multiplying the sample weight by 100. For the GSM analysis of knitted and woven fabric the average of these tests was taken into consideration.

Measurement of fabric Stiffness:

- i. Stiffness tester was used to determine the stiffness of the Woven and knitted fabric.
- ii. The fabric was marked in warp and weft direction.
- iii. In both ways two strips were cut out of the fabric providing dimensions of 6" x 1".

- iv. The sample was then placed on a stiffener tester fabric.
- v. Under controlled movement, the tester fabric was fallen to about 45° and marked the length to which it dropped to 45°.
- vi. The same method was extended to both faces and fabric sides.
- vii. The fabric reducing length was measured using a cm scale.
- viii. The fabric bending length was then determined by including the factor decay length $f(\theta)$.
- ix. The mean of these tests was considered for the stiffness test of knitted and woven fabric if the bending length of the fabric is greater than the stiffness of the fabric and if the stiffness is less [10]. From the experiment of tested sample, it was sawn that the bending length of the given was average both in warp and weft way.

Measurement of fiber identification solvent test

The knowledge of identifying the textile fibers helps a producer of apparels to classify the fiber types to be generated it. This is essential factor for labeling of the garments, which includes specifying the fiber content in the apparel. There were different tests which could be used for the identification of the textile fibers such as burning test, microscopic test, solubility test, optical test, density test etc. In the fiber identification of woven & knitted fabric burning test procedure was followed. Then analyzing the ash & smell the fiber identification was found.

Measurement of Drape

Using the instrument drape meter can determine the drape ability of a fabric and is expressed in terms of Drape Co-efficient. A circular 10-inch diameter specimen was supported on a 5-inch circular surface. As a result, the unsupported area of the fabric drapes beyond the edge of the supporting disk as shown in figure 2.



Figure 2. Supporting disk

This example was a solid object saying a card board wouldn't be draping and thus the area of the marginal projection would be equal to the area of the solid object.

When the fabric has been supported the folded shape will be expected due to gravity and the form of the projected area will not be circular but something like the shape shown in figure-2.



Figure 3. Projected area shape

The drape coefficient F can be determined on calculation of the following areas. The drape coefficient, F is the ratio between the draped specimen's predicted area and its undraped area, after elimination of the supporting disc's location. Where,

- i. The area of the specimen, A_D
- ii. The area of the supporting disc, A_d
- iii. The actual projected area of the specimen, As

Thus
$$F = \frac{A_s - A_d}{A_D - A_d}$$

The small value of F indicates the better drape ability of the fabric and the large value of F indicated the bad drape ability.

Table 1: The experimental data of EPI, PPI, GSM, Stiffness, Fiber identification, Static Drape Co-efficient, Dynamic Drape Co-efficient of ten woven fabric samples are given below-

Sample	Fabric	EPI	PPI	GSM	Stiffness	Fiber	Static	Dynamic
NI-	structure					Identification	Drape	Drape Coefficient
NO.							Coefficient	coefficient
1.	Plain in	53	80	118	0·9N	Cotton	74.13	187.57
	structure							
2.	Plain in	50	88	120	1N	Cotton	55.76	74.77
	structure							
3.	Twill in	49	55	266	2·2N	Cotton	65.48	64.41
	structure							
4.	Plain in	60	58	397	8·2N	(Cotton	66.01	94.14
	structure					+Polyester)		
5.	Plain in	48	53	340	2.8 N	Polyester	57.83	78.79
	structure					cotton		
6.	Plain in	60	98	161	0.9 N	Cotton	51.72	79.94
	structure							
7.	Twill in	50	62	312	2.1 N	Polyester	70.19	79.05
	structure					cotton		
8.	Twill in	52	90	275	3.1 N	Pure cotton	76.11	77.62
	structure							
9.	Plain in	56	59	132	2.9 N	Pure cotton	62.63	45.95
	structure							
10.	Twill in	45	60	360	6.1 N	Polyester	82.61	93.32
	structure					cotton		

Table 2: The experimental data of WPI, CPI, GSM, Stiffness, Fiber identification, Static Drape Co-efficient, Dynamic Drape Co-efficient of two knit fabric samples are given below –

1. Sample	2. Fabric	3. WPI	4. CPI	5. GSM	6. Stiffness	7. Fiber	8. Static	9. Dynamic
No.	structure					Identification	Drape	Drape
							Coefficient	Coefficient
10. 1.	11. Single	12.33	13.54	14. 280	16. 0.0 N	17. Cotton	18.4.22	19.73.34
	jersey			15.				
20. 2.	22. Rib	23. 32	24. 53	25.332	27. 0·8N	28. (Cotton	29.27.85	30. 72.72
21.	(2/2)			26.		+Spandex)=		
						97%+3%		

III. RESULTS AND DISCUSSION

From table no 1 the result of the woven fabric EPI & PPI, GSM, Fabric Stiffness, Fiber Identification and Drape is discussion below -

The range the woven fabrics EPI are between 45 to 60& the range of PPI are between 53 to 98.GSM of the woven fabrics were between 118 to 397. Fabrics with lower GSM were being used for shirting and fabrics with higher GSM were being used for producing trousers. The ranges of Fabric Stiffness were between .9 N and 8.2 N. Most of the woven fabrics were made of pure cotton fiber & Cotton+ Polyester fiber. The extent of static drape co-efficient were between 51.72 and 82.61& dynamic drape co-efficient were between 45.95 and 187.57.

From table no 2 the result of the knit fabric WPI & CPI, GSM, Fabric Stiffness, Fiber Identification and Drape is discussion below

The range of knitted fabrics WPI was between 32 and 33 & CPI was between 53 and 54. Rib structure's knitted fabric WPI and CPI was comparatively lower than Single jersey structure's knitted fabric. The GSM of the fabrics were between 280 and 332. The extent of Fabric Stiffness was between 0.0 N and 0.8 N. The knitted fabrics were made of pure cotton fiber or Cotton+Spandex fiber. The range of static drape co-efficient were between 4.22 and 27.85 & dynamic drape co-efficient were between 72.72 and 73.34.

IV. CONCLUSION

The key objective of this study was to examine the fabrics used our local market. Measuring the fabric properties is key in gauging apparel quality and assessing the performance of the apparel. Following my report the distributors and consumer can determine the end product quality. For further improvement and solving the problem of apparel product my research will help the production company. Also the goal of this report is to provide required information on fabric properties of apparel to the textile learner. The study also shows the lack of facility in the production level of fabric in Bangladeshi industry. This study will help the managerial level of industry to buy proper modern equipment's of apparel production for maintain superior quality and reduce the problem.

V. ACKNOWLEDGMENT

First of all, we profound thanks to al-powerful Allah who has enabled us to overcome successfully all shortcomings to complete this report in due time. We also express thank to honorable teacher Md. Mahbubul Haque for shearing instruction and experiences during this work. After that, we would like to thank our parents, the students of KCC women's college, Khulna for doing this work with great co-operation. Finally, we unconditionally thanks for the knowledge of those persons, we have share to preparing this report with our own pleasure & mentally satisfaction during this working moment.

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