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An Investigation on Geometric and Dimensional Properties of Bamboo Single Jersey Knitted Fabrics

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***Abstract*— In recent years, the importance of geometric and dimensional properties has become one of the most significant features of fabrics, with many studies focusing on the measurement of geometric properties under various relaxation states. In this project overview, we produced nine samples with different tex values and loop lengths: 24.60 tex fabric with loop lengths of 0.28, 0.31, and 0.34 cm; 19.68 tex fabric with loop lengths of 0.27, 0.30, and 0.33 cm; and 14.76 tex fabric with loop lengths of 0.25, 0.28, and 0.31 cm. The loop lengths are all measured in centimeters. The aim of this study is to characterize the geometric and dimensional properties of bamboo knitted single jersey fabrics. For this purpose, the geometric property values are tested on the knitted fabrics in dry relaxation, wet relaxation, and fully relaxed states. Dimensional properties are also tested using repeated cycles of washing and drying..**

***Keywords*--- Bamboo Knitted fabric; Geometrics; Dimensional properties;**

I. INTRODUCTION

This chapter provides a general introduction to the usefulness and suitability of bamboo hosiery yarns in knitwear production, as well as the objectives of the study. The geometric and dimensional properties of knitted fabrics are essential in determining the suitability of these fabrics for apparel end use. Therefore, emphasis has been placed on the study of the geometric and dimensional properties of bamboo single jersey fabrics under different fabric relaxation states.

II. BAMBOO FIBRE

Bamboo fiber is a recent type of natural material with significant potential applications in the textile industry due to its unique properties (LiuHu, 2008). For example, it has a unique structure that makes it superior to other natural lignocellulosic fibers. In recent years, bamboo fibers have attracted considerable attention as one of the most abundant renewable biomass materials that can be used in textiles (Xu et al., 2006) and composite reinforcement. They possess many excellent properties when used as textile materials, such as high tenacity, excellent thermal conductivity, resistance to bacteria, and high water and perspiration absorption. Natural bamboo fibers have excellent properties and, therefore, have potential for use in textiles; however, they have not received the attention they deserve due to their coarse and stiff texture. A chemical method for the extraction and modification of natural bamboo fibers is used in this article. Regenerated bamboo fiber is 100% cellulose, biodegradable, and is claimed to be 'green' and environmentally friendly.

III. ADVANTAGES OF BAMBOO FIBRE

Smooth, soft, and luxurious feel: It has a naturally round surface, which makes it very smooth and allows it to sit perfectly next to the skin. Bamboo apparel is softer than the softest cotton and has a natural sheen like silk or cashmere. Bamboo drapes like silk or satin, yet it is less expensive and more durable. Bamboo/organic cotton blends are also extremely soft but heavier in weight.

- Temperature adaptability
- Antibacterial
- Thermal regulating
- UV protection
- Antistatic
- Green and bio-degradable

IV. GEOMETRY OF SINGLE JERSEY WEFT KNITTED FABRICS

The primarily examined structure is the basic plain-knit structure. Peirce created a three-dimensional model of a plain-stitch loop by laying it on the surface of a circular cylinder, with its generators parallel to the lines or courses. Peirce's model also took into account changes introduced by variations in loop length for a given yarn diameter, by adding extra straight portions across the top and bottom of the loops and in the diagonal straight portions.

V. TESTING METHOD AND RESULTS OF SAMPLES

All the developed bamboo jersey knit fabric samples were subjected to their Dry Relaxed State, Wet Relaxed State, and Fully Relaxed State one after another. The reference samples

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were cut and kept separately after each state of relaxation for carrying out tests to estimate the wale count (i.e., WPCM), course count (i.e., CPCM), loop length (l in cm), area density (i.e., grams per square meter, GSM), and tightness factor (K). All the FRS samples were further subjected to five repeated cycles of washing and drying to assess their dimensional stability. The results obtained were tabulated and discussed.

A. Dry Relaxation of Fabric Samples

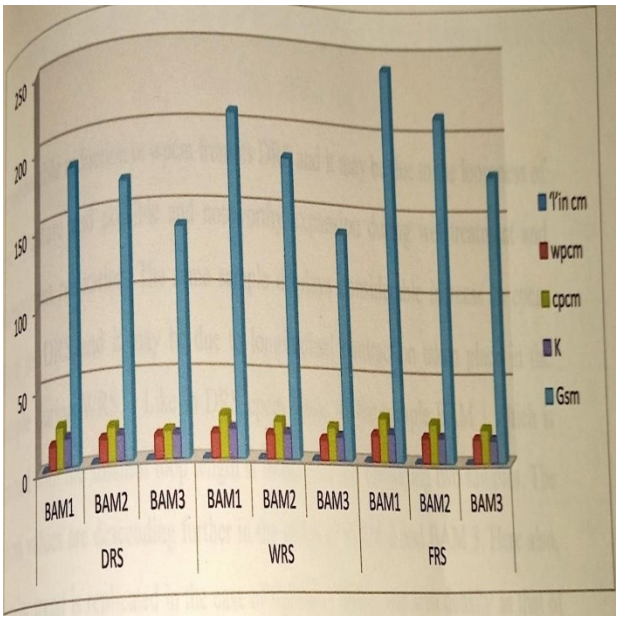
After knitting, the samples are kept flat for 24 to 48 hours under standard atmospheric conditions (25 ± 2°C temperature and 65 ± 2% RH) to attain their Dry Relaxed State (DRS).

B. Dry Relaxation of Fabric Samples

All the developed samples are dyed in a laboratory model soft flow dyeing machine and then relax-dried. These samples are soaked in stagnant water in a cistern for a period of 12 hours and subsequently dried by laying them flat for 72 hours under standard atmospheric conditions (25 ± 2°C temperature and 65 ± 2% RH) to achieve the perfect Wet Relaxed State (WRS).

C. Full Relaxation of Fabric Samples

All fabric samples subjected to repeated cycles of washing and drying are kept on a flat surface after their final wash for 24 hours under standard atmospheric conditions (25 ± 2°C temperature and 65 ± 2% RH) to attain their Fully Relaxed State (FRS). During this period, the samples reach their dimensional equilibrium state and minimum energy level.



[10] Fig. 1.Geometric properties of bamboo jersey knitted fabrics (24.60Tex) DRS, WRS and FRS.

CONCLUSION

a) The ring-spun combed hosiery yarn has the prerequisite qualities for knitting, such as sufficient strength, elongation, uniformity, and low hairiness. Therefore, knitting all the samples was found to be easier.

b) The values of wale density remain more or less the same for all the stitch density values after every relaxation state. The slight difference may be due to the degree of widthwise shrinkage or growth of that specific sample.

c) The geometric properties, such as courses per inch, wales per inch, stitch density, areal density, and tightness factor, show higher values when the stitch length is small, and vice versa, during all the relaxation states.

d) The fabrics knitted with [missing information] have shown more dimensional stability in both the length and width directions. This is evident from the results of the repeated cycles of washing and drying.

REFERENCES

[1] Ajay and Avinash (2012) developments in new fibre research is the usage of bamboo fibre in various textile products.
[2] Bayazit Marmarali A (2003), Dimensional and Physical Properties of cotton/Spandex Single Jersey Fabrics, Text. Res. J. 73 11-14.
[3] Doyle P J, (1953) Fundamental Aspects of The Design of Knitted Fabrics, J. Textile inst.,44,561-578.
[4] Doyle, PJ 1952, 'Some Fundamental Properties of Hosiery Yarns and their Relation to the Mechanical Characteristics of Knitted Fabrics', Journal of Textile Institute, vol. 43,pp.19-35.
[5] Dundar (2008) The bursting strength of fabrics knitted with 100% bamboo yarn was higher than that of fabric knitted with 100% cotton yarn vol.5, no. 4, pp.219-226.
[6] Erdumlu, N.; Ozipek, B. (2008) Investigation of Regenerated Bamboo Fibre and Yarn Characteristics. Fibres&Textiles in Eastern Europe, 16(69), 4347.
[7] G Singh, K Roy(2011), Dimensional parameters of single jersey cotton knitted fabrics and positive feed device in the machine.
[8] Gericke et al (2010), Regenerated bamboo fibres are superior to cotton and viscose rayon fibres.
[9] Karahan et (2006) Bamboo-based fabrics are antibacterial and very soft,with a low amount of pilling and creasing.