

EFFECT OF DESIZING AND SCOURING ON GEOMETRICAL PROPERTIES OF THE COTTON FABRIC

RITIKA BAMAL¹, NISHA ARYA², ARPITA GROVER¹ and NEETA¹

¹Department of Apparel and Textile Science, I.C. College of Community,
CCS Haryana Agricultural University, Hisar, Haryana

²Amity school of Fashion Technology, Amity University, Mumbai, Maharastra

Date of Receipt: 02-12-2023

Date of Acceptance: 15-12-2023

ABSTRACT

Textiles have constantly played a crucial role in the evolution of human culture by being at the forefront of both technological and artistic development. The study investigates the impact of desizing and scouring processes on the geometrical properties of grey cotton fabric, crucial for its functionality in various applications. Through a series of preparatory treatments, including desizing to remove stiffening agents and scouring to eliminate impurities, the fabric's appearance and physical attributes were enhanced. Geometrical properties such as fabric count, weight, and thickness were examined before and after treatment. The results indicate a notable increase in fabric count, with a 12.38% rise in warp and a 6.4% increase in weft, post-desizing and scouring. Additionally, fabric weight and thickness showed significant increases of 9.5% and 8.6%, respectively, after treatment. These enhancements suggest improved fabric quality, likely attributed to the removal of impurities and the resulting compactness of the weave. Overall, the study underscores the importance of preparatory processes in optimizing cotton fabric properties for diverse textile applications.

KEYWORDS: Textiles, geometrical properties, cotton fibre, desizing and scouring

Textiles have constantly played a crucial role in the evolution of human culture by being at the forefront of both technological and artistic development. Clothing, considered to be the second skin, is responsible for a healthy and contagious free living (Hooda *et al.*, 2013). Cotton is a natural fibre of great economic importance as a raw material for cloth (Saleemuddin, 2013). Cotton fibre is mainly compiled with cellulose and some non-cellulosic constituents surrounding the cellulose core (Chung, 2004). Physical properties of fabric are vital because these properties decide the functionality of the fabric. There were various physical properties such as geometrical, mechanical and comfort properties. The geometrical properties of the cotton fabric comprised of fabric count, weight and thickness etc. (Poonia, 2018).

The pretreatment of cotton fabric, involving desizing and scouring processes, is a critical phase in textile production, bringing about significant improvements in both appearance and geometrical properties. Cotton, a ubiquitous natural fiber in the textile industry, undergoes a series of manufacturing stages before becoming the final fabric. Desizing and scouring are pivotal steps in this journey, preparing the fabric for further processing while enhancing its quality. Desizing, as the initial step, focuses on removing sizing agents applied during weaving. These agents, while

essential for yarn strength and weaving efficiency, can leave the fabric feeling stiff and textured. Desizing effectively eliminates these agents, resulting in a softer, more pliable cotton fabric. This transformation enhances the fabric's comfort and drape, making it more appealing for various applications.

Following desizing, the scouring process tackles impurities and natural waxes that may linger on the fabric's surface. Scouring ensures the removal of these unwanted substances, promoting fabric cleanliness and improving its overall aesthetic appeal. The fabric emerges from this stage cleaner, smoother, and ready for further treatment or processing. In addition to these changes in appearance, the geometrical properties of the treated cotton fabric also undergo significant alterations. These properties include fabric count, weight, thickness, and weave pattern. These changes are essential as they directly impact the fabric's functionality and performance characteristics. For instance, a fabric with improved geometrical properties *i.e.*, fabric weight, fabric count and thickness may exhibit better dye absorption, print adhesion, and overall durability, making it a versatile choice for a wide range of textile applications. Thus, the work has been planned to find the "Effect of Desizing and Scouring on Geometrical Properties of the Cotton Fabric".

MATERIAL AND METHODS

Selection and Procurement of Cotton Fabric

A small survey was undertaken in the local market of Hisar city to acquire cotton fabric and samples were collected from various sources. The collected fabric samples were screened visually and through physical and chemical tests. Physical (microscopic analysis), burning and solubility tests were performed on the collected samples to ensure the purity. A medium weight grey cotton fabric was chosen from the collected cotton fabric samples. Grey cotton fabric was chosen since it has no finishing treatments, making it more suitable for the study as no previous treatment will interfere with the research, resulting in unbiased data.

Determination of the Geometrical Properties of the Cotton Fabric

Geometrical properties of the selected cotton fabric were examined for three parameters: fabric count, weight, and thickness. Prior to determining fabric measurements, the fabric samples were conditioned before desizing and scouring under standard test circumstances, which included a relative humidity of 65 ± 2 per cent and a temperature of 27 ± 20 °C.

Desizing of the Fabric

It is very usual for the fabric to have leftover sizing material on the warp yarn after weaving; this makes the yarn less porous and may obstruct the penetration of the test extract, thus it is critical to remove it. The prewetted cotton fabric was desized in Water Bath rectangular 6 holes for 60 minutes at 50 °C with MLR 1:40 in a solution containing 1 per cent sulphuric acid (H_2SO_4). The fabric was rinsed thoroughly to remove loose starch and other residues, if left (Singh *et al.*, 2017).

Scouring of the Fabric

As woven fabrics include natural and added impurities such as wax, oils, dirt and non-cellulosic material (in the case of cotton fabric), scouring (wetting procedure) is used to remove the dirt and extra impurities without affecting the fabric's physical and chemical qualities. It entails washing the textile material in a water bath with chemical (Soda Ash and Sodium Sulphite) or enzymatic agents for a set period of time. In an aqueous solution, the cloth was properly squeezed before being immersed in a mixture comprising 1 per cent soap, 3 per cent soda ash, and 0.5 per cent sodium sulphite at boiling temperature (100°C) with MLR 1:40 for 60 minutes. The fabric was further rinsed thoroughly to remove any residues, if left and dried on a flat surface (Singh *et al.*, 2017).

Determination of Geometrical Properties after Preparatory Processes

Fabric's geometrical properties are crucial because they determine the fabric's functionality. When a fabric is treated, it is critical that the geometrical properties are not significantly altered and if they are, the fabric's quality is improved. The geometrical qualities of the desized and scoured samples were examined and compared in order to see the influence of the fabric treatment. According to the standards, each sample was subjected to the recommended number of tests. The samples were trimmed to the size of the template, leaving the selvedge on both sides and ensuring that neither warps nor weft yarn was repeated. The influence of preparatory processes on the geometrical properties of finished fabric samples were investigated using a variety of standard test methods, as detailed below.

Table 1. Instruments and Test Standards Used

Physical properties	Sample size	Instruments	Standard Methods
Fabric count (Ends and picks per sq. inch.)	6"x6"	Paramount Pick Glass with (1"x1")	ASTM-D123
Fabric weight (g/m ²)	5"x5"	GSM Quadrant Balance	ASTMD-377960
Fabric thickness (mm)	4"x4"	Paramount Thickness Tester	BS 2544:1967

RESULTS AND DISCUSSION

Effect of Preparatory Processes on Geometrical Properties on Cotton Fabric

Grey cotton fabric exhibiting medium weight was selected for the study. Three parameters i.e. fabric weight, count and thickness of the cotton fabric were evaluated. The data in Table 2 indicated that the fabric count of grey cotton fabric was 55×41 picks/sq. inch with 0.23 mm thickness and 120 g/m² weight.

62.6±0.88×44.4±1.20 ends and picks per inch with 12.38 and 6.4 per cent increase and 4.23 and 3.12 t-values, respectively. The increase in fabric counts in both warp and weft direction was found to be non-significant.

The thickness and weight of the grey fabric was found to be 0.23±0.006 mm and 120±3.39 g/m² which increased to 0.25±0.021 mm and 131.4±1.87 g/m², respectively after desizing and scouring with +

Table 2. Preliminary Data of the Cotton Fabric

Fabric Properties	Fabric count (ends and picks/sq. inch)	Fabric weight (g/m ²)	Fabric thickness (mm)
Cotton fabric	55×41	120	0.23

Effect of Preparatory Processes on Geometrical Properties of Grey Cotton Fabric

The selected cotton fabric underwent preparatory processes like desizing and scouring which involves the removal of impurities and starch from the fabric and makes it more absorbent for further textile processing. Scouring was done after desizing to ensure that all contaminants and starch were removed. The change in physical attributes of the pretreated grey cotton fabric, such as geometric, mechanical and comfort aspects was investigated further.

Geometrical Properties of Cotton Fabric

Geometrical properties i.e. fabric count, weight and thickness were tested to analyze the effect of preparatory processes on the geometrical properties of grey cotton fabric. The data in Table 3 highlighted that the fabric count of grey fabric was 55.7±0.33 × 41.7±0.66 ends and picks per sq. inch. It was found that after desizing and scouring, it increased to

9.5 and + 8.6 per cent increase and 8.25 and 2.87 t-value respectively. The increase in fabric weight and thickness of desized and scoured fabric was found to be non-significant. Medha (2019) reported non-significant increase in geometrical properties of cotton fabric after giving pretreatment to cotton fabric. Sushila et al., (2021) reported non-significant gain in fabric count, weight and thickness of fabric after scouring of cotton fabric. After desizing and scouring, there was removal of starch as well as cellulosic matter and other impurities which resulted in compactness and closeness of weaves. The change in physical properties of the fabric may therefore be attributed to the compactness of the weave. Decrease in air permeability may be owing to increased fabric count and thickness of the fabric.

Thus, it was perceptible from the results presented in Table 3 that after desizing and scouring there was non-significant increase in all geometrical properties of grey cotton fabric.

Table 3. Effect of Preparatory Processes on Geometrical Properties

Physical Parameters \ Fabric		Grey fabric Mean±S.E	Desized and scoured fabric Mean ± S.E	Per cent change	t-value
Fabric count (ends and picks per square inch)	Warp	55.7±0.33	62.6±0.88	+ 12.38	4.23
	Weft	41.7±0.66	44.4±1.20	+ 6.4	3.12
Weight per unit area (g/m ²)		120±3.39	131.4±1.87	+ 9.5	8.25
Thickness (mm)		0.23±0.006	0.25±0.021	+ 8.6	2.87

**Significant at 1% level of significance, *Significant at 5% level of significance

CONCLUSION

The pretreatment of cotton fabric through desizing and scouring processes not only enhances its visual and tactile qualities but also refines its geometrical properties, making it a more adaptable and valuable material in the textile industry. These treatments set the stage for further processing, ensuring that the fabric meets quality standards and performance expectations while opening doors to a variety of creative possibilities in the world of textiles.

REFERENCES

- Chung, C., Lee, M and Choe, EK 2014. Characterization of cotton fabric scouring by FT-IR ATR spectroscopy. *Carbohydrate Polymers*. 58:417-420.
- Hooda, S., K. Khambra, N. Yadav and V.K. Sikka. 2013. Eco-friendly antibacterial finish for wool fabric. *Journal of Life Sciences*. 5(1):11-16.
- Medha, K. 2019. Antibacterial finish on cotton using Giloy extract. Master's Thesis, Department of Textile and Apparel Designing, CCS Haryana Agricultural University. Hisar.
- Poonia, N. 2018. Efficacy of *kinnow* peels extract for microbial resistance on cotton fabric. Master's Thesis, CCS Haryana Agricultural University, Hisar.
- Saleemuddin M, Ali S.T. and Parvez M.K. 2013. Optimization of easy care finishing of cotton/ polyester blend fabric. *Journal of Chemical Society of Pakistan* 35(3):560- 564
- Sharma, R and Prajapati, P.K. 2017. Screening of Antimicrobial activity of *Guduchi Ghana* dried aqueous extract of *Tinospora cordifolia* (Willd.) Miers). *Journal of Ayurvedic and Herbal Medicine*. 2(6): 209-212.
- Singh, N. 2017. Microbial resistance of cotton and silk finish with plants extract. Doctoral Research Thesis, submitted to CCS Haryana Agricultural University, Hisar.
- Singh, N., P. Punia and V. Singh. 2017. Bacterial resistance finish on cotton fabric with pomegranate and onion peel extracts. *International Journal of Current Microbiology and Applied Sciences*. 6(10): 1075-1079.
- Sushila, Arya, N., Singh, V., Devi, S. and Reena. 2021. Effect of pretreatment on physical properties of cotton fabric. *International Journal of Ecology Environmental Science*. 3(1): 472-476.