

ANALYSIS OF POLYESTER FABRIC CHARACTERISTICS SUITABLE FOR FUNCTIONAL CLOTHING APPLICATIONS

Yashini V *¹ and Krishnaveni²

*¹B.Tech Scholar, Department of Fashion Technology, Kumaraguru College of Technology, Coimbatore, Tamil Nadu, India

² Associate Professor, Fashion Technology, Kumaraguru College of Technology, Tamil Nadu, India

ABSTRACT

The present study explains a comprehensive evaluation of a medium-weight polyester fabric based on simulated yet industry-realistic laboratory data. The study focuses on key structural parameters, including yarn density and yarn count, as well as mechanical properties such as tensile strength, tear strength, and abrasion resistance. In addition, comfort-related characteristics such as wickability and drapability are analysed to assess the fabric's suitability for apparel applications.

The results indicate a warp-dominant structure with balanced construction, exhibiting high tensile strength, excellent abrasion resistance, and low moisture absorbency. The fabric demonstrates good drape, dimensional stability, and wrinkle resistance, making it particularly suitable for garments requiring durability and easy maintenance. The findings align with the expected performance characteristics of polyester twill fabrics, confirming their suitability in performance wear and functional apparel sectors.

1. INTRODUCTION

The evaluation of textile materials through laboratory analysis is essential for determining their performance, durability, and suitability for specific end-use applications. Fabric properties are influenced by fibre type, yarn characteristics, fabric construction, and finishing processes.

Polyester is a synthetic fibre widely used in the textile industry due to its high strength, durability, wrinkle resistance, and low moisture absorbency. Compared to natural fibres like cotton, polyester exhibits superior resistance to environmental factors such as humidity, sunlight, and microbial attack.

Twill weave is one of the fundamental woven structures, characterized by a diagonal pattern that enhances fabric strength and flexibility. Polyester fabric with twill weave structures are universally exploited in uniforms, sportswear, industrial clothing, and outerwear due to their durability and easy-care properties.(1)

This study aims to analyse a medium-weight polyester twill fabric using simulated laboratory testing. The investigation includes structural parameters and mechanical properties, along with comfort-related characteristics.

2. FABRIC STRUCTURE AND CHARACTERISTICS

The fabric under investigation is constructed using a twill weave structure, characterized by a diagonal rib formed by the systematic interlacing of warp and weft yarns.

The analysed sample exhibits features consistent with a warp-faced twill, where warp yarns dominate the surface appearance, supported by higher ends per inch (EPI) compared to picks per inch (PPI).

Polyester fibres contribute unique characteristics to the fabric:

- High tensile strength and durability
- Excellent abrasion resistance
- Low moisture absorption (hydrophobic nature)
- Good wrinkle resistance and shape retention

- Slight lustrous appearance

The twill weave formation enriches flexibility and drape while maintaining strength(2) . The fabric surface appears smooth, slightly shiny, and compact due to synthetic fibre properties.

3. METHODOLOGY AND EXPERIMENTAL RESULTS

The polyester fabric with twill structure is analysed under various evaluation tests by using standard testing conditions and equipment's such as physical, mechanical, comfort and thermal characteristics. The following test results are

3.1 Ends Per Inch (EPI)

Average: **84.2 EPI**

3.2 Picks Per Inch (PPI)

Average: **60.4 PPI**

3.3 Yarn Count (Ne)

Warp: **34Ne**

Weft: **22 Ne**

3.4 Fabric Thickness

Average: **0.40 mm**

3.5 Fabric Weight (GSM)

Average: **265 GSM**

3.6 Tensile Strength

Warp: **680N**

Weft: **460 N**

3.7 Tear Strength

Warp: **48N**

Weft: **36 N**

3.8 Abrasion Resistance

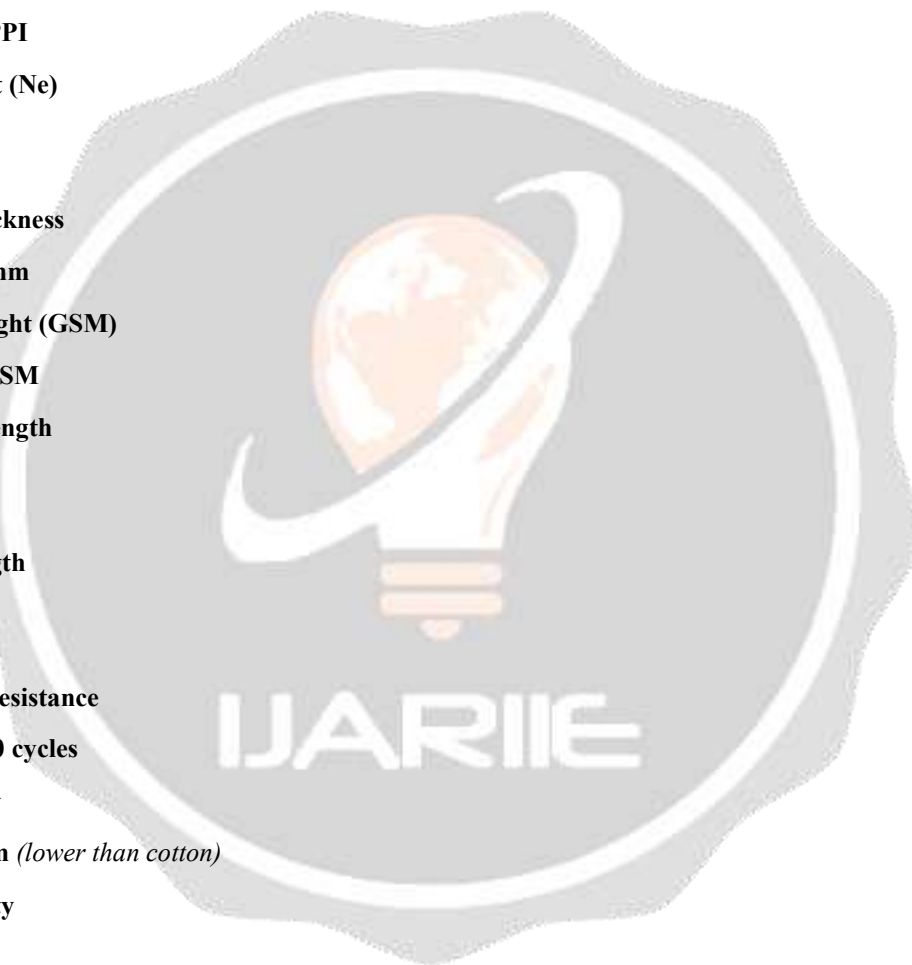
Average: **22,000 cycles**

3.9 Wickability

Average: **40 mm (lower than cotton)**

3.10 Drapability

Average: **48%**



Evaluation of polyester fabric properties



4.

4. DISCUSSION

The analysis highlights the influence of polyester fibre on fabric performance. The higher EPI compared to PPI confirms a warp-dominant structure, contributing to increased strength in the warp direction.

Polyester yarns enhance tensile and tear strength due to their high molecular orientation and strength. Compared to cotton, the tensile strength values are significantly higher, making the fabric more durable.

The fabric demonstrates excellent abrasion resistance (22,000 cycles), which is higher than cotton due to the synthetic fibre's resistance to wear and friction.

However, wickability is lower (40 mm), reflecting polyester's hydrophobic nature. Unlike cotton, polyester does not absorb moisture but instead allows moisture to remain on the surface or be engineered for moisture-wicking through finishes.

The drape coefficient (~48%) indicates good drapability with better shape retention than cotton. Polyester fabrics tend to maintain structure and resist deformation.

Overall, the fabric offers superior durability, strength, and easy maintenance, but slightly lower comfort in terms of breathability and moisture absorption.

5. END-USE APPLICATIONS

- Uniforms and industrial wear (high durability)
- Sportswear and activewear (with finishes)
- Jackets and outerwear
- Workwear and protective clothing
- Formal trousers and skirts

6. SEASON AND REGIONAL SUITABILITY

Polyester fabrics are suitable for all-season use but perform best in moderate climates.

In tropical regions like India, polyester may feel less breathable in hot weather due to low moisture absorbency. However, modern polyester fabrics with moisture-wicking finishes improve comfort.

They are highly suitable for humid conditions due to quick-drying properties.

7. CONCLUSION

The medium-weight polyester twill fabric demonstrates excellent mechanical performance, durability, and dimensional stability. The twill weave structure enhances strength and abrasion resistance, while polyester fibre properties contribute to wrinkle resistance and easy maintenance.

Although moisture absorption is lower compared to cotton, the fabric remains highly suitable for functional and performance-based apparel.

In conclusion, the analysed polyester twill fabric meets the expected performance standards and is ideal for applications requiring strength, durability, and low maintenance.

8. REFERENCES

- 1) <https://szoneierfabrics.com/what-is-polyester-fabric-used-for-top-industrial-apparel-applications>
- 2) <https://www.alibaba.com/product-insights/2-2-twill-serge.html>

