



Daffodil
International
University

Faculty of Engineering

Department of Textile Engineering

Project (Thesis) Report on

"Comparative Study of physical properties of Acrylic-Acrylic and Acrylic Cotton Rib Fabrics."

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This Thesis report is Presented in partial fulfillment of the requirements for the Degree of Bachelor of Science in Textile Engineering.

**Advanced in Fabric Manufacturing Technology
Semester-Summer 2025.**

Declaration

I therefore attest that the thesis "Comparative Study of Physical Properties of Acrylic-Acrylic and Acrylic-Cotton Rib Fabrics" submitted to the Department of Textile Engineering, Faculty of Engineering, Daffodil International University is my own original work. This thesis was produced under the supervision of Md. Farhad Hossain, Lecturer, Department of Textile Engineering, Faculty of Engineering, Daffodil International University, and is being submitted in partial satisfaction of the requirements for the Bachelor of Science in Textile Engineering degree. I also confirm that all sources of information and data used in this thesis were correctly cited and acknowledged.



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LETTER OF APPROVAL

In June 2025, The following students submitted the project Comparative Study of Physical Properties of Acrylic-Acrylic and Acrylic-Cotton Rib Fabrics to the Board of Examiners of the Faculty of Engineering as a partial fulfillment of the requirements for the Bachelor of Textile Engineering degree, so it was accepted as satisfactory.

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First and foremost, I want to thank Almighty Allah for giving me the strength, patience, and determination to complete my study work successfully. I would like to express my profound appreciation to my supervisor, **Md. Forhad Hossain**, Lecturer, Department of Textile Engineering, for his unwavering guidance, helpful assistance and thoughtful thoughts over the course of this thesis. His encouragement was key to the success of this study. My heartfelt gratitude also goes to **Mr. Tanvir Ahmed Chowdhury**, Associate Professor and Head of the Department, for his helpful criticism and support during the study process.

Dedication

First and foremost, we express our heartfelt gratitude to the Almighty for enabling us to complete this thesis (project) report successfully. We sincerely dedicate this report to Md. Farhad Hossain, Lecturer at Daffodil International University, whose continuous guidance and support played a vital role in the successful completion of our industrial training. Lastly, we extend our deepest appreciation to our parents for their unwavering encouragement and support throughout this journey. Their constant motivation has been a cornerstone of our efforts, and we wholeheartedly dedicate this report to them.

Statement of Contributions

I put sincere effort into completing this report. Initially, I carried out the fabric production process at the university's knitting laboratory using a V-bed knitting machine and practically observed the GSM (Grams per Square Meter) of the fabrics. I also determined the Wales per Inch (WPI), Courses per Inch (CPI), and Stitch Length (SL) of the samples. Furthermore, I assessed the abrasion resistance and bursting strength of the fabrics in the university lab.

Throughout the thesis, our supervisor, Md. Farhad Hossain, provided continuous guidance and support. Lab assistants Md. Alamin Hossain and Md. Rasel helped us operate the laboratory equipment efficiently. With everyone's cooperation and contribution, we were able to successfully complete this dissertation.

Abstract

This study is comparative based on rib-knitted materials using two different types of yarn, 100 percent acrylic (Acrylic-Acrylic) and acrylic-cotton blend. Rib-knit materials are widely used both in the design and in technical pieces since they are stretchy yet stable in their composition. The first aim of the study will be find out the effect of constituent fiber compositions on physical and comfort-related features of these fabrics. Both fabric samples were produced under the same machine conditions and one of them was made by using only acrylic yarn and another one by using special mix of acrylic and cotton fibers (50:50). The properties that were tested included fabric weight (GSM) and thickness, tensile and bursting strength, air permeability, moisture absorbency, elasticity, dimensional behavior like shrinkage and spirality with standard textile testing methods. Results show that the 100 acrylic material was stronger and more elastic but the blend acrylic-cotton was more breathable, less moisture retentive hence soft to the hand. Addition of cotton enhanced aspects of comfort, however impacted slightly on the structural strength of the fabric. In general the present study provides a meaningful contribution to textile industry professionals to make decisions in choosing the right fiber mixture in the rib-knit product as regards structural strength versus comfort.

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Chapter 1: Introduction

1.Introduction

The textile business never stops to expand with the ever increasing need of producing a comfortable and high performance piece of clothing. Rib-knit fabrics are popular, in particular, due to their pocket stretch, recovery and stability, among other things, among fabrics of different types. They are perfect materials in cuffs and collars, belts and waistbands as well as active wear. The form of fiber matters a lot on the performance of the fabric. Acrylic fibers are well known as warm, soft, and durable, cotton fibers as breathable and able to absorb moisture. A blend of these two fibres has the ability to produce a fabric that is comfortable and strong together through the aid of this research, compares the physical properties of fabrics of the rib knitting knots of Acrylic 100% yarn and Acrylic-Cotton blended yarn. Important elements including weight of the fabric (GSM), fabric thickness, tensile strength, burst strength, air permeability, shrinkage, elasticity, and moisture management are determined to determine how cotton addition influences performance and comfortability of the fabric. The result of this study will assist in making well-informed decisions in designing and utilizing rib-knit fabrics in different areas.

1.1 Objectives

The main objectives of this study are:

- To produce and compare rib-knitted fabrics made from 100% acrylic yarn (Acrylic-Acrylic) & acrylic-cotton blended yarn (50:50 blend).
- To test and evaluate the physical properties of both types of fabrics, including:
 - Fabric weight (GSM)
 - Thickness
 - Air permeability
 - Dimensional stability
 - Elasticity and recovery
- To understand how adding cotton affects the overall performance and comfort of rib knitted fabrics, especially in terms of strength, durability, breathability, and moisture control.

- To give useful suggestions for choosing fiber blends in rib fabrics, helping textile manufacturers, designers, and researchers make better decisions based on fabric performance.
- insights for textile manufacturers, designers, and researchers.

1.2 Output

The study is expected to yield the following outcomes:

1. **Comparative Data on Physical Properties:**

- The research will provide a detailed comparison of the physical properties of rib-knitted fabrics made from 100% acrylic yarn and acrylic-cotton blends, focusing on properties such as fabric weight (GSM), thickness, tensile and bursting strength, air permeability, moisture absorption, and elasticity.

2. **Performance Analysis of Acrylic vs. Acrylic-Cotton Blends:**

- The study will determine how the inclusion of cotton in acrylic fabrics influences key performance aspects, such as dimensional stability, strength, and comfort. It is expected that the acrylic-cotton blend will offer improved moisture management and breathability, but may have slightly reduced strength compared to the pure acrylic fabric.

3. **Impact of Fiber Composition on Fabric Comfort:**

- The research will identify the comfort-related advantages of cotton blending, such as better moisture absorption and a softer hand feel, compared to the 100% acrylic fabric, which may have superior elasticity and durability.

4. **Practical Recommendations for Textile Manufacturing:**

- The outcomes will offer insights into selecting the appropriate fiber blend for rib fabrics based on specific end-use requirements—helping manufacturers optimize the balance between durability, comfort, and functionality for various

applications, including sportswear, casual clothing, and activewear.

5. Contribution to Textile Research:

- The findings will contribute to existing knowledge on fiber blending and its effects on fabric performance, particularly in rib-knit structures, providing a foundation for future research in fabric development and innovation.

1.3 Limitations

While this aims to enhance knowledge regarding the physical properties of rib-knitted fabrics made from 100% acrylic and acrylic-cotton blends, the following limitations should be considered:

1. Limited Fiber Blend Ratios:

- This study focuses on a specific acrylic-cotton blend ratio (50:50). Other ratios, such as 60:40 or 70:30, were not explored and may yield different results, potentially influencing the fabric's performance.

2. Sample Size and Variability:

- Only a limited number of samples were tested due to time and resource constraints. A larger sample size could provide more statistically significant data and account for variability in the yarns used.

3. Control of Environmental Factors:

- The study assumes constant environmental conditions (temperature, humidity) during testing. Variations in these conditions could affect the test results, especially for properties like moisture absorption and shrinkage.

4. Test Methods and Equipment:

- While standard testing methods were used, the accuracy of results could vary depending on the precision of the testing equipment and procedures. Differences in testing machines or

methodologies across studies could lead to slightly different outcomes.

5. Focus on Physical Properties:

- This study primarily examines physical properties such as tensile strength, elasticity, and air permeability. Other important factors like color fastness, comfort under varying conditions, and long-term wearability were not included in the scope of the research.

6. Lack of Commercial Fabric Testing:

- The fabrics were produced under controlled laboratory conditions, which may not fully represent the real-world conditions of commercial fabric production, where factors like batch-to-batch variation and production processes can impact the final product.

7. Material Availability and Cost:

- The availability and cost of certain yarns limited the range of materials that could be tested. As a result, only commercially accessible yarns within a specified price range were used.

Chapter 2 : Literature Review

2. Knitting Technology

Knitting is the process of inter looping yarns to create fabric. Rib-knitted fabrics are especially valued for their elasticity, shape recovery, and dimensional stability, making them ideal for garments like cuffs, collars, and activewear.

Types of Knitting

- **Weft Knitting:** Yarn is fed horizontally; commonly used for rib fabrics using circular machines.
- **Warp Knitting:** Yarn is fed vertically; not typically used for rib fabrics.

Key Factors in Rib Fabric Production

- **Needle Selection:** Alternating knit and purl stitches form rib structures (1×1, 2×2).
- **Yarn Tension:** Affects fabric smoothness, elasticity, and stability.
- **Machine Speed:** Influences fabric quality and consistency.
- **Fabric Density:** Determined by the number of courses and wales, impacting weight and stretch

Key Parameters in Rib Knit Production

- **Needle Selection:** Alternating knit and purl stitches form the rib structure (1×1 or 2×2).
- **Yarn Tension:** Impacts fabric smoothness, elasticity, and dimensional stability.
- **Machine Speed:** Affects uniformity and quality of the fabric.
- **Fabric Density:** The number of courses (horizontal loops) and wales (vertical loops) affects the fabric's weight and stretch.

2.1 Characteristics of knitted fabric :

Knitted fabrics possess a range of unique and advanced properties. Below is a detailed exploration of some of their key characteristics.

- Flexible and Extensible
- Durable and Breathable
- Versatile fabric
- Crease & Tear resistance
- Air permeability:
- Easy to maintain
- Softness.
- Extensibility:

2.2 Role of yarn in Knitting

The quality and the performance of knitted fabrics lie in the yarn. The most important ones are:

1. **Fiber Composition:** Softness, durability, and comfort are determined by the nature of the fiber (acrylic, cotton, and wool). Mixed fabrics take the best of various fibers to make the resultant material better at its performance.
2. **Yarn thickness:** The thickness (denier or Ne) affects the density and weight of the cloth. Thinner yarn produces lighter materials whereas the heavier yarn is more sturdy and warmer.
3. **Strength and Durability:** The sturdier the yarn, the more durable the fabric will be, nylon yarn being a good example, as well as stretch and recovery yarns (spandex) will be essential in the case of activewear.
4. **Texture and Finish:** texture (smooth, textured) influence how the fabric feels and how they look. Yarn finishes have the potential to enhance features such as softness and absorbency.
5. **Color and Dyeing:** The capacity of the yarn to take up dye and its fastness properties is relevant in the maintenance of appearance particularly on fabrics that are frequently washed.

6. **Knitting Performance:** Yarns should be compatible with the knitting machines to eliminate some knitting problems such as the tension problem. Smooth yarns produce uniform fabrics though casts textured yarns to produce visual interest.

2.3 Physical Characteristics of Acrylic:

The acrylic fiber is extensively utilized in textiles because of its identify physical characteristics. These characteristics affect the effectiveness and the applicability of acrylic based fabrics.

1. **It is lightweight:** The acrylic fiber is extremely light and, therefore, is used in making warm and comfortable wear without adding bulk.
2. **Softness:** Acrylic fibers are soft with wool like feel and are comfortable to wear and nice to touch and thus can be used as an alternative to wool.
3. **Strength:** The strength property of acrylic fibers is good in terms of weight bearing with the strength of the fibers being resistant to breaking, and can bear moderate stress and wear.
4. **Elasticity:** The acrylic fibers are to some extent elastic and consequently products based on these fibers are sensitive to shape and are stretchable or recover easily when stretched, and hence may be used in stretchable fabric such as rib knits.
5. **Dimensional Stability:** The acrylic fibers have good dimensional stability, they retain their shape and there is minimal shrinkage when put through a washing or when wet.
7. **Thermal Insulation:** Acrylic is an insulator of good insulating capability and can be considered an equal substitute to wool, because it keeps the user warm, and is lighter and less expensive.
8. **Moisture Resistant:** Acrylic fibers do not retain moisture well in comparison to natural fiber cotton. This causes acrylic fabrics to dry fast though they may not have the capability of natural fibers of determining their ability to allow the wicking of moisture.
9. **UV Resistance:** Acrylic is UV resistant and it does not degrade nor fade quickly under sunlight exposure, hence it can be used in outdoor or places where it could be exposed to sunshine.
10. **Colorfastness:** Acrylic fibers take dye easily to give excellent and lasting color which does not wear out easily when washed.
11. **Chemical Resistance:** Acrylic withstands most of the chemicals, even acids and alkalis, and this increases its life span and survivability in many place.

2.4 Cotton Fiber:

Cotton, being a natural cellulose-based fiber, possesses numerous distinct properties and features. Some of the key characteristics of cotton fibers include:

- **Structure:** Made of cellulose, offering strength and stability.
- **Softness:** Comfortable, soft, and breathable, ideal for clothing.
- **Moisture Absorption:** Absorbs up to 25 times its weight in water but dries slowly.
- **Strength:** Moderate strength, less durable than synthetics; prone to abrasion.
- **Thermal Properties:** Keeps cool in warm weather but offers limited insulation.
- **Shrinkage:** Tends to shrink in hot water.
- **Colorfastness:** Takes dye well, but may fade over time.
- **Environmental Impact:** Biodegradable but water-intensive in farming.
- **Chemical Resistance:** Resistant to alkalis, but sensitive to acids and oils.

2.5 Knit Fabric GSM:

GSM measures the weight of fabric and helps determine its thickness and comfort. Here's a quick overview:

- **Low GSM (50-120):** Lightweight, breathable; used for summer wear like T-shirts.
- **Medium GSM (120-200):** Balanced softness and durability; common in casual wear and activewear.
- **High GSM (200-350):** Thicker, more durable; used for sweatshirts, hoodies, and winter wear.
- **Very High GSM (350+):** Thick and insulating; used for outerwear and heavy sweaters.

Importance of GSM

- **Comfort:** Low GSM for warmth, high GSM for insulation.
- **Functionality:** Higher GSM = more durability and warmth.
- **Quality:** Higher GSM = denser, more durable fabric.

GSM helps choose the right fabric for comfort, weather, and wear.

2.6 Stitch Length

Stitch length refers to the length of yarn consumed in one complete stitch, usually measured in millimeters (mm) or inches. It is an important parameter in knitted fabrics and determines.

2.7 WPI

WPI stands for Wales Per Inch. In knitted fabrics, wales are the vertical columns of loops. WPI indicates the number of wales in one inch of fabric width.

2.8 CPI

CPI means Courses Per Inch. Courses are the horizontal rows of loops in a knitted fabric. CPI shows how many courses exist per inch along the fabric's length.

2.9 Bursting Strength of Knit Fabric

When a fabric is subjected to pressure, it begins to expand in all directions. As the applied pressure continues to increase, the fabric eventually reaches its limit and ruptures. The maximum pressure a fabric can endure before breaking is referred to as its bursting strength. In simple terms, bursting strength indicates the amount of pressure required to rupture the surface of the fabric. One common method to assess this property is the Ball Burst Test, which measures the force (in Newtons) necessary to tear the fabric. Bursting strength is particularly important for applications such as parachute fabrics, where durability and resistance to high pressure are essential. Factors like yarn type, material composition, yarn count, and fabric structure all play a vital role in determining a fabric's bursting strength.

Chapter 3: Methodology

3 Elements:

3.1 Yarns:

- 100% Acrylic Yarn
- 28 Ne Cotton
- 18/1 Nm Acrylic Yarn



Figure A (3.1.): Acrylic Yarn



Figure B (3.1) : Cotton

3.3 Machinery Details

3.3.1 Knitting Equipment

3.3.1.1 V-Bed Knitting Machine

A V-Bed knitting machine is a flat knitting machine with a V-shaped needle bed design, allowing it to produce two-way stretch fabrics and complex patterns.

Key Features:

- V-Shaped Needle Bed: This will allow the production of fabrics in multiple directions and production of double layers of sheets.
- Pattern Making: Suitable in the intarsia, jacquard and rib patterning.
- Two needle Beds: A front-Needle Bed and a back-Needle Bed, which work angularly on each other.

Advantages:

- **Multi-purpose:** Able to knit an extensive variety of kinds of fabrics including multi-color patterns.
- **High Productivity:** Designs complicated designs fast.
- **Quality Output:** Produces smooth, resistant and dimensionally stable fabrics.

Applications:

- **Fashion:** Applied on sweaters, dresses and jackets.
- **Sportswear production:** Produces stretchy and comfortable clothing of sports fabrics.
- **Home Textiles:** It may be used on upholstery and curtain.

Limitations:

- **Complex Setup:** Has to be operated by a professional.
- **Maintenance:** Needs regular upkeep to function smoothly.
- **High Cost:** Expensive, especially computerized models.

V-Bed knitting machine is suitable to manufacture quality and flexible materials which applied in fashion, sportswear, and house hold items

3.3.1.2 Key Elements

- Yarn guide
- Yarn package
- Yarn take-up
- Dead weighting
- Fabric comb
- Tension spring
- Needle spring
- Latch needle
- Fabric
- Yarn carrier
- Cymbal tension



Figure : C.3.1.1 : V-bed Knitting Machine

Needles : 294 .





Brand : China

GAUGE : 7 G

Machine Width : 42 Inch

3.4 Fabric Structure :

The sample was made manually in a V-bed knitting machine by adjusting the stitch length in three different settings making 6 samples in total. Out of them, three samples were created using acrylic yarn, and the other three using acrylic-cotton ply yarn.

SL No	Types of Yearn	Setup SL	Fabric sample
1	Acrylic rib		
2	Acrylic- Cotton rib		
3	Acrylic rib		







4	Acrylic – Cotton rib		
5	Acrylic rib		
6	Acrylic – Cotton rib		

Table A (3.4): Sample Fabric Table

3.5 Measurement & Calculation of SL:

3.5.1 For (2/2 rib) Acrylic & Acrylic-cotton

Length (SL)=Course Length ÷ Number of Stitches

$$= (1020/100)$$

$$= 10.2 \text{ mm}$$

3.5.2 For (2/2 rib) Acrylic & Acrylic-cotton

$$\begin{aligned}\text{Stitch Length (SL)} &= \text{Course Length} \div \text{Number of Stitches} \\ &= (1090/100)\text{mm} \\ &= 10.9 \text{ mm}\end{aligned}$$

3.5.3 For (2/2 rib) Acrylic & Acrylic-cotton

$$\begin{aligned}\text{Stitch Length (SL)} &= \text{Course Length} \div \text{Number of Stitches} \\ &= (989/100)\text{mm} \\ &= 9.89 \text{ mm}\end{aligned}$$

3.6 Test Procedure and Equipment:

3.6.1 Fabric weight (GSM):

There are various methods available to determine the mass of a fabric per unit length and per unit area.

Standard followed: ISO-3801.

Machine name: GSM Cutter Machine.

Standard atmosphere under which to condition and test

The standard environment of conditioning and testing in textile industry also makes the test results consistent and accurate because the conditioning environment regulates temperature and humidity. It is normally maintained at 20 °C (2 C), 65% (2 %) humidity and fabrics are left to attain moisture equilibrium before testing. This makes it possible to avoid being affected by factors in the environment especially on strength, weight, and ability to absorb moisture. The conditioning of fabrics takes at least 24 hours, and usually more, and the same material can be reliably tested under stable conditions in any laboratory, and in any region across the world, which is crucial to the quality control of products in the textile market.



Figure D (3.6.1) : GSM Cutter & Weight Balance Machine

3.6.2 Stitch Length, WPI & CPI:

Important parameters by which the knit fabrics are defined in terms of their structure, and quality are stitch length, WPI (Wales per Inch), and CPI (Courses per Inch). Stitch length is the distance between successive needles whereby the shorter stitches produce more densely-woven materials and the longer stitch lengths make loosely-woven materials. WPI is the amount of vertical loops (wales) per inch; the higher the WPI the tighter/denser the fabric and the lower the WPI the softer/more stretchy it will be. In the case of CPI, however, the horizontal loop count per inch is enumerated; the greater the CPI the stiffer and thicker the material fabric, and the lesser the CPI the softer and flexible material fabric. Interactively, these parameters regulate the density, texture and stretchability of knitted fabrics, enabling the manufacturers to modify specific materials to suit different uses.



Figure E (3,6.2) : Thread Counting Glass

3.6.3 Bursting Strength Test :

Bursting strength test includes the measurement of the resistance to the inner pressure of fabric to find out its ability to resist the extra force before it finally breaks. In the test the fabric sample is placed over a circular diaphragm within a bursting strength tester, and the pressure is applied steadily until the fabric breaks. The force units that are needed to gauge the amount of pressure are taken down. It is a very important test used to measure the durability of fabrics in the case of uses such as clothes, safety equipment and vehicle fabric. Bursting strength is affected by such factors as the type of fabric, the composition of the fiber, density, and the finishing treatment. Through the test of bursting strength, manufacturers confirm the fitness of their fabrics to perform about the purpose that it was being used.

Testing Procedure:

In doing the test, we used the software that comes in default mode of the Burst system known as the "Test Wise Lite" program. The fabric sample was carefully put in the clamping unit, and the experiment started as soon as the steel ball was loaded accurately on top of the fabric surface. The gauging was made at the moment of bursting of the fabric under pressure.



Figure F (3.6.3) : Universal Strength Tester

3.6.4 Thickness Test:

The thickness test determines the thickness of the fabric, a factor that is very important in gauging the level of comfort, insulation and durability of the fabric. A sample of fabric is compressed between two flat plates by a standard force and the thickness is recorded using micrometer or thickness gauge. Several measurements are made all over the cloth to make it precise. The test plays a relevant role in determining the softness, softness and wear of clothing fabrics, home textile fabrics as well as industries. Thickness of the material can be influenced by the type of fiber, fabric construction and also amount of moisture content. This test helps manufacturers ensure that fabrics meet performance and quality standards for their intended use.

Specifications of Fabric Thickness Gauge:

Measurement Range : 0 to 10 mm

- Smallest Dial Gauge Reading: 0.01 mm
- Anvil Diameter: 60 mm
- Pressure Foot Diameters: 10 mm and 25 mm

Procedure for Measuring Fabric Thickness Using a Thickness Gauge:

1. Place the fabric sample carefully on the anvil.
2. Lower the presser foot gently onto the fabric.
3. Measure the thickness of the fabric at that point.
4. The micrometer's flat circular tip applies a predetermined pressure on the sample during measurement.
5. Repeat this measurement at a minimum of three different spots on the fabric.
6. Calculate the average thickness by taking the mean of all measurements, rounded to the nearest 0.01 mm.



Chapter 04 : Result and Discussion

The test outcomes for GSM, stitch length (SL), WPI, CPI, abrasion resistance, and bursting strength are presented below. The yarn quality conforms to the as per established standards.

4. Test Results:

4.1 GSM:

No	SL	Fabric Types: Rib	GSM
1	10.6	Acrylic	539
2	10.2	Acrylic-cotton	300
3	11.2	Acrylic	601
4	10.9	Acrylic-cotton	309
5	10.35	Acrylic	805
6	9.89	Acrylic-cotton	469

Table B : GSM Results

4.2 SL, WPI & CPI:

No:	Fabric Types: Rib	SL	WPI	CPI
1	Acrylic	10.6	14	15
2	Acrylic-cotton	10.2	14	13
3	Acrylic	11.2	14	13
4	Acrylic-cotton	10.9	19	12
5	Acrylic	10.35	16	14
6	Acrylic-cotton	9.89	18	15

Table C: SL, WPI &CPI Results

4.3 Bursting Strength test:

No:	SL	Fabric types: Rib	Rupturing Force(N)
1	10.6	Acrylic	336.99
2	10.2	Acrylic-cotton	267.62
3	11.2	Acrylic	359.78
4	10.9	Acrylic-cotton	248.40
5	10.35	Acrylic	344.17
6	9.89	Acrylic-cotton	295.19

Table D : Bursting Results

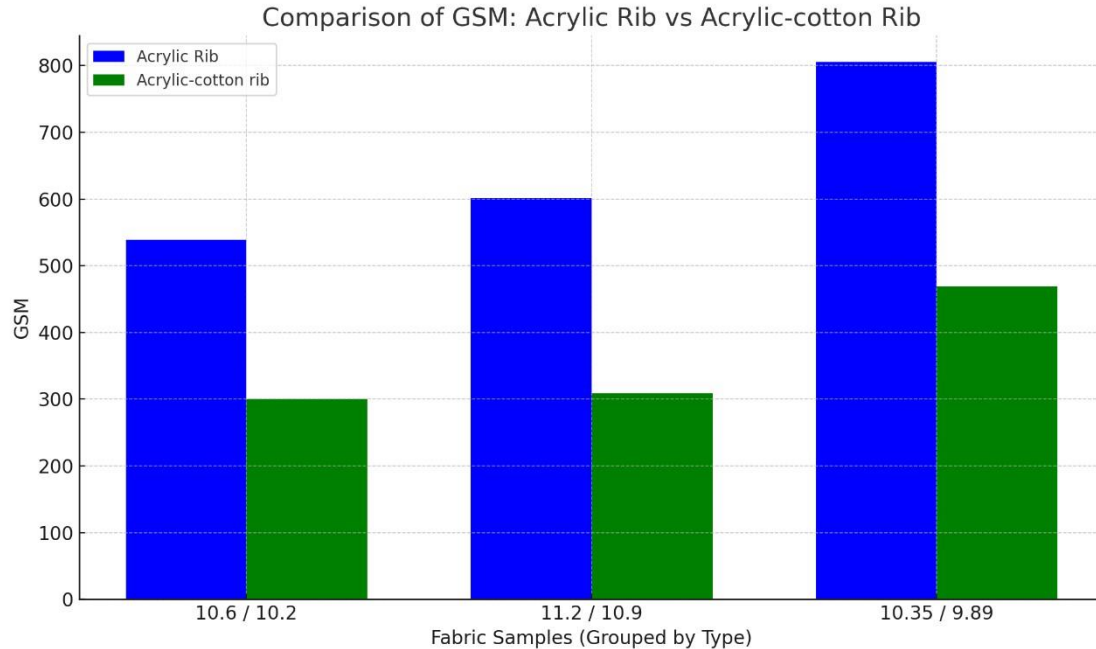
4.4 Thickness Test

No:	SL	Fabric types: Rib	Thickness
1	10.6	Acrylic	2.91
2	10.2	Acrylic-cotton	1.89
3	11.2	Acrylic	2.82
4	10.9	Acrylic-cotton	1.84
5	10.35	Acrylic	4.11
6	9.89	Acrylic-cotton	2.59

Table E : Thickness Results

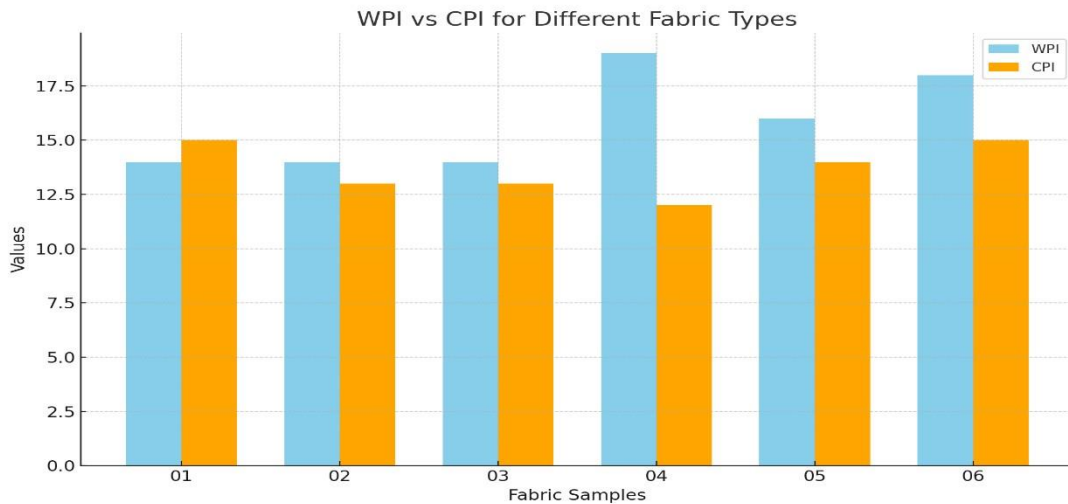
4.5 Discussion Based on Test Results

4.5.1 GSM



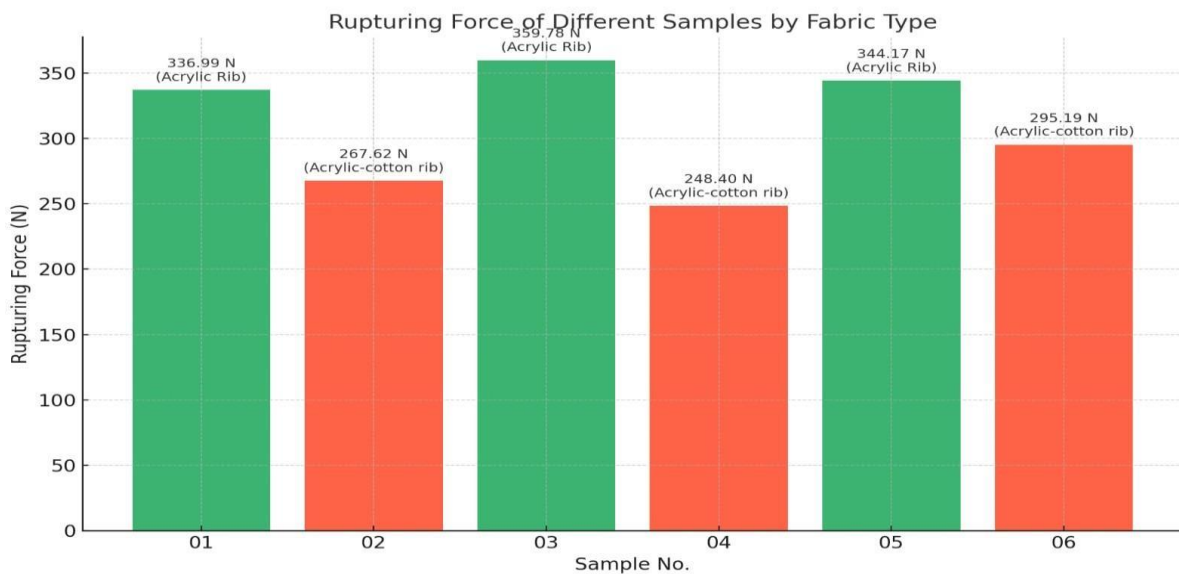
Discussion on GSM: As per to the above graph, The graph shows that Acrylic Rib fabrics consistently have higher GSM than Acrylic-Cotton blends at similar stitch lengths. This is due to the bulkier nature of 2-ply acrylic yarn, which results in denser and heavier fabrics. As stitch length decreases, GSM increases for both fabric types, but the rise is more significant in acrylic fabrics. For example, GSM reaches 805 at SL 10.35 for acrylic, compared to 469 at SL 9.89 for cotton blend. The gap in GSM between fabric types also widens with shorter stitch lengths, proving that fiber composition and loop tightness together influence fabric weight.

4.5.2 WPI & CPI



Discussion on WPI & CPI: As per to the above graph, The chart shows that Acrylic–Cotton Rib fabrics have higher WPI, meaning a denser vertical structure. For example, Sample 04 and 06 show WPI values of 19 and 18. On the other hand, CPI stays quite stable (12–15) across all samples, showing it's less affected by fabric type and more by factors like stitch length.

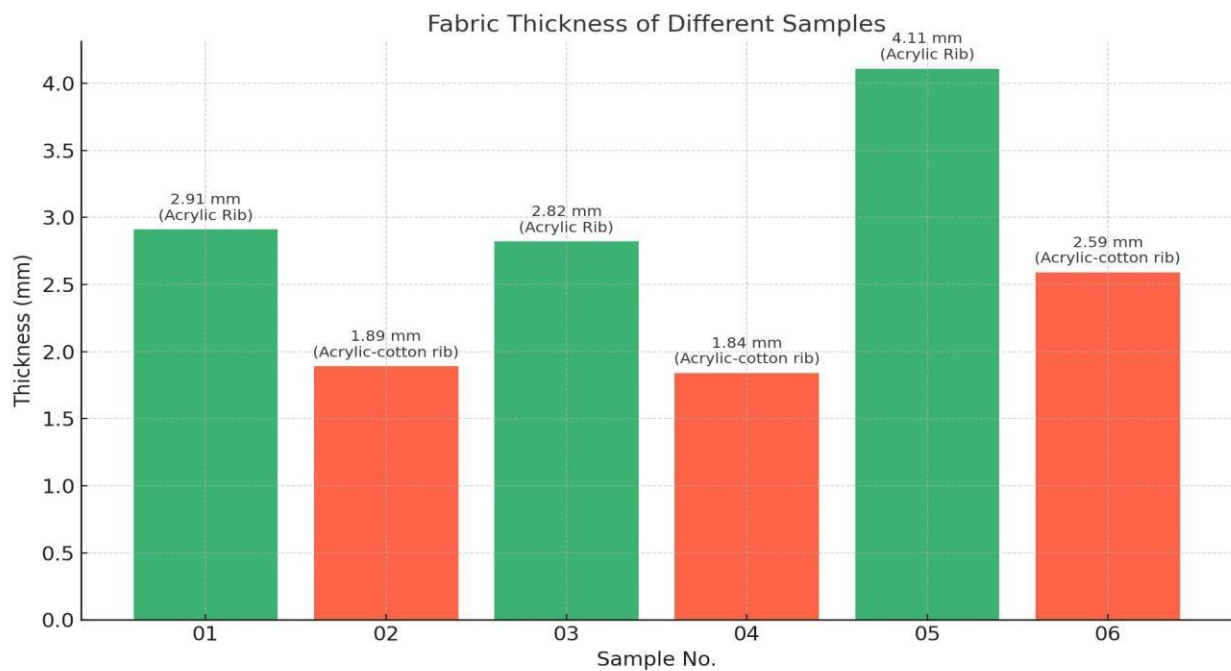
4.5.3 Bursting Strength



Discussion on Ball Bursting: As per to the above graph. The bursting strength test revealed that Acrylic Rib fabrics consistently exhibited higher rupturing forces compared to Acrylic cotton rib fabrics. On average, Acrylic Rib samples showed greater resistance to force, with values ranging from 336.99 N to 359.78 N, while Acrylic-cotton rib samples ranged from

248.40 N to 295.19 N. This indicates that Acrylic Rib has superior structural integrity and elasticity, making it more durable under stress. The tighter construction and synthetic composition of Acrylic Rib likely contribute to its enhanced performance.

4.6.4 Thickness



Discussion on Ball Bursting: As per to the above graph, The test results indicate that Acrylic Rib fabrics consistently showed higher thickness compared to Acrylic-cotton rib fabrics. The maximum thickness was observed in Sample 05 (4.11 mm), made of Acrylic Rib, while the minimum was in Sample 04 (1.84 mm), an Acrylic-cotton rib. This suggests that Acrylic Rib fabrics are generally denser and bulkier, which may contribute to better insulation and durability.

Chapter 5: Conclusion

Conclusion

This comparative study of Acrylic-Acrylic and Acrylic-Cotton rib fabrics reveals distinct differences in their physical properties due to the variation in fiber composition. Acrylic-cotton blends generally exhibit improved comfort and breathability owing to the natural cotton fibers, while pure acrylic fabrics tend to offer higher durability and better resistance to abrasion and bursting strength. Parameters such as GSM, stitch length, and fabric density vary between the two types, affecting their suitability for different end-uses. Overall, the selection between Acrylic-Acrylic and Acrylic-Cotton rib fabrics should be based on the desired balance of performance, comfort, and application requirements.

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