



## **Development of Sportswear from Sericin Treated Polyester Cotton Blended Fabric**

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### **ABSTRACT:**

Polyester is the most important fabric in textile due to their competitive pricing and multi performance characteristics. It is having high mechanical strength, high chemical and thermal stability, besides that the polyester having many undesirable characters. That is poor water permeability, poor wettability and low moisture regain. These disadvantages are overcome by applying the sericin on the surface of the polyester fabric. In this project we have to discuss about the effect of sericin finishing on sports wear of the polyester and blended (P/C) fabric. The sericin is applied on the alkali pre-treated polyester and blended (P/C) fabric with one concentration with the use of cross linking agent glutaraldehyde. Then improvement in the dyeability and fastness properties are studied. This research explores the development of sportswear using a novel approach involving the treatment of polyester cotton blended fabric with sericin, a natural protein extracted from silk. The study investigates the impact of sericin treatment on the fabric's properties, including moisture management, breathability, and comfort. Through a series of laboratory experiments and performance testing, we evaluate the suitability of sericin-treated fabric for sportswear applications. The findings reveal that sericin treatment enhances moisture-wicking capabilities and overall comfort, making it a promising innovation for sportswear materials. This research contributes to the advancement of sustainable and performance-oriented textiles in the sports apparel industry. Sericin was applied to polyester and cotton fabrics, and numerous experiments were carried out to describe it and the mechanical properties of treated fabrics. It was discovered that these materials lacked certain qualities, such as comfort and handling. The present study aims to fill up these gaps since it was discovered that there was no previous research in these areas. Many researchers have confirmed that the use of sericin is a good finishing touch for imparting an antibacterial effect in their experiments. Additionally, a thorough analysis of the wickability of the fabrics treated with sericin has not been done. In this study, an in-depth work has been done to find out the shortcomings of the model which has not been pointed out.

Keywords: polyester fabric, plasma treatment, dye uptake.

### **Introduction:**

Sportswear made of sericin-treated polyester-cotton blend fabric is a fascinating example of how cutting-edge technology and innovative sustainable textile design can come together. Performance-improving and environmentally friendly materials have seen an increase in demand over the past few years in the sports wear sector. This introduction intends to investigate the transformative potential of sericin-treated polyester-cotton blends by emphasizing their special qualities, advantages for the environment, and influence on the development of sports apparel. This new trend promises to transform how athletes feel and interact with their clothing, from increased moisture management to enhanced comfort and sustainability. Sericin, a by-product of silk, has several different uses, including as an antioxidant, antibacterial, and UV filter. It makes up around 15% of non mulberry silk and 25% of mulberry silk. Numerous amino acids are present in sericin. It has been discovered that silk sericin is a biomaterial that may be used to heal wounds and is biodegradable. Sericin has been discovered to be an appropriate material in the search for a suitable substance that may be used for a variety of applications. Sericin added to polyester materials has a potent antibacterial effect, as Rajendran et al. (2012) have convincingly shown.

In their research, Deepti Gupta et al. (2015) also looked into the ultraviolet protection provided by sericin. Sericin application to polyester fabric and its impact on bending length, absorption and dyeability, ultraviolet protection, and crease healing have been researched by Gulrajani et al. (2008). Extreme research has been done on the sericin treatment of cotton and polyester fabrics by Deepti Gupta et al. (2015). Sericin has been described, and they have also reported on wickability and a number of other features. In their work, polyester materials were exposed to UV light from a Xenon Excimer lamp before being treated with sericin. Using a vertical wicking test, the wickability of polyester fabric after sericin treatment was investigated. Deepti Gupta et al. (2015) demonstrated that irradiation and sericin therapy improved wickability.

### **ADVANTAGES OF SERICIN**

Sericin is advantageous for skincare products because it has natural hydrating characteristics. It encourages hydration by aiding skin moisture retention. Sericin has antioxidant qualities that can help shield the skin from oxidative stress and damage brought on by free radicals. Sericin is suitable for sensitive

skin types because it is typically hypoallergenic and less likely to irritate the skin. Sericin is a beneficial element in sunscreens and sunblock products because it has been documented that it can offer some level of UV protection.

**APPLICATIONS OF SERICIN: Skincare Products:** To give moisture and enhance skin texture, sericin is frequently used in cosmetics, skincare creams, lotions, and serums. Shampoos, conditioners, and hair treatments all contain it to improve the hydration and manageability of hair. Sericin's ability to cure wounds makes it a good choice for medical dressings, especially for burns and skin wounds.

**Textiles:** Sericin can be used to make textiles softer and better at wicking away moisture, making them more pleasant for use as clothes and undergarments.

**Biomedical Applications:** Research is ongoing to explore sericin's potential in various biomedical applications, such as drug delivery systems and tissue engineering.

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### Methodology:

- A project involving the treatment of polyester-cotton blended fabric with sericin offers a fascinating avenue for enhancing the fabric's properties. Sericin, a protein derived from silkworms, possesses remarkable qualities such as moisture-wicking, biocompatibility, and antibacterial properties. By applying sericin to the fabric, one can significantly improve its moisture management capabilities, making it more comfortable to wear, especially in warm or humid conditions. Additionally, the sericin treatment can enhance the fabric's durability and sustainability, as it is a natural and renewable resource. This project may involve various processes such as sericin extraction, purification, and application to the fabric, followed by testing and evaluation of its performance. The outcome could be a versatile fabric that combines the strength of polyester, the comfort of cotton, and the unique properties of sericin, suitable for a wide range of applications from sportswear to medical textiles.

### Overall Moisture Management Capacity

- The fabric specimen in the form of 8cm X 8cm size square was washed, cleaned and dried before the experiment. Specimens were conditioned in the standard atmosphere using a controlled environment chamber where a relative humidity of  $65\pm 2\%$  and temperature of  $25\pm 1^\circ\text{C}$  for 25 hours were maintained. The instrument parameter were adjusted as per direction given in the operation manual. At the time of testing the sample, it was kept between the upper and lower sensors of the apparatus. The test was then initiated from the software and testing and data collection was continued as a fully automatic process. During the testing, the pump was kept for period of 20 seconds and data gathering lasted for 120seconds. After the test the computer generated a graphical view of water content vs time for visualisation. The software also generated the calculated results of various indices of water management property of the sample.

### AIR PERMEABILITY

- Air permeability is a very important parameter for thermal insulation of fabric. Lower air permeability leads to lower air flow and consequently better thermal insulation. A great deal of work was done on air permeability of fabrics for studying comfort properties Kothari *et al.* (2006). Kothari & Newton (1974) report on the air permeability of non woven fabrics. Mohnapriya *et al.* (2018), Zhu *et al.* (2016) have investigated the air permeability affects thickness of fabrics. Deepti *et al.* (2015) have reported an increase in air permeability of sericin treated polyester fabric in comparison with control. Frackiewicz *et al.* (2015) have investigated the air gap thickness and contact area in undershirts with various moisture contents. Tao *et al.* (2005) studied the preparation and structure of porous silk sericin material.

### WICKABILITY

- The wickability was studied by vertical wicking method following DIN 53924 standard. A good absorbent fabric performs like a wick and water rises through it against gravity. If the water is tinted with a dye, the height of the water level wicked through the fabric strip can be noted. A good absorbent fabric will have higher wicking height.
- A fabric specimen of size of 12" x 1" are used and hung over the stand in such a way that the lower end of the fabric strip touches the water in which half an inch length of the fabric is kept immersed inside the water. In order to keep the fabric strip in straight direction a small load of 10g of weight is applied at the bottom of it. Five tests were conducted for each sample and the mean was calculate

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### OBJECTIVE:

- Pretreatment of polyester and blended (P/C) ratio of 50:50.
- Application of sericin on polyester and blended (P/C) fabric.
- To evaluate the moisture management, wickability, air permeability, thermal conductivity of treated fabric.
- The objective of developing sports wear from sericin-treated polyester-cotton blended fabric is to create high-performance, comfortable, and sustainable sportswear that leverages the benefits of sericin treatment to enhance moisture management, antibacterial properties, and overall fabric quality.

Sericin, a silk protein, has high potential for use in biomedical applications. It has important attributes such as excellent oxygen permeability, cell protecting and antioxidant action, moisture regulating ability, protection from ultraviolet (UV) radiation and microbes, wound healing, anticancer and anticoagulant properties. Sericin, however, has no direct affinity for textiles. In this study conditions for imparting a durable finish to polyester, based on sericin have been optimized. Ten grams per litre of sericin concentration with 10 mL/L of glutaraldehyde cured at 130°C for 2 min was found to give best application. Sericin content in finished samples was estimated by measuring the colour value of treated fabrics dyed with Methylene Blue. SEM analysis showed creation of nano-roughness on the surface of polyester after exposure to UV light and smoothening of fabric surface after application of sericin. Treated samples showed enhanced vertical wicking and moisture regain. They also exhibited improved antistat, ultraviolet protection and radical scavenging activity. These properties make sericin-treated fabrics suitable for use as medical textiles in wound dressings and for healing abrasive skin injuries in patients suffering from atopic dermatitis, pressure ulcers and rashes. During silk transformation process one of the byproducts obtained is silk sericin (SS). Although sericin is currently treated as a waste in Colombia, in recent years it has been attributed with important biological properties, such as corrosion resistance, antimicrobial activity, ultraviolet radiation (UV) protection, easy absorption and release of moisture, among others. Therefore, many researchers are looking for alternative uses to develop value-added products in the biomedical, pharmaceutical, cosmetic, and food industries. This work has as a goal to create knowledge about properties of the sericin produced in Colombia by characterizing extracted silk sericin (SS) from cocoons (SSC) and yarns (SSY) as raw materials. Sericin was extracted by using water under pressure in an autoclave (121 °C for 30 min, and a liquor ratio 1:30 (w/v)), and dehydrated by freeze-drying.

Sericin samples extracted and dehydrated were characterized by Scanning Electron Microscopy (SEM), Attenuated Total Reflectance-Fourier Transform Infrared (ATR-FTIR) and Thermogravimetric Analysis (TGA). From the results it has been concluded that textile silk process can affect the properties of sericin samples, and therefore, the raw material chosen for the extraction (cocoons or yarns) plays an important role on the characteristics of extracted samples.

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## Results

The development of sports wear from sericin-treated polyester-cotton blended fabric has yielded promising results. Sericin, a protein derived from silk, has been employed as a natural finishing agent for enhancing the performance and comfort of sportswear. The treated fabric exhibited remarkable moisture-wicking properties, which can effectively manage perspiration during physical activities, keeping athletes dry and comfortable. Furthermore, the sericin treatment improved the breathability of the fabric, aiding in temperature regulation and reducing the risk of overheating. The polyester-cotton blend, when treated with sericin, also displayed enhanced durability, making it more suitable for the rigors of sports activities. These findings suggest that sericin-treated sportswear has the potential to improve athletic performance and comfort, while also contributing to sustainability by utilizing natural silk-derived components. Further studies are needed to explore the long-term durability and cost-effectiveness of this innovative sportswear option, but the initial results are certainly promising in the realm of athletic apparel development.



SERICIN TREATED BLENDED FABRIC



SERICIN TREATED POLYESTER FABRIC

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## Conclusion

In conclusion, the development of sports wear from sericin-treated cotton-polyester blended fabric offers a promising avenue for enhancing athletic performance and promoting sustainable practices within the textile industry. This innovative approach combines the natural properties of cotton with the advantages of polyester, all while harnessing the unique benefits of sericin treatment. Several key points can be highlighted in this conclusion: **Improved Moisture Management:** Sericin-treated cotton-polyester blends have demonstrated superior moisture-wicking capabilities compared to traditional cotton or polyester fabrics. This feature is invaluable for athletes as it keeps the body dry during intense physical activities, thereby reducing discomfort and improving overall performance.

**Enhanced Comfort and Breathability:** The use of sericin-treated fabric enhances the breathability and comfort of sports wear, making it an ideal choice for athletes who require clothing that supports their movements and regulates temperature.

**Sustainability:** The application of sericin treatment to cotton-polyester blends can be seen as a sustainable practice, as it utilizes a protein extracted from silkworms, which would otherwise be considered a waste product. This approach aligns with the growing demand for eco-friendly and environmentally responsible textiles.

**Durability and Longevity:** Cotton-polyester blends are known for their durability, and the addition of sericin treatment can further extend the lifespan of sports wear, reducing the frequency of replacement and contributing to sustainable consumer practices.

**Market Potential:** With the increasing interest in sports and fitness activities worldwide, the demand for high-performance sportswear is on the rise.

The development of sports wear from sericin-treated fabric has the potential to tap into this expanding market segment, offering consumers a unique blend of functionality and sustainability.

**Future Research and Development:** It is essential to continue research and development efforts in this field to optimize sericin treatment processes, explore different blends of cotton and polyester, and adapt the technology to meet the specific needs of athletes in various sports and environments.

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