Usability of Soya Bean Protein Fibre in Denim Fabric Production and Its Potential in Textile Industry

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Abstract: This study extensively examines the feasibility of using soybean protein fiber (SPF) in denim fabric production and its potential within the textile industry. Known as Glycine max, soybean's application in fiber form presents numerous benefits. SPF stands out for its softness, drapability, and luster. These properties have popularized its use in the textile sector, particularly in knitting groups for baby clothes, underwear, and similar products.[1]

SPF is a botanical protein fiber containing 16 amino acids, making it healthy and nutritious for human skin. It also exhibits superior performance compared to natural and synthetic fibers in terms of moisture absorption, ventilation, drapability, and thermal comfort.[2] The softness and smoothness of SPF, akin to cashmere, and its derivation from the resource-rich soybean plant, make it a valuable material in the textile industry.[3]

Experiments indicate that denim fabrics enriched with SPF have significant effects on their physical, visual, and tactile properties. This study involves a comparative analysis of SPF-enhanced and traditional denim fabrics. The addition of SPF has notably improved the fabrics' moisture absorption capacity and thermal comfort. The strength and durability of SPF-enhanced denim fabrics have also been evaluated.

The methodology used in this research is carefully designed to understand the effects of SPF on denim fabrics. Initially, yarns made from a blend of SPF and traditional cotton were produced. These yarns were then used to weave denim fabrics, whose physical and chemical properties were examined through various tests. The experiments have demonstrated several advantages of SPF-enhanced denim fabrics. For example, their moisture absorption and air permeability are higher. Additionally, these fabrics have shown increased resistance to bacteria, making them suitable for hygienic applications.

The results suggest that using SPF in denim fabric production can enhance product quality and contribute to the sustainability goals of the textile industry. SPF-enhanced denim fabrics can be produced with less water and energy consumption and possess recyclable and biodegradable characteristics.[4],[5]

In summary, this study comprehensively reveals the feasibility of using soybean protein fiber in denim fabric production and the potential of this innovative material in the textile industry. It concludes that SPF can significantly reduce ecological footprint, enhance consumer comfort, and improve the overall performance of textile products. These findings could pave new paths for the sustainable development of the textile industry and promote wider use of SPF.

Keywords: *Soybean Protein Fiber (SPF), Denim Fabric Production, Textile Industry, Sustainability, Physical and Chemical Properties, Moisture Absorption Capacity, Thermal Comfort, Strength and Durability, Environmental Impact, Biodegradability omponent, formatting,*

Table 1 Comparative Results of Soybean and Cotton Yarn

Property	***%50 Soybean Protein Fiber + %50 Cotton***	***%100 Cotton***
Irregularity (%U)	11.23	7.27
Fuzziness (H)	7.3	5.27
Elongation (%)	6.77	8.41
Strength (cN/tex)	14.91	14.19

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REFERENCES

[1] EKİNCİ, D., & SABIR, E. C. (2018). Soya ve pamuk lifi içeren dokusuz yüzey kumasların hijyen tekstili performansının deneysel incelenmesi. *Çukurova Üniversitesi Mühendislik-Mimarlık Fakültesi Dergisi*, *33*(4), 165-174.

[2] Özgen, B., & Altaş, S. (2014). The investigation of thermal comfort, moisture management and handle properties of knitted fabrics made of various fibres. *Textile and Apparel*, *24*(3), 272-278.

[3] Yıldırım, F., AVİNÇ, O., & Yavas, A. (2014). Soya Fasülyesi Protein Lifleri Bölüm 2: Soya Liflerinin Özelliklerinin Ve Kullanım Alanları. *Uludağ Üniversitesi Mühendislik Fakültesi Dergisi*, *20*(1), 1-21.

[4] Yıldırım, F. F., Avinç, O. O., & Yavaş, A. (2014). Soya fasülyesi protein lifleri Bölüm 1: Soya fasülyesi protein liflerinin genel yapısı, üretimi ve çevresel etkileri.

[5] Yilmaz, D., Karaboyaci, M., Kilic, H., Kitapci, K., & Yelkovan, S. (2015). Comparison of selected properties of eco-friendly soybean and other fibres. *Fibres & Textiles in Eastern Europe*, (3 (111), 14-24.