

Research Article

Sustainable Denim Design Using Giza Cotton

İsmet Ege Kalkan^{1*}, Elçin Emekdar-Karaman², Zuhale Karacayır³, Gökhan Ünsal⁴, Umut Kıvanç Şahin⁵

¹ Department of Textile Engineering, Istanbul Technical University, Istanbul, Turkey

Orcid ID: <https://orcid.org/0009-0001-3447-2132>, E-mail: kalkani15@itu.edu.tr

² Department of Textile Engineering, Istanbul Technical University, Istanbul, Turkey, Orcid ID:

<https://orcid.org/0000-0001-9964-0099>, E-mail: emekdar@itu.edu.tr

³ DNM Tekstil Sanayi ve Ticaret A.Ş., Istanbul, Turkey, Orcid ID: <https://orcid.org/0009-0003-1783-8117>, E-

mail: zkaracayir@dnmdenim.com

⁴ DNM Tekstil Sanayi ve Ticaret A.Ş., Istanbul, Turkey, Orcid ID: <https://orcid.org/0009-0007-3983-8766>, E-

mail: gunsal@dnmdenim.com

⁵ Department of Textile Engineering, Istanbul Technical University, Istanbul, Turkey

Orcid ID: <https://orcid.org/0000-0003-3074-3633>, E-mail: sahinumut3@itu.edu.tr

* Correspondence: kalkani15@itu.edu.tr; Tel.: 05323954387

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Abstract

Designing denim fabrics that will have a longer wear life by combining Giza cotton, one of the best cottons in the world, with yarn technology, without using any reinforced synthetic fibers. Giza cotton will be used in the products to be developed specifically for the project. High strength yarns will be obtained with the fiber length of Giza cotton and the appropriate twist value to be applied. It is aimed that the fabrics produced from these threads will have a longer lifespan than normal cotton threads. One of the most important steps for the continuity of sustainable production will be that the produced product is recyclable and can be used for a longer time. In this way, a significant decrease in the carbon and water footprint resulting from production will be achieved. The environmental impact of production will be minimized.

Keywords: Giza Cotton, Durability, Strength, Natural Fibers

1. Introduction

Giza cotton is a type of cotton that is grown in the Nile River Delta region of Egypt. It is known for its excellent quality and is considered a symbol of luxury and comfort in the textile industry. Giza cotton, cultivated in the fertile Nile River Delta region of Egypt, stands as a testament to the union of nature's bounty and human craftsmanship. Renowned for its exceptional quality, Giza cotton has become synonymous with luxury

and comfort in the world of textiles. This article explores the unique attributes of Giza cotton, shedding light on its cultivation, characteristics, and the unparalleled experience it offers in various textile applications [1].

Sustainability and durability are closely related. Using resilient materials and products can help increase the lifespan of a product, which in turn allows us to use it for a longer time. This reduces the need for new products, saving resources and minimizing waste. Ultimately, it helps us meet our needs without causing harm to the environment. [2]. The concepts of sustainability and durability are interconnected. By utilizing strong and long-lasting materials and goods, we can extend the lifespan of a product, which enables us to reap its benefits for a longer period. This lessens the demand for new products, resulting in the conservation of resources and the reduction of waste. Ultimately, this approach allows us to fulfill our requirements without causing any harm to the environment. Managing environmental impacts in the textile/clothing/fashion industry is of increasing concern. In the past few decades, clothing manufacturers utilized various globalization strategies to lower production costs and raise profit margins. These strategies in turn created nearly unbounded arrays of clothing choices for consumers that are available in a wide array of price points [3].

The textile industry has a substantial impact on the environment, from the production to the disposal of textile products. The importance of all stakeholders, including consumers, manufacturers, supply chains, and retailers, acting to protect the environment when producing and consuming textile products. industry, take alternatives to promote environmental protection in the production and consumption of textile products can not be ignored [4].

To provide garments with longer wear life by designing fabrics with increased durability by around 30% compared to fabrics produced with normal cotton. Increased strength is provided by the fiber length and high twist of Giza cotton. Since equivalent works are made with reinforced synthetic fibers, they are not recyclable and their costs are higher. Since it is produced from Giza cotton, products that are recyclable and also offer wearing comfort will be obtained. The product lifespan is extended and the purchased product will be suitable for long-term use and reuse. Thus, environmental damage resulting from production will be minimized and products that will contribute to the circular economy will be obtained.

2. Materials and Methods

In this novel study 4 different types of woven jeans have been produced and are retrieved from DNM company.

These samples are Dave and Dawson are %99 giza cotton and %1 elestane, Carlos and Longanica are %100 cotton. All weave types are 3/1 RHT.

Table 1: Samples

Sample Name	Yarn Count	Composition	Weave Type	Weight
Dave	7,7 Ne Warp 10,4 Ne Weft	%99 (giza) co - %1 El	3/1 RHT	406 g/m ²
Dawson	7,7 Ne Warp 10,4 Weft	%99 (giza) co - %1 El	3/1 RHT	406 g/m ²
Carlos	7,5 Ne Warp 6,5 Ne Weft	%100 (giza) co	3/1 RHT	449 g/m ²
Longanica	7 Ne Warp 6 Ne Weft	%100 (regular) co	3/1 RHT	457 g/m ²

2.1.1. Performance Testing of the Fabrics

Samples were tested for tensile strength according to ASTM D5034, for tearing strength according to ASTM D1424 and for abrasion resistance according to ISO 12947.

3. Results

Tensile Test results have been shown in Table 1.

Table 2: Tensile Test Results

Fabric Name	Tensile Strength (Kgf)	
	Warp	Weft
	INT	INT
DAVE	105.6	48.4
DAWSON	143.6	60.6
LONGANICA	78.2	62.3
CARLOS	126.2	85

The test shows us that Dawson sample has better tensile strength than others. The results show us that denim fabrics manufactured with giza cotton tensile strength is similar to regular cotton denim fabrics, but further work is needed in order to improve tensile strength performance.

Tear strength results are shown in Table 2.

Table 2: Tear Strength Results

Fabric Name	Tear Strength (gf)	
	Warp	Weft
DAVE	7582	3516
DAWSON	10224	5116
LONGANICA	7242	6484
CARLOS	10505	9252

The results show us that in tearing the durability of the fabrics are better than expected while using no synthetic fibers in the production. Similar to tensile strength the giza cotton shows performance is similar but work under strength is needed.

Abrasion resistance results are shown in Table 3.

Table 3: Abrasion Resistance

Fabric Name	Abrasion Resistance	
DAVE	no yarn break @12k rubs	no yarn break @ 25k rubs
DAWSON	no yarn break @12k rubs	no yarn break @ 25k rubs
LONGANICA	no yarn break @12k rubs	no yarn break @ 25k rubs
CARLOS	no yarn break @12k rubs	no yarn break @ 25k rubs

Results shows us that under 25.000 rubbing that the samples did not show any sign of cuts or damage to the fabric. All fabrics studied show demanded abrasion resistance performance.

4. Discussion and Conclusion

For sustainability, production using only sustainable materials and methods will not be sufficient. In order to change the fast consumption mentality that prevails today, we need products with a longer wear life. These products can be used for a long time, are suitable for reuse with second-hand use, and if desired, small changes to be made in the product can be made fashionable and can be used again and again. They can also be returned when they reach the end of their useful life. will be suitable for conversion.

In conclusion, the comprehensive testing of the Dawson sample has revealed a superior tensile strength compared to other samples, underscoring its potential as a robust and resilient fabric. However, the findings also point towards the necessity for additional research and development to further enhance tensile strength performance across all samples. Notably, the unexpected durability in tearing tests, particularly in the absence of synthetic fibers, suggests a promising avenue for fabric production that prioritizes natural materials. Moreover, the impressive resistance displayed by all samples under 25,000 rubbing cycles highlights their commendable abrasion resistance, meeting the stringent demands for durability. These results collectively emphasize the need for

continued investigation and refinement in fabric development to capitalize on strengths and address potential areas for improvement.

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