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# Analysis of Physical Properties on Gossypium Herbaceum Fabric

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**ABSTRACT**

As of right now, Kala Cotton (Gossypium herbaceum) is submitting its trademark application. This crop uses less energy and emits no carbon. It grows natively in the arid, drought-prone areas of Kutch, where the annual rainfall is less than 40 cm. It is resilient and persistent even in inclement weather. It is nourished only by rain. This study aims to assess the tensile and tearing strengths of the selected cloth. A few factors that influence tensile strength are fiber type, thickness of the fabric, and yarn structure. High tensile strength fabrics are preferred in applications where resistance to elongation and stretching is vital, such as seatbelts, industrial safety harnesses, and geotextiles. The amount of force required to start or continue ripping a textile in the warp or weft direction under specific conditions is known as tearing strength, according to ASTM D1682.

***Keywords:*** *Kala Cotton, Physical properties, tensile strength, Tearing strength.*

## Introduction:

India has been cultivating cotton, also known as gossypium, for a millennium. India has provided area for the cultivation of all four types of cotton throughout its stormy history: the Old World cottons, *G. herbaceum* and *G. arboreum*, also known as desi or indigenous cotton, and the New World cottons, *G. barbadense* and *G. hirsutum*, generally known as American cotton. Kala cotton is a short-staple, carbon-neutral crop that grows only when it rains, and it resists pests and disease. It is resilient to even the most extreme weather and terrain. (1)

Since most Indian languages use the word "black" to describe kala, people frequently assume that kala cotton is black in color while, in fact, it refers to the boll that remains after the cotton fiber is extracted. It is a member of the *G. Herbaceum* type and is identified by its short to medium staple length of 20–22 mm. Its seed type is often V-797 and G. Cot. 21. Its closed or semi-open boll type is harvested together with the calyx. (2)

It's critical to understand that the tensile and tear strengths of textiles might vary. This might vary depending on the fabric's construction, fiber type, denier, and final usage, as well as the surrounding environment (3). Tensile and tear strength can be lost as a result of various factors, such as wind, sun, and moisture, causing the fabric to degrade over time. Sunlight can hasten degradation and is one of the main causes of a decrease in fabric or textile strength (4).

According to ASTM D1682, tearing strength is the amount of power needed to begin or maintain tearing a cloth in the warp or weft direction under particular circumstances. A rip in a cloth or garment can be caused by a moving piece of fabric catching on a sharp object; tears usually start to appear gradually along a line. The double tongue rip (tear) test, the trapezoid tear test (ASTM D5587), and the single tongue tear test (ASTM D2661, BS 4303) are some of the techniques used to determine tear strength (5).

## Material and Methods

The tensile test was conducted using Elmendorf's apparatus for tearing strength test and the Cloth Tensile Strength Tester. A 2 x 4 m fabric swatch was cut to test the tearing strength, and a 12 x 2 m fabric swatch was cut in the warp and weft directions, respectively, to test the tensile strength.

Table 1: Tensile strength of *Gossypium herbaceum* – Warp & Weft

| S. No | Warp | | Weft | |
|---|---|---|---|---|
| | Elongation | Tensile breaking point (kg) | Elongation | Tensile breaking point (kg) |
| 1 | 1.3 | 24 | 2 | 24 |

| | | | | |
|---|---|---|---|---|
| 2 | 1.3 | 24 | 1.8 | 18 |
| 3 | 1.4 | 25 | 2 | 24 |
| 4 | 1.5 | 26 | 2 | 22 |
| 5 | 1.4 | 25 | 1.8 | 18 |
| 6 | 1.4 | 25 | 1.8 | 17 |
| 7 | 1.3 | 24 | 2 | 24 |
| 8 | 1.3 | 24 | 2 | 24 |
| 9 | 1.3 | 24 | 2 | 22 |
| 10 | 1.5 | 26 | 1.8 | 18 |

The above Table no: 1 represents the elongation and tensile breaking range in kilograms by *Gossypium herbaceum* on both warp and weft direction.

Table 2: Tearing strength of *Gossypium herbaceum* – Warp & Weft

| S.No | Tearing Strength (kg) | |
|---|---|---|
| | Warp | Weft |
| 1 | 30 | 18 |
| 2 | 32 | 18 |
| 3 | 27 | 20 |
| 4 | 32 | 19 |
| 5 | 32 | 18 |
| 6 | 30 | 19 |
| 7 | 30 | 18 |
| 8 | 30 | 20 |
| 9 | 27 | 20 |
| 10 | 27 | 20 |

The above Table no: 2 represents the tearing strength in kilograms by *Gossypium herbaceum* on both warp and weft direction.

## Results and Discussion

The tensile strength of *Gossypium herbaceum* has been calculated used ten different reading for each warp and weft, the average value of each sectors has been mentioned in the below Fig: 1 as a graphical representation.

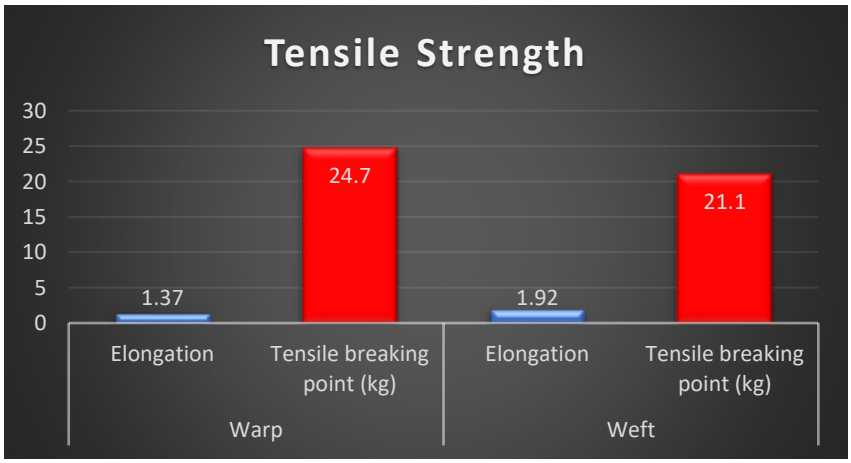

Fig 1: Elongation and Tensile breaking point of *Gossypium herbaceum*

The tearing strength of *Gossypium herbaceum* has been calculated used ten different reading for each warp and weft, the average value of each sectors has been mentioned in the below Fig: 2 as a graphical representation.


Fig 2: Tearing strength of *Gossypium herbaceum*

## Conclusion

This study was carried out to analyses the tensile strength and tearing strength of *Gossypium herbaceum* (Kala Cotton). For analysing the tensile property both weft and warp direction of samples was taken and analysed under elongation and tensile breaking point, where warp showed lower elongation point of 1.37 and higher tensile breaking point of 24.7kgs and weft showed higher elongation point of 1.92 and lower breaking point of 21.1 kgs. In the analysis of tearing strength, warp and weft direction was taken under consideration and ten reading was kept under evaluation, where the average was calculated and showed the result where warp has higher tearing strength of 29.7kgs and weft showed 19kgs.

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