# Study on Application of Various Blends of Soya and Cotton in Medical Gauze Bandages

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**Abstract:**

*This Study is focused on applying the Soya material in medical textiles and to improve the absorbency, better wound healing, with moderate cost than that of cotton material. To use the soya as substitute for cotton in medical field as gau it has to be bleached in order to enhance its absorbency. We have studied about the usage of Soya /cotton union woven product in the medical field. We started by weaving the fabric with a Soya as weft, cotton as warp and it was also bleached. It should be emphasized here that Soya on its raw form could be used for medical purpose because of the presence of amino acid. The raw Soya and processed Soya material were made as gauze and applied to the patients with the varying wound types such as lacerations, abrasions, incisions.*

**Keywords:** *Absorption, Bandage, Gauze, Lacerations, Soya Protein Fiber*

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## 1. Introduction

Soya protein fiber is gaining importance due to its excellent moisture absorption, soft, smooth and good drapability. It is a regenerated protein fiber with excellent absorption and healing properties. It has been taken by many people for strength and essential amino acids and is now emerging in textile field and diverse application. This study aims to use this Soya protein fiber in medical textile arena. [1]. This study compared the absorbency, biodegradability and smoothness of cotton gauze fabric with Soya and Soya/cotton blend fabric to improve its absorbency and better wound healing. It found that Soya protein fiber is having similar properties as that of cotton.

## 2. Medical Textiles

Textile materials used in medical field include fibers, yarns, fabrics and composites. Polymers, ceramic fibers, alginate fibers, cotton, silk, viscose, nylon, polyurethane are all used. The medical and related health care and hygiene sector is growing due to developments in both textile technology and medical procedures.

The application of textile in medical field is huge and diverse ranging from a single thread suture to the complex composite structures for bone replacement.

### *2.1 Classification of Fibres in Medical Textiles*

Fibers used in Medicine and surgery may be classified depending on the materials from which they are made from:

- Natural Fibers - Cotton, Silk.
- Regenerated cellulosic fibers - Viscose rayon
- Synthetic Fibers - Polyester, Polyamide, Polypropylene, Carbon, glass.

### *2.2 Specialty Fibres*

**i. Natural Polymers**

Natural polymers Collagen, Alginate, Chitin and Chitosan have been found to be useful for modern wound dressings. Collagen obtained from bovine skin is a protein available either in fiber or hydro gel. It is biodegradable, strong as silk and used for sutures. Its hydro gel form can be processed into soft contact lenses **[12]** (*Table-1*).

Fibers melt-spun from Lactic acid have similar strength and heat properties as Nylon and are also biodegradable.

**ii. Hollow Fibres**

Hollow fibers are presently used in kidney dialysis and blood oxygenation equipment. They are also being evaluated for use in immobilized enzyme and controlled drug delivery systems.

**iii. Optical Fibres**

Optical fibers are hair-thin strands made of glass or plastic with the ability to guide light along their axis. The materials being currently employed are silica, glass, other glass materials, polycrystalline materials and polymeric plastic materials. The use of fiber optics allows a substantial reduction in the size of certain diagnostic equipment.

**Table – 1 Fibers used in Hospital Textiles**

| Product Application | | Fiber Type | Fabric construction method |
|---|---|---|---|
| Gowns | | Cotton, polyester, Polypropylene | Nonwoven, Woven |
| Caps | | Viscose | Nonwoven |
| Masks | | Viscose, Polyester, Glass | Nonwoven |
| Surgical Cover | Drapes | Polyester | Nonwoven, Woven |
| | Clothing | Polyethylene, Polyester | Nonwoven, Woven |
| Blankets | | Cotton, Polyester. | Woven, Knitted |
| Sheets | | Cotton | Woven |
| Pillow Case | | Cotton | Woven |
| Clothing | Uniforms | Polyester | Woven |
| | Protective Clothing | Polypropylene | Nonwoven |
| Incontinence diaper/sheet | Cover stock | Polypropylene | Nonwoven |
| | Absorbent layer | Wood fluff, (super absorbents) | Nonwoven |
| | Outer layer | Polyethylene | Nonwoven |
| Surgical hosiery | | Polyamide, polyester, Cotton elastomeric yarn | Knitted |
| Cloths/Wipes | | Viscose | Nonwoven |

***2.2 Properties of Fibres used in Medical Application***

Textile material for medical applications typically has specific requirements Strength related to strength, stiffness, abrasion resistance and mechanical patency **[6]** *(Table-2).*

**a. Strength**

The strength requirement of medical textile materials varies depending upon its end uses. For some of the applications like bandages cloth, extensibility of material is more important than strength and for artificial ligaments, a high strength product is required.

**b. Stiffness**

Bending stiffness, which governs the handling comfort and comfort ability of a fabrics, is a critical parameter of medical textiles. For examples, suture with low bending stiffness requires fewer throws to tie a secure knot and has higher knot strength. The most important factors affecting bending stiffness are the shape of fiber, modules, linear density and specific gravity of material.

**c. Abrasion resistance**

Where fibers, yarns or fabric rub against themselves or other structures, abrasion resistance assumes an important role. A high value is usually desirable, especially in applications such as artificial ligaments or tendons. The factors considered for these properties are denier of fiber, orientation of molecules in the fibers, amount of twist in the yarn and surface co-efficient of friction.

**d. Mechanical potency**

Implanted products must bear load over a long term and maintain their dimensional integrity require a high degree of mechanical potency. Theses mainly include the ability to resist permanent charge in physical properties, the chemical, and biological and stress environment into which the implant is placed, the non-reactivity of polymer with the environment and the most important viscoelastic properties of material. For example, tissue engineering, vascular grafting tubes, covering of heart valve ring, etc.

***2.3 Wound Care Textiles***

Wound dressings are composite materials consisting of an absorbent layer held between a wound contact layer and a flexible base material. They provide protection against infection, absorption of blood and exudates, and promote healing. The absorbent pad absorbs blood or liquids and provides a cushioning effect to protect the wound. The base materials are coated with an acrylic adhesive to provide the means by which the dressing is applied to the wound.

Textile materials used for wound dressing applications include:

i. Gauze
ii. Lint
iii. Wadding
iv. Bandage

**Gauze**

Gauze is an open weave, absorbent fabric that when coated with paraffin wax is used for the treatment of burns and scalds. In surgical applications gauze serves as an absorbent material when used in pad form (swabs), yarns containing barium sulphate are incorporate so that the swab is X-ray detectable.

**Lint**

Lint is a plain weave cotton fabric that is used as a protective dressing for first-aid and mild burn applications.

**Wadding**

Wadding is a highly absorbent material that is covered with a Non-woven fabric to prevent wound adhesion or fiber loss.

**Bandages**

Bandages can be woven, knitted or non-woven and are either elastic or non-elastic. The most common purpose of bandages is to hold dressing in place over wounds, such as light weight knitted or simple open weave fabrics made from cotton or viscose. Elasticized yarns are incorporated into the fabric structure to impart support and conforming characteristics. Woven light support bandages are used in the management of sprains or strains and the elasticized properties are obtained by weaving. (*Table-2*).

**Table 2 - Types of medical bandages**

<table>
<tr><th>S. NO.</th><th colspan="2">Type of bandages</th><th>Commercial name</th><th>Remarks</th></tr>
<tr><td>1</td><td colspan="2">Retention bandage</td><td>Slinky, stayform, easifix, tensofix.</td><td>Exert very little pressure on a limb.</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Compression bandage</td><td>Light compression</td><td>J-plus,<br>K-crepe</td><td>Exert various levels of pressure according to type, limb. Give sub bandage pressures between 14-17mmHg</td></tr>
<tr><td>Moderate compression</td><td>Veinopres,<br>Granuflex compression<br>Adhesive compression</td><td>8-24mmHg</td></tr>
<tr><td>High compression</td><td>Surpress</td><td>25-35mmHg</td></tr>
<tr><td>Extra-high compression</td><td>Blue live, Webbing</td><td>Up to 60mmHg</td></tr>
</table>

**The required property for wound dressing medical fibers:**

Fabric properties such as tensile strength, Air permeability, Flexural rigidity and liquid interaction properties can be predicted accurately by equation based on aerial density and bulk density for needle punched fabrics and by modules of aerial density and fabric thickness for hydro entangled fabrics. (*Table-3*)

**3. Extra Corporeal Devices**

Extracorporeal devices are mechanical organs used for purification of blood, such as the artificial kidney, the artificial liver, and the mechanical lung. They circulate the blood through a membrane, which may be either a flat sheet or a bundle of hollow regenerated cellulose fibers. Biodegradable sutures are used for internal wound closures, while non-biodegradable ones are used to close exposed wounds.

**Table 3 - Application of fibers in Extracorporeal**

| S. No. | Product Application | Fiber Type | Function |
|---|---|---|---|
| 1 | Artificial kidney | Hollow viscose, Hollow polyester | Remove waste products from patients' blood |
| 2 | Artificial liver | Hollow viscose | Separate and dispose patients plasma and supply fresh plasma |
| 3 | Mechanical lung | Hollow polypropylene, Hollow silicone, Silicone membrane | Remove carbon hollow silicone, dioxide from patients' blood and supply fresh blood |

**a. Soft-tissue implants**

Textile materials are particularly suitable for soft-tissue implants, such as tendons, ligaments and cartilage. Artificial tendons are woven or braided porous meshes or tapes surrounded by a silicon sheath. During implantation, the natural tendon is looped through the artificial tendon and then sutured to itself to connect the muscle to the bone. Textile materials used to replace damaged knee ligaments must possess biocompatibility properties and have the physical characteristics needed for a demanding application.

**b. Orthopedic implants**

Orthopedic implants are materials used to replace bones and joints, and fixation plates are used to stabilize fractured bones. Fiber reinforced composite materials are now replacing metal implants, and a non-woven mat is used to promote tissue growth around the implant. To promote tissue in growth around the implant a non-woven mat made from graphite and PTFE.

**c. Cardiovascular implants**

Commercially available vascular grafts are produced from polyester (e.g. Dacron or PTFE (e.g. Teflon) with either woven or knitted structures. Straight or branched grafts are possible by using either weft or warp knitting technology. Polyester vascular grafts can be heat set into a crimped configuration that improves the handling characteristics.

## 4. Fabrics used in Medical Textiles

The basic fabric structures used for medical implants or sutures are:

**i. Woven**

The fabrics that are woven are usually dimensionally very stable but less extensible and porous than the other structures. One disadvantages of woven is their tendency to unravel at the edges when cut squarely or obliquely for implantation. However leno weave can substantially alleviate this fraying or unraveling.

**ii. Knitted**

Weft-knitted structures are highly extensible, but are also dimensionally unstable unless additional yarns are used to interlock the loops and reduce the extension. Knitted materials are externally versatile and can be engineered with a variety of mechanical properties matching those of woven fabrics. Their major advantage is their flexibility and ability to resist unraveling when cut, but their high porosity limits their use in applications requiring low porosity.

**iii. Braided**

Typically employed in cord and sutures, braided structure can be designed using several different patterns, wither with or without a core. To reduce their capillarity, braided materials are also treated with biodegradable (Teflon) creation. Such a coating also serves to reduce chatter or noise during body movement, improve hand or feel, and help position suture knots that must be transported by pressure from outside the body to the wound itself.

**iv. Nonwoven**

Non-woven are now being used in a range of tailor-made products, improving properties such as tensile strength, abrasion resistance and handle. Pore size and fiber diameter depend on the processing technology and process parameter, and different cell types require different structures. Special non-woven technologies have been developed to allow the economic production of high porous structures.

## 5. Materials and Methods

### *5.1 The Soya Bean Plant*

**Nomenclature**

The bellow table (*Table-4*) shows detailed nomenclature of soya plant.

**Table – 4 Nomenclature of Soya Plant**

**Figure 1- Soya Plant**

| Kingdom | Plantae |
|---|---|
| **Clade** | Tracheophytes |
| | Angiosperms |
| | Eudicots |
| | Rosids |
| **Order** | Fabales |
| **Family** | Fabaceae |
| **Subfamily** | Faboideae |
| **Genus** | Glycine |
| **Species** | Glycine max |

The Soya bean plant is a bush-like annual, growing about 1.8 m tall and bearing pods which each contain several smooth seeds. It was first cultivated in the USA in the nineteenth century and by the late 1990s, 70 million hectares worldwide were being used for Soya bean cultivation. It became a significant crop in the early twentieth century in a linked producer/processor development known as the 'American Soya complex'. Thousands of new varieties were introduced and USA Soya beans have an export value of $ 7.2 billion, with major markets being Europe, China, Mexico and Japan. Du Pont researchers have been experimenting with modifying soya beans to give them higher oil or protein content.
In the following table (*Table-5*) we have compared the amino acid content in soya bean, wool and silk.

**Table 5- Amino acid content of soya, wool, silk**

| S.No | Amino Acids | Soya | Wool | Silk |
|---|---|---|---|---|
| **1.** | Alanine | 4.12 | 4.10 | 26.40 |
| **2.** | Arginine | 5.80 | 3.60 | 1.05 |
| **3.** | Astartic acid | 3.86 | 7.27 | 2.00 |
| **4.** | Cystine | 1.00 | 11.30 | - |
| **5.** | Glutamic acid | 19.46 | 16.00 | 2.03 |
| **6.** | Glycine | 0.23 | 6.50 | 43.80 |
| **7.** | Histidine | 2.30 | 0.70 | 0.47 |
| **8.** | Isoleucine | 4.00 | - | 1.37 |
| **9.** | Leucine | 8.40 | 9.70 | 0.80 |
| **10.** | Lysine | 5.40 | 2.50 | 0.88 |
| **11.** | Methionine | 2.00 | 0.35 | - |
| **12.** | Phenylalanine | 5.30 | 1.60 | 1.50 |
| **13.** | Proline | 3.04 | 7.20 | 1.50 |
| **14.** | Serine | 6.00 | 9.50 | 12.60 |
| **15.** | Threonine | 4.00 | 6.60 | 1.50 |
| **16.** | Tryptophan | 1.50 | 0.70 | - |
| **17.** | Tyrosine | 4.30 | 6.10 | 10.60 |
| **18.** | Valine | 4.50 | 5.50 | 3.20 |
| **19.** | Ammonia | - | 1.18 | - |
| **20.** | Hydroxylysine | - | 0.10 | - |

***5.2 Sanitary Property and Content of Amino Acid***

The soybean protein contains (*Table-7*) lots of polar amino-acids necessary for human body, such as hydroxyl, amino-cyanogen and carboxyl. The content of parts amino-acids is listed below

**Table 7 - Parts amino-acids in degrease and separate soybean**

| Type of Amino Acid | Histidine | Isoleucine | Leucine | Lysine | Threonine | Tryptophan |
|---|---|---|---|---|---|---|
| **Degrease Soybean** | 26 | 48 | 78 | 64 | 39 | 14 |
| **Separate soybean** | 28 | 49 | 82 | 64 | 38 | 14 |

It is obvious that the soybean fiber has good biocompatibility and is beneficial to the human health. Furthermore, the anti-bacterial agents, which were added to the soybean fiber in spinning process, can restrain the growth of colon bacillus, impetigo bacterial and sporothrix. Therefore, soybean fiber is a kind of sanitarian fiber.

## 6. Soya Protein Fibre

**Figure 2 - Soya Fiber and Yarn**

Soya protein fibers are naturally colored light yellow and have a soft lustrous similar to silk(*fig-2*). Chinese manufacturers compare it to cashmere and it has good warmth retention and better moisture transmission than cotton. The Dry strength of the Soya protein fiber is higher than that of wool, cotton and silk at 3.0 c Nd Tex$^{-1}$, while the Wet strength is similar to cotton. It has a higher breaking strength and is stable to normal domestic washing. It has been blended with wool, silk, alginate and cotton and its properties were studied.[6]

### *6.1 Identifying procedure of Soya protein fiber*

1. Fine marks and striations may be visible on the surface of all such fibers.
2. Fletches reports that Soya bean fibers responded like wool to chemical and burning tests.
3. It can also be identified by burning tests. Soya bean protein fibers melt away from the flame before touching the flame and melt and burn in the flame with smell of burning feathers although they do not combust easily, tending to melt before burning.
4. The black ash is said to be brittle, puffy and easily crushable.

### *6.2 Properties of Soya Fiber*

i. It has a good alkali and acid resistance and also it wear well. Two months outdoor exposure of the Soya protein fiber resulted in little fading, 11% strength loss and fungal formation.
ii. Exposure to UV for 120 hours resulted in a 9.8% strength loss.**[9]**
iii. Exposure to dry heat caused the fiber to become yellow and sticky.
iv. The fiber itself is said to be biodegradable in land fill and it seems likely that biodegradation processes would be initiated through exposure to water.
v. Fletcher reports that Soya bean fibers mildewed less easily than natural and casein fibers but more easily that synthetic fibers. The residues of the Soya beans may be used as animal fodder once the protein has been extracted. The wider environmental impact large-scale Soya bean farming needs to be factored into an overall evaluation of the environmental impact of Soya protein fiber (*SPF*).

### *6.3 Comparison of the properties of Cotton Fiber with Soya Protein Fiber*

**Table 8 - Properties of Cotton and Soya fiber**

| S. No | Property | | Soya Protein Fiber | Cotton |
|---|---|---|---|---|
| 1. | Breaking Strength (CN/dtex) | Dry | 3.8-4.0 | 1.9-3.1 |
| | | Wet | 2.5-3.0 | 2.2-3.1 |
| 2. | Dry breaking extension (%) | | 18-21 | 7-10 |
| 3. | Initial modulus (Kg/mm$^2$) | | 700-1300 | 850-1200 |
| 4. | Loop Strength (%) | | 75-85 | 70 |
| 5. | Knot Strength (%) | | 85 | 92-100 |
| 6. | Moisture regain (%) | | 8.6 | 9.0 |
| 7. | Density (g/cm$^3$) | | 1.29 | 1.50-1.54 |
| 8. | Heat endurance | | Yellow and tackifing at about 120$^o$ (BAD) | Becoming brown after long time processing at 150$^o$C (Excellent) |
| 9. | Alkaline resistance | | At general level | Excellent |
| 10. | Acid resistance | | Excellent | Bad |
| 11. | Ultraviolet resistance | | Good | At the general level |

## 7. Conversion of Soya Protein Fiber to Fabric

### *7.1 Weaving of the Soya yarn*

**Warp Yarn**

100% Soya is procured from the market with the following specification. Count – $14^S$ is used in warp.

**Weft Yarn**

100% Soya is procured from the market with the following specification. Count – $14^S$ is used in weft

**Weaving Process**

The prepared warp is loomed in a sample power loom and weaved. The loom performance is good and in order to avoid the slippage between particulars are shown below (*Table -9,10*). Warp and weft yarn rice starch was applied for the warp yarn.

**Fabric particulars for pure Soya gauze**

**Table 9 - Specification of Soya gauze**

| | |
|---|---|
| Warp Count | $14^S$ |
| Weft Count | $14^S$ |
| Ends per inch | 19 |
| Picks per inch | 19 |
| GSM | 40 |

**Fabric particular for soya/cotton blend gauze**

**Table 10 - Specification of Soya/Cotton gauze**

| | |
|---|---|
| Warp Count | $14^S$ |
| Weft Count | $14^S$ |
| Ends per inch | 19 |
| Picks per inch | 19 |
| GSM | 40 |

### *7.2 Desizing*

Both the pure Soya and Soya cotton sized fabrics were desized with concentrated Hydrochloric acid (33-35 g/l) for one hour at room temperature with a material to liquor ratio of 1:30. The desized fabrics were washed thoroughly in cold water and dried. Then desized fabrics are subjected to recipe.

### *7.3 Bleaching*

Bleaching of pure Soya and Soya cotton was done in a vessel for one hour at 95° c in gas stove keeping the material to liquor ratio at 1:30 with hydrogen peroxide (40g/l), sodium carbonate (5g/l), sodium silicate (8g/1) at the PH of 11. The bleached sample was washed thoroughly in cold water and the bleached fabric was dried. ***Chlorine bleaching should not be used for medical textile due to their harmfulness to skin.***

## 8. Testing the produced Gauze Fabrics

### *8.1 Test for Absorbency*

The main object of this is to compare the absorbing capacity of the Raw Soya with bleached Soya, Cotton and Soya Cotton.

**Procedure**

Take 2.2 Gms of Raw Soya, Bleached Soya, Cotton and Soya Cotton union fabric separately and immerse the samples in two separate beakers, which are filled with water. Keep the samples as such for 5 minutes.

After 5 minutes the four samples are weighted separately. The reading is tabulated. The test is repeated for 5 different samples.

### *8.2 Absorbency by Sinking Method*

**Objective**

The main objective of this sinking method is to compare the absorbency capacity of bleached Soya, Cotton, Soya Cotton and unbleached Soya of using stop watch.

**Materials**

1. Glass beaker

2. Distilled water
3.Stopwatch

**Procedure**

Cut out five 1" x 1" squares of fabric from the material to be tested. Drop one of the pieces gently on the surface of distilled water in a beaker and start the stop watch as soon as the corner of the piece leaves the water surface and the piece begins to sink to the bottom of the beaker. Repeat the above procedures with the remaining pieces of fabric.

### *8.3 Bending Length*

**Objective**

The main objective this test is to find the stiffness of the fabric with its curve.

**Principle**

The stiffness of the fabric is being found with the help of the bending curve scale. The readings are to be taken in cm.

**Procedure**

1. The fabric or the sample is being placed on the smooth surface in the market line.
2. Note that the fabric does not touch the sides of the surface.
3. Now place the scale over the fabric which is marked too.
4. Now glide downs slowly along with the fabric. Fill the fabric until touches the line.
5. The bending curve can be noted on the mirror and reading are taken.

### *8.4 Air permeability*

**Objective**

The main objective of this test is to measure the permeability of fabrics to Air.

**Principle**

This method is based on the measurement of rate of flow of Air through a given area of fabric by a given pressure drop across the fabric.

**Procedure**

1. Take the conditional specimen and mount a portion between the clamp and circular orifice with sufficient tension to eliminate wrinkles, if any, taking care to see that the fabric is not distorted in its own plane.
2. Start the suction fan or other means to force Air through the fabric and adjust the rate of flow of Air pressure drop of 1 cm water head across the fabric is indicated.
3. Note the rate of flow of Air in $cm^3$ and repeat the same.

## 9. Results and Discussion

### *9.1 Test for Absorbency*

Results of the for absorbency of Raw soya, Bleached Cotton, Cotton and Soya/Cotton blend is tabulated bellow

**Table 12 - Results for absorbency test**

| Sample NO. | Raw Samples | Bleached Samples | | |
|---|---|---|---|---|
| | Soya | Soya | Cotton | Soya/Cotton |
| 1. | 4.3 | 6.53 | 7.2 | 7.65 |
| 2. | 4.5 | 6.42 | 7.3 | 8.15 |
| 3. | 5.35 | 7.75 | 7.2 | 6.5 |
| 4. | 4.5 | 6.42 | 7.4 | 7.35 |
| 5. | 4.4 | 6.53 | 7.3 | 8.05 |
| Average | 4.61 | 6.73 | 7.28 | 7.54 |

*All the units are in cm

### *9.2 Test for Absorbency by Sinking Method:*

Results for the absorbency by *Sinking Method* of Raw soya, Bleached Cotton, Cotton and Soya/Cotton blend is tabulated bellow:

**Table 13 - Results for absorbency by Sinking Method test**

| Sample No | Raw Samples | Bleached Samples |
|---|---|---|

| | Soya | Soya | Cotton | Soya/Cotton |
|---|---|---|---|---|
| **1.** | 22 | 2 | 0.5 | 2.0 |
| **2.** | 20 | 1 | 0.3 | 1.8 |
| **3.** | 25 | 1.3 | 0.2 | 1.7 |
| **4.** | 30.5 | 1.5 | 0.3 | 1.5 |
| **5.** | 23 | 1.2 | 0.5 | 1.6 |
| **Average** | 24.1 | 1.4 | 0.36 | 1.72 |

*All the units are in cm

### *9.3 Test for bending Length*

Results for the bending Length test for raw soya, Bleached Cotton, Cotton and Soya/Cotton blend is tabulated bellow:

**Table 14 - Results for bending Length test**

| Sample No | Raw Samples | Bleached Samples | | |
|---|---|---|---|---|
| | Soya | Soya | Cotton | Soya/Cotton |
| **1.** | 1.4 | 2.0 | 2.1 | 2.0 |
| **2.** | 1.5 | 2.4 | 2.0 | 2.0 |
| **3.** | 1.6 | 2.0 | 1.9 | 2.4 |
| **4.** | 1.5 | 2.2 | 2.0 | 2.0 |
| **5.** | 1.4 | 2.0 | 2.2 | 2.3 |
| **Average** | 1.48 | 2.12 | 2.04 | 2.3 |

*All the units are in mm

### *9.4 Test for air permeability*

Results for the air permeability test for raw soya, Bleached Cotton, Cotton and Soya/Cotton blend is tabulated bellow:

**Table 15 - Results for air permeability test**

| Sample No | Raw Samples | Bleached Samples | | |
|---|---|---|---|---|
| No | Soya | Soya | Cotton | Soya/Cotton |
| **1** | 27.5 | 59.02 | 60.8 | 25.9 |
| **2** | 30.5 | 61.8 | 69.7 | 27.6 |
| **3** | 29.16 | 62.5 | 58.5 | 27.3 |
| **4** | 28.47 | 61.8 | 87.5 | 25.7 |
| **5** | 28.47 | 59.75 | 78.6 | 29.3 |
| **Average** | 28.86 | 60.96 | 71.02 | 27.16 |

*All the units are in $cm^3/s$

## 10. Conclusion

In conclusion, Soya gauze material has better absorption, air permeability, and less soakage than cotton. It is also more economically viable, as it requires fewer dressing changes and has a shorter healing granulation period. Therefore, Soya gauze is a more suitable choice for wound dressings than cotton.

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