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The Future of Child Care: Aloe Vera–Cotton Blend as a Sustainable Substantial

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ABSTRACT

An experiment was carried out for manufacture of childcare products in the present challenging environment. In general, cotton-based materials are normally recommended for babies born. Considering the present challenging environment aloe vera – cotton blended material was chosen for childcare application. Warp threads for production of fabrics were prepared from 100% cotton and weft threads were prepared from aloe vera fibers. Hence, during the weaving process, aloe vera – cotton blended fabrics were produced. The woven aloe vera – cotton fabric has undergone desizing, scouring and bleaching before testing the fabric samples.

The antibacterial analysis of raw aloe vera fiber showed partial activity of about 42% against the S. Aureus bacteria. And the aloe vera fabric in combination with cotton showed 67% activity against the same bacteria. By nature, aloe vera fiber has more anti-microbial property. The specialized aloe vera – cotton fabrics are less in availability, highly hygienic and valuable. So, the inherent characteristics of aloe vera – cotton fabrics can be used effectively for special application of childcare products.

KEY WORDS: Aloe vera fiber, Antibacterial effects, aloe vera – cotton woven fabric, cost of childcare products, tensile strength, crease recovery, wettability.

INTRODUCTION

Aloe Vera is basically a native plant of Africa. It is also known as lily of the desert and plant of immortality due to its medicinal effects. This plant has 96 percent of water content. The leaf of this plant contains over 75 nutrients and 200 active compounds such as 20 minerals, 18 amino acids and 12 vitamins. Since historic times its versatile uses were recognized. Starting from Cleopatras' skin care efforts to Alexanders medical treatment to heal his wounded soldiers, it was used in a variety of applications. The content of the plant helps in rejunuvating the skin cells, helps in the formation of healthy dermis and fights against skin damage. Innovations

in the textile field have embedded the virtues of aloe vera in garments, which prevents ageing of the skin; rejuvenating skin cells and keeps skin free from microbial infections. Garments are made of a microfiber with an open mesh construction that improves the transport of moisture to the skin.

As these fibres have their own medicinal properties it can be used widely in the garment industry. These fibres have a good luxurious appearance. In the present-day situation, the environment is getting polluted day by day and it affects human beings in many ways. So, we need more protection from environmental pollution. To that day the protection which we have from day-to-day clothing is not enough for us. Usually, people prefer cotton for their comfort, but this cotton does not protect us from pollution and skin allergies. When comparing banana and aloe vera fabric with cotton, they have more medicinal values which can help us to protect our skin and keep our skin hygienic.

Microbial infestation poses danger to both living and non-living matters. Obvious smells from the inner garments such as socks, spread of diseases, staining and degradation of textiles are some of the detrimental effects of bad microbes. Though the use of antimicrobials has been known for decades, it is only in the recent couple of years that several attempts have been made at finishing textiles with antimicrobial compounds. The consumers are now increasingly aware of the hygienic lifestyle and there is a necessity and expectation for a wide range of textile products finished with anti-microbial properties. Appropriate material selection is one of the crucial factors. For this purpose, we have chosen and experiment aloe vera – cotton fabric for childcare products.

MATERIALS & METHODS

The aloe vera–cotton fabric underwent a series of preparatory treatments before testing. Initially, the cotton fabric was scoured and bleached to remove impurities and enhance absorbency. It was then treated with an aloe vera finish through a padding, drying, and curing process to ensure proper adhesion of the extract. These steps prepared the fabric for performance and safety evaluations in childcare applications.

Desizing

To prevent breakage of yarn in the weaving process due to abrasion and to increase weaving efficiency a starchy substance is added to the warp yarn. This process is called sizing. The process of removal of this starchy substance from the fabric is called desizing.

In this process the fabric is soaked in a solution of water and hydrochloric acid.

M: L = 1:20

3- 5 ml of Hydrochloric acid per lit of water

Temperature – Room temperature.

Duration – 2 hrs

Scouring

Woven cotton fabric contains several substances that are water repellent and hence have to be removed before any further processing can be done. The substances commonly found in cotton fabric are oily matter, waxy substances, fat, and pectin. Scouring is the process where dirt particles which are accumulated on the yarn are removed. In this process the material is treated at boiling temperature in an alkaline soapy solution. The following chemicals are to be used in the ratio mentioned alongside

Caustic Soda – 0.5 % to 3.0% OWF

Soda ash – 1% OWF

Soap or detergent – 1% if it is soap it and 0.5% if it is detergent

Wetting agent – 0.5%

M: L ratio = 1: 20

Temperature: boiling

Duration: 2-3 hours

The fabric has to be washed thoroughly in cold water after this process.

Bleaching with Hydrogen peroxide

It is the process of removing natural colouring matter from the natural fabric with hydrogen peroxide. The strength of Hydrogen peroxide (H_2O_2) is expressed as a percentage or in volumes commercially available H_2O_2 has strength of 50% or 160 volumes. 1 volume of H_2O_2 will evolve 1cc of oxygen for bleaching. 160 volumes will evolve 160cc of oxygen for bleaching. 2 -3 volumes of H_2O_2 are taken. Therefore for 2 volumes we need 12.5cc of H_2O_2 for every litre of bath water.

M: L = 1kg: 20 lt

Stabilizer is 50% of H_2O_2

Require pH is 10.5

Temperature: 85^0C

Duration: 1-2 Hr

Fabric has to be washed thoroughly at least twice in cold water before further processing.

Quantitative antibacterial analysis of aloe vera – cotton blended fabrics

The antibacterial activities of aloe vera – cotton fabric samples are tested as per the standard methods AATCC 100.

Fabric Properties

The newly developed aloe vera - cotton fabric is subjected to uniform process parameters, and they are tested as per the standard procedure for

Tensile strength – IS: 1969: 1985.

Crease recovery – AATCC – 66.

Wettability - IS: 2349 – 1963.

Count of yarn removed from fabric – TC/ LAB/ TM – 02.

Threads / Inch – ASTM D – 3775 – 2008.

Fiber identification – AATCC – 20 – 2007.

% Composition – AATCC – 20 A – 2008.

RESULTS AND DISCUSSION

The coarseness of the fabric of the thread on the material covered area on the fabric of all four sides is arrested because of the weaving process that is the reason that layer can be used for the antimicrobial test to get the increased result as the comparative fiber. So, when we go for higher GSM or closed fabric construction, we may get more microbial characteristics as compared to the open structure or fiber state. On the whole aloe vera – cotton fabric has excellent anti-microbial characteristics. This amount of anti-microbial characteristics is sufficient for using childcare products. As childcare product wettability is an important characteristic, enough tensile strength is needed in general.

The material taken for the experiment is aloe vera – cotton fabric. Where, aloe vera fiber is added on weft direction and 100% cotton fiber on warp direction. Particulars of aloe vera – cotton woven fabric.

Table 1. Fabric Specifications of Aloe vera – Cotton Fabric

Fabric Specifications	Parameters
Ends / Inch	78
Picks / Inch	58
Warp Count	57.1 s Ne
Weft Count	23.6 s Ne
Composition	
(i) % of warp	33.8
(ii) % of weft	66.2

Quantitative antibacterial analysis of aloe vera – cotton blended fabrics

The antibacterial analysis of raw aloe vera fiber (0.129gm) showed partial activity of about 42% against the S. Aureus bacteria. And the aloe vera fiber on the weft in combination with cotton fiber on the warp showed 67% activity against the same S. Aureus bacteria by nature, aloe vera fiber has more anti-microbial property.

Table 2. Antibacterial Activity

Sl. No.	Material	Antibacterial Activity

1.	Aloe vera fiber (0.129gm)	42%
2.	Aloe vera fabric	67%

Wettability, crease recovery and tensile strength of aloe vera – cotton blended fabrics

For childcare application wettability and tensile strength are the essential characteristics. For understanding the nature of these two characteristics we have conducted the test for the tensile strength, crease recovery and wettability; the results are shown in Table 2. The time taken to absorb the water molecules in the aloe vera – cotton fabric is higher when compared to the literature of banana – cotton fabric. The banana – cotton blended fabric takes about 15.6 seconds to absorb the water molecules whereas aloe vera – cotton blended fabric takes only 3.2 seconds to absorb the water molecules. So, this kind of absorbing and wettability characteristics are essential for childcare product application. Based on these wettability characteristics we think that we have chosen the right material for the right application.

Normally tensile or breaking strength of the cotton fabric on warp way is 15 kg whereas aloe vera on the weft way is 52.8kg has significant increase. So, when we go for durability characteristics of aloe vera material is excellent and can be adapted for childcare products. Even though the yarn count of the warp and weft is different, the improvement in strength of the aloe vera is significantly higher, so it gives an idea that it has higher tenacity when compared to the cotton yarn. So, when we chose this for making the childcare product it also has the higher durability characteristics.

Table 3. Physical Properties of Aloe vera – Cotton Fabric

Sl. No.	Aloe vera – Cotton Fabric	Units	
1.	Tensile strength (Breaking strength)	Warp way	15.0 Kg
		Weft way	52.8 Kg
2.	Crease Recovery	^{0}	
3.	Wettability	3.2 sec	

Overall considering the wettability characteristics and tenacity this aloe vera – cotton material has higher durability and wettability characteristics. So, this material is more suitable for childcare product applications.

CONCLUSION

The present study is fundamental in nature as it points to the significance of some basic tests that should be known equally to the manufacturer and buyer of the textile fabric for different end uses. The study creates awareness about the evaluation of textile products on scientific grounds which are in the benefit of everybody. In today's world of high fashion, fabrics play a role of paramount importance. For conservation and maximum utilization of natural fibres it is imperative that production techniques of newly developed fibers should be

optimized for higher production and improved quality to meet, ever increasing demand of the textile fabrics at competitive prices.

It is undoubtedly true that newly developed fabrics exhibit much improved physical properties like crease recovery, tensile strength, wettability etc. These fabrics are lustrous by nature. And these aloe vera – cotton have their own medicinal values. Newly developed aloe vera – cotton fabric has good antibacterial property. The aloe vera fabric in combination with cotton showed 67% activity against the S. Aureus bacteria. This provides a lot of flexibility for imparting desired quality and hygiene to the final fabric.

The fiber properties govern the characteristics of the final fabric. Strong fibers make durable fabrics that can be light in weight. Aloe vera – cotton fabric are absorbent fibers, which are good for skin-contact apparel and for towels and diapers. Newly developed aloe vera fibers which are self-extinguishing, are good for children sleepwear and protective clothing. The specialized aloe vera – cotton fabrics are less in availability, highly hygienic and valuable. So, the inherent characteristics of aloe vera – cotton fabrics can be used effectively for special application of childcare products.

RECOMMENDATION

The prospective researchers can expand the scope of the present study in the following manner:

- Aloe vera – cotton fabric can be used to produce hygienic, allergic free and bacterial free childcare fabrics.
- In future core yarn techniques can be implemented for aloe vera fiber to give extra smoothness to the fabric.
- Since, the aloe vera fabrics have some similar properties like luster, toughness, and stiffness, as that of silk fabrics; these fibers can be used to replace silk.

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