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Study on characteristics of Bamboo Fibre and to develop a eye mask using herbal finish

Ms. Sowmmiya S[1], Dharunesh S[2]

Asst. Professor, Dept. of Fashion Technology, Bannari Amman Institute of Technology, Tamil Nadu, India
UG Scholar, Dept. of Fashion Technology, Bannari Amman Institute of Technology, Tamil Nadu, India

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Abstract - *Bamboo fibers are cellulosic fibers that are regenerated from bamboo plant. Bamboo used for fibers preparation is usually 3–4 years old. Fibers are produced through alkaline hydrolysis and multi-phase bleaching of bamboo stems and leaves followed by chemical treatment of starchy pulp generated during the process. Bamboo fiber has various micro-gaps, which make it softer than cotton and increase its moisture absorption. Due to its antibacterial nature, it is used for making bandages, masks, nurse wears, and sanitary napkins. UV-proof, antibiotic and bacteriostatic curtains, television covers, and wallpapers and many other things are also prepared from bamboo fibers to lessen the effects of bacteria and harm of ultra violet radiations on human skin. Eye masks or sleep masks work by blocking out artificial light, light especially at night, that helps to regulate our sleep-wake patterns, eye masks resulted in an increased amount of REM sleep and less time spent between falling asleep and reaching REM sleep. Herbal finish on fabrics provides various properties like anti- septic, anti-allergic, wound healing, coolness etc. These fabrics repel moisture and cold from the outside, a large number of pores allow an easy evaporation of sweat. The fabric cools during the warm nights, and if you are cold on the contrary it warms. It features excellent antibacterial and anti-allergenic properties.*

Key Words: Cellulosic fibre, antibacterial nature, better moisture absorption, softer hand feel, antibacterial eye mask, aloe vera for eyes, etc.

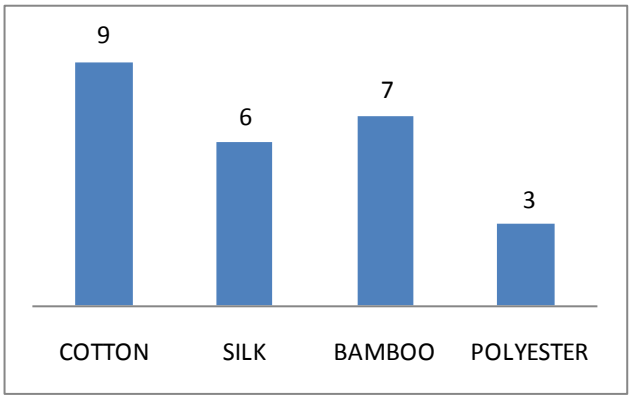
1. INTRODUCTION

It is concluded that bamboo consumes less water, it is a replenishing resource, grows at incredible speed, it consumes less chemicals, it is softer, more absorbent, clean and breathable [1]. The result shows that thermal conductivity of bamboo is low in perpendicular direction towards the heat source compared to the parallel direction. Different species of bamboo also give significant result on thermal conductivity hence improved the insulation properties of the bamboo [2]. The distinctive characteristics of regenerated bamboo fibre, such as its natural antibacterial and biodegradable properties, high moisture absorption capacity, softness, brightness as well as UV protective characteristics, bamboo textile products have started to edge into the textile market [3]. Bamboo fabric exhibits higher elongation than bamboo-cotton (50:50) blended yarn fabric. This result may be attributed to higher elongation of bamboo fiber. From the results, it is observed that higher elongation values are noticed in the case of 100% bamboo fabric than bamboo-cotton (50:50) blended yarn fabrics [4]. As a fiber, bamboo is a natural cellulosic regenerated biodegradable environment friendly textile material. It is very useful for high performance end uses as a composite material due to high tensile strength, durability, stability [5]. Garments of bamboo fiber can absorb and evaporate human sweat in a split second just like breathing. Such a garment makes people feel extremely cool and comfortable and never sticks to skin even in hot summer [6]. Each person has a circadian rhythm that helps their body figure out whether it's time to be asleep or awake, based on light, light; darkness helps the body know it's time to be asleep [7]. Patients in coronary care unit (CCU) are at risk of sleep deprivation. This study investigated effects of eye mask on sleep quality in patients of CCU in Southeast of Iran by a cross-over design [8]. Aloe Vera is one of the oldest medicinal plants in human history. It exhibits 200 or more different biologically-active substances and has attracted many researchers into its potential applications [9]. Cotton fabrics were finished with Aloe Vera gel along with 1,2,3,4-butanetetracarboxlic acid as a cross linking agent using the pad-dry-cure method. The finished fabrics were characterized by Fourier transform infrared spectroscopy [10]. Utilization of aloe vera proven to accelerate the process of wound healing and decrease some health problems of pain intensity. There is one researching article indicate date aloe vera can also be used as therapy or treatment in melasma patients with fix function skin pigment [11].

1.1 Materials

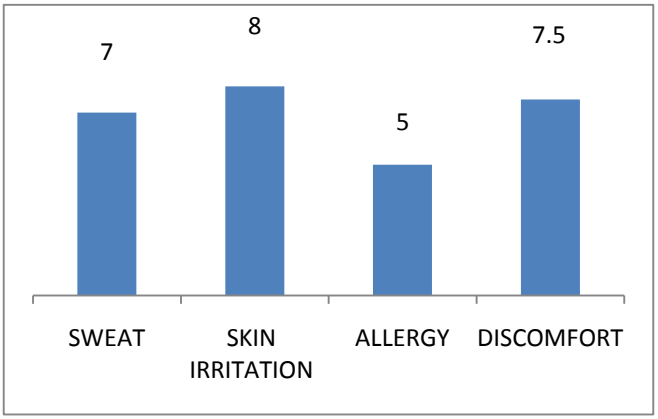
On basis of the research on eye mask's property and comfortableness I've done a survey. In this survey I've conducted the survey to different people about their usage of eye masks, difficulties faced, fabric preference and problems occurred.

Chart -1: Survey on fabric preference



Cotton, silk, polyester and satin is generally used fabrics for eye mask. Cotton has good sweat absorbency but no moisture absorbency. Silk feels soft on skin but it doesn't have good sweat absorbency property. Based on the survey and literature review I've chosen bamboo fabric to develop eye mask.

Chart -2: Survey on problems faced



I've chosen herbs based on their problems. Aloe Vera, turmeric and coleus are the herbs I've chosen. Dark circles occur when the skin under your eyes appears darker than usual. This is a common issue that may be caused by several factors. Aloe Vera is often used around the eyes to help heal or repair damaged skin, relieve swelling or puffiness, moisturize dry or flaky skin. Turmeric is the best effective herb that protects

from condition like glaucoma. Turmeric can effectively remove dark circles due to its anti-inflammatory and antioxidant properties. Coleus used in the eyes to treat glaucoma.

1.2 Fabric Testing

Table -1: Dimensional stability to washing test

SPECIFICATION	**RESULT**
1.Dimensional stability to washing (Washing as per ISO 6330:2001) (40°C temp, normal machine wash front loading normal cycle, followed by flat dry)	
Observations	**After wash**
Length wise	(-) 1.6%
Width wise	(-) 0.4%
(+) denotes elongation, (-) denotes shrinkage	

Table -2: Pilling test

2.Pilling resistance (BS 5811-86) ICI Pill box method After one wash	
Rating (after 18,000 Revs)	4
(4) denotes slight surface fuzzing and or partially formed pills	

Table -3: pH Value test

3.Ph Value with reference to (ISO 3071:2005 / Analysis by pH meter)	
pH Value	7.1 @ 25°C

Table -4: Water absorbency test

4.Water absorbency (ISO 62:2008)	
Water	**Absorbency**
1	1 sec
2	1 sec
3	1 sec
4	1 sec
5	1 sec

In dimensional stability to washing (Test according to Washing as per ISO 6330: 2001) , the fabric sample was washed under 40ºC temperature in normal machine wash and dried using flat dry. During this test the sample were found to have shrinkage of (-) 1.6% in lengthwise and (-) 0.4% in width wise [Table -1]. The pilling resistance (Test according to BS 5811 - 86), was carried out using ICI pill box method. The results were determined after 18,000 Revs and the result is 4. The sample were found to have

slight surface fuzzing and /or partially formed pills. pH value tests were undergone for the samples to test the acid and alkali contents remained in the fabric [Table -2]. The test was taken with reference to (ISO 3071:2005 /Analysis by pH meter). The result value is 7.1 @ 25°C which denotes that the sample's pH value is neutral [Table -3]. The water absorbency test were conducted according to (ISO 62: 2008), where the sample is treated with 5 different waters and the time taken by the sample to absorb all the water type is 1sec, which shows it has good water absorbency level [Table -4].

2. Methodology

2.1 Extraction of Aloe Vera

The solid cubes of Aloe Vera leaf (inner material) were placed in a thimble manufactured from thick filter paper and poured into the main chamber of the Soxhlet extractor. The extraction solvent methanol was poured into a distillation flask, and the Soxhlet extractor was placed on top of it. The methanol in the distillation flask was heated, and the vapors goes up a distillation arm and into the chamber containing the solid Aloe Vera . Every methanol vapor cools and drips back down into the chamber containing the solid Aloe Vera. Warm methanol was poured into the compartment containing the Aloe Vera material. In the warm methanol, some of the desirable chemicals dissolved. When the Soxhlet chamber was full, a siphon side arm automatically empties the chamber, sending the methanol back down to the distillation flask. This operation was done 4-5 times until the cubes were small enough to remove the appropriate materials. The desired chemicals anthraquinones and polysaccharides was concentrated in the distillation flask after numerous cycles. The advantage of this method is that instead of passing multiple batches of warm methanol through the sample, only one batch is recycled. After extraction, it was exposed to air to remove methanol. Methanol is a highly volatile liquid that evaporates rapidly at room temperature, leaving the desired material. The insoluble portion of the extracted solid was left on the thimble.

2.1.1 APPILICATION METHOD

The application of the Aloe Vera extract finish was done in the following way,

PAD → DRYING & COATING → DRYING → CURING

First samples were cut according to the processing specifications of the lab-scale stenter frame available in wet processing laboratories. The second step was to prepare the recipe according to the experimental design. The amount of liquid collected for each sample was 500 ml. After that, it was finished with padding, dried at 100 ° C, and antibacterial finished with Aloe Vera extract. After application, the sample was tested and the results were analyzed.

2.2 Extraction of Turmeric

The solid form of turmeric (10 gm) was placed in a thimble manufactured from thick filter paper and poured into the main chamber of the Soxhlet extractor. The extraction solvent methanol was poured in a distillation flask, and the Soxhlet extractor was placed on top of it. The methanol in the distillation flask was heated, and the vapors goes up a distillation arm and into the chamber containing the turmeric. Every methanol vapor cools and drips back down into the chamber containing the turmeric. Warm methanol was poured into the compartment containing the turmeric. In the warm methanol, some of the desirable chemicals dissolved. When the Soxhlet chamber was full, a siphon side arm automatically empties the chamber. This operation was done 4-5 times until the turmeric were small enough to remove the appropriate materials. A fraction of the non-volatile component dissolves in the solvent throughout each cycle. The desired chemical was concentrated in the distillation flask after numerous cycles. After extraction, it was exposed to air to remove methanol. Methanol is a highly volatile liquid that evaporates rapidly at room temperature, leaving the desired material. The insoluble portion of the extracted solid was left on the thimble.

2.2.1 APPLICATION METHOD

The application of the turmeric extract finish was done in the following way,

PAD → DRYING & COATING → DRYING → CURING

First samples were cut according to the processing specifications of the lab-scale stenter frame available in wet processing laboratories. The second step was to prepare the recipe according to the experimental design. The amount of liquid collected for each sample was 400 ml. After that, it was finished with padding, dried at 100 ° C, and antibacterial finished with turmeric extract. After application, the sample was tested and the results were analyzed.

2.3 Extraction of Coleus

The desired amount of wet coleus leaves (Mexican mint) was placed in a thimble manufactured from thick filter paper and poured into the main chamber of the Soxhlet extractor. Methanol, the extraction solvent, was poured in a distillation flask, and the Soxhlet extractor was placed on top of it. The methanol in the distillation flask was heated , and the vapors travelled up a distillation arm and into the chamber containing the coleus leaves. Every methanol vapor cools and drips back down into the chamber containing the coleus leaves. Warm methanol was poured into the compartment containing the leaves. When the

Soxhlet chamber was full, a siphon side arm automatically empties the chamber, sending the methanol back down to the distillation flask. This operation was done 4-5 times until the cubes were small enough to remove the appropriate materials. A fraction of the non-volatile component dissolves in the solvent throughout each cycle. The desired chemical was concentrated in the distillation flask after numerous cycles. The advantage of this approach is that instead of passing multiple batches of warm methanol through the sample, only one batch is recycled. After extraction, it was exposed to air to remove methanol. Methanol is a highly volatile liquid that evaporates rapidly at room temperature, leaving the desired material. The insoluble portion of the extracted solid was left on the thimble.

2.3.1APPLICATION METHOD

The application of the coleus extract finish was done in the following way,

PAD → DRYING & COATING → DRYING → CURING

First samples were cut according to the processing specifications of the lab-scale stenter frame available in wet processing laboratories. The second step was to prepare the recipe according to the experimental design. The amount of liquid collected for each sample was 400 ml. After that, it was finished with padding, dried at 100 ° C, and antibacterial finished with coleus leaves extract. After application, the sample was tested and the results were analyzed.

2.4 Fabric Testing After Treatment

SAMPLE A	Aloe Vera Treated Fabric
SAMPLE B	Turmeric Treated Fabric
SAMPLE C	Coleus Treated Fabric

Table -5: Appearance after washing test

1.Appearance after washing (Washing as per ISO 15487:2009) (40°C temp, machine wash front loading normal cycle, followed by flat dry)	
SAMPLE A + SAMPLE B + SAMPLE C	
Observation	**Results after 3 rd wash**
Colour change	Base: 4
Staining on multi fiber	Acetate 4-5, cotton 4-5, nylon 4-5, polyester 4-5, acrylic 4-5, wool 4-5
Pilling / fuzzing	4 (slight)
General appearance on the washed garment	**SATISFACTORY**

Table-6: Odour test

2.Odour test (ASTM E54)	
SAMPLE A (COATED WITH ALOE VERA)	
Result	Odorless
SAMPLE B (COATED WITH TURMERIC)	
Result	Odorless
SAMPLE C (COATED WITH COLEUS)	
Result	Odorless

Table -7: Antibacterial test

Test Item	Component description
A	COATED WITH ALOE VERA
B	COATED WITH TURMERIC
C	COATED WITH COLEUS

Test Organisms Used : Staphylococcus aureus ATCC 6538, Klebsiella pneumoniae ATCC 4352 Sample Size/ Volume : Swatch of 25x50 mm for each bacterium

Media Used : Nutrient agar

Incubation Conditions: 37°C for 24 h

OBSERVATION

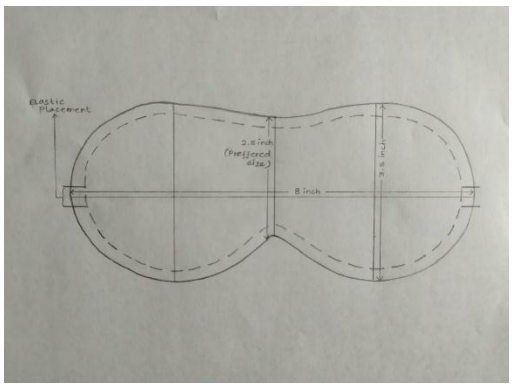
SAMPLE A + B + C		
Test organism used	**Bacteriostatic activity (mm)**	**Growth under fabric**
Staphylococcus Aureus ATCC 6538	0	Absent
Klebsiella pneumonia ATCC 4352	0	absent

2.5 PATTERN MAKING

LENGTH	**WIDTH**
8 Inch	3.5 Inch
ELASTIC LENGTH	**ELASTIC WIDTH**
15 Inch	15 mm

*make a curve along the eyes on your preferred size.

IMAGE -1: Pattern for eye mask



2.6 PRODUCT CONSTRUCTION

Place the pattern on the fabric and draw the outline of the pattern. Also draw the outline of the pattern in the batting material. Cut out the desired patterns using scissors. Measure down from the top of the mask and attach the elastic in place on the right side of the fabric. Repeat on the other side of the mask so the straps are evenly placed on both sides. Attach each side of the elastic to the fabric at a ¼" seam allowance. This will hold the elastic in place and keep it inside the mask at ⅜" seam allowance. Place the fabric piece's right sides together and the batting underneath the two fabric pieces. Keep the elastic away from the stitch line and tucked into the fabric pieces so it's out of the way. Sew all the way around the mask with a ⅜" seam allowance, leaving a 2″ opening at the top along the flat edge. After sewing, trim the seam allowance down to about ¼"-⅛". Do not trim at the opening along the top. Use the seam allowance at the 2″ opening inside the mask. Finger press the edges and create a smooth line. Topstitch around the perimeter of the entire mask, closing the opening at the same time. Use a ¼"-⅛" seam allowance and a thread colour you like on top of your fabric. Finally check and trim the excess threads and give it an iron.

2.7 FIT ANALYSIS & SURVEY

After the product construction I made a survey on fit analysis and product comfortableness. I received a positive feedback on the survey. The survey report is analyzed and it is attached below. As the product received a positive feedback I'm looking forward to launch the product in the future.

3. FINAL PRODUCT

IMAGE – 2: Aloe Vera coated eye mask

IMAGE – 3: Turmeric coated eye mask

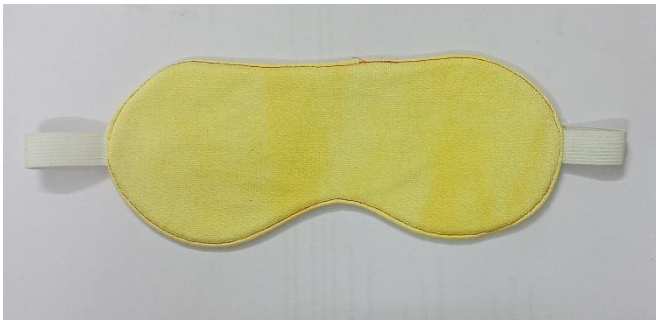


IMAGE – 4: Coleus coated eye mask

3. CONCLUSIONS

Recently, researchers have turned their attention to the production of natural products. After the outbreak of COVID 19, people became more aware of their environmental impact and preferred a sustainable lifestyle, which led to the demand for natural fibers and fabrics. Yarn made of bamboo fiber exhibits the desirable properties of high absorbency, antibacterial properties, soft touch, and can be used in hygienic garments. Eye masks are made from a variety of materials and can cause

allergic reactions to the fabric. Sleeping on a snug-fitting eye mask can effectively block outside light, but it's not good for your eyes. A consistent pressure placed in a narrow sleep mask can be blurred when you wake up. Aloe Vera concentration in the organization is mainly very nutritive to the body for human skin. The fabric absorbs moisture and supports cold from the outside, allowing many holes to easily evaporate sweat. Turmeric solution helps to reduce the symptoms of healthy conditions. Turmeric can treat a group of eye states that damage optical nerves. Coleus drop is used in the eyes to treat glaucoma. Manufacturers of herbal products are currently producing Coleus extract containing high levels of forskolin ($C_{22}H_{34}O_7$). These supplements are advertised under the same conditions that forskolin was traditionally used.

REFERENCES

1. Brady, S. 7 Reasons bamboo is better option than cotton. 2014, 8 22.

2. Chidambaram, P., Govind, R., Venkataraman K. C. "The effect of loop length and yarn linear density on the thermal properties of bamboo knitted fabric". Autex Research Journal, 11, 102–105, (2011).

3. Erdumlu, N., Ozipek, B. "Investigation of regenerated bamboo fibre and yarn characteristics". Fibres & Textiles in Eastern Europe, 16, 69, 2008.

4. Filiz, S. "Investigation on the unevenness, tenacity and elongation properties of bamboo/cotton blended yarns". Fibres & Textiles in Eastern Europe, 19, 86, 2011.

5. Hengshu, Z. "Study on the characteristics of bamboo fiber in spinning and weaving". Journal of Textile Research, 25, 91–93, 2004.

6. Fateme Mashayekhi, Mansour Arab, Motahhareh Pilevarzadeh, Masoud Amiri, Hossein Raei. "The effect on eye mask on sleep quality in patients of coronary care unit", Sleep science 6(3):75-78, JAN 2013.

7. Md.Ibrahim H.Mondal, Md.Ashadur Rahman. "Functional Applications of Aloe vera on Textiles", April 2021.

8. Wazad Ali, Roli Purwar, Mangala Joshi, Ss Rajendhran. "Antibacterial properties of Aloe vera gel-finished cotton fabric'. Cellulose 21(3):2063-2072, JUN2014.

9. Hetal Mistry, Suman Mundkur, Anju Tulshyan. "Antibacterial Treatment on Fabric from Aloe Vera". International Journal of Polymer and Textile Engineering, BY SSRG – IJPTE JOURNAL, 2020.

10. Hussain, U., Younis, F. B., Usman, F., Hussain, T., Ahmed, F. "Comfort and mechanical properties of polyester/bamboo and polyester/cotton blended knitted fabric". Journal of Engineered Fabrics & Fibers (JEFF), 10, 61–69, 2015.

11. Moh Rozani and Kusbaryanto. "Efficacy Aloe Vera in Treatment". A Literature Review, JULY 29, 2019.

Fateme Mashayekhi[1], Mansour Arab[2], Motahhareh Pilevarzadeh[1], Masoud Amiri[3], Hossein R