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UTILIZATION OF ALOE BARBADENSIS MILLER [ALOE VERA] TREATED WITH BAMBOO FABRIC IN SWADDLE WRAP WITH ANTIBACTERIAL PROPERTIES

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Abstract: This study looks at the antibacterial finishing of bamboo fabric using a natural *Aloe barbadensis miller* extract and methanol as a solvent. Bamboo's softness and breath-ability make it a popular cloth for infant swaddling wraps. Strengthening its antibacterial properties can further improve its safety and sanitary attributes.Aloe Vera's antimicrobial and skin-benefiting properties are well known. In this work, *Aloe barbadensis* miller extract is made and applied to bamboo fabric using a methanol-based finishing technique. The antibacterial effectiveness of the treated cloth is evaluated using common bacterial strains. Additionally, the fabric's durability, softness, and safety are assessed to ensure that the treatment doesn't take away from its natural qualities.The project's outcomes are meant to support the development of ecologically friendly and sustainable antibacterial textiles specifically for products used for infant care.

Keywords: Aloe barbadensis miller , antibacterial finish , bamboo fabric , methanol - swaddle wrapper , sustainability.

I. INTRODUCTION

The expanding global demand for textile products with antibacterial treatments made of natural sources, environmentally acceptable components, Textiles with distinctive or functional finishes are much sought after these days, particularly those with antimicrobial qualities to protect humans from bacteria.

A swaddle wrap is a cozy blanket or carefully made wrap that is used to enclose a newborn tightly, simulating the womb's sensation of security. By lessening the startle reaction (also known as the Moro reflex), which frequently wakes babies, swaddling promotes greater sleep. Moreover, it keeps infants warm, stops them from rubbing their faces, and may have a soothing effect that lessens excessive screaming. Traditional muslin or cotton swaddle blankets, Velcro or zipper swaddles for simpler fastening, stretchy knit swaddles for flexibility, and sleep sacks for a more relaxed and secure option are just a few of the several varieties of swaddle wraps available. To avoid hip dysplasia, it's crucial to swaddle the infant snugly but not too tightly so that their hips may move freely. Additionally, as the infant begins rolling over, which normally happens between two and four months, swaddling should be stopped. Always put the infant to sleep on their back for safety, and keep the room at a suitable temperature and use breathable materials to prevent overheating. When used correctly, a swaddling wrap may be a great way to calm a baby and encourage deeper sleep.

A Natural materials are frequently used in textiles as an antibacterial treatment. It is a well-researched issue to develop antibacterial treatment on cotton fabric using *Aloe barbadensis* extract with various finishing techniques. *Aloe barbadensis* has been utilized for centuries in both medical and cosmetic applications due to its abundant components. Being a cactus, aloe plants have an average pH of 4.5 and are composed of roughly 95% water.

The residual solid matter has more than 75 distinct components, such as lignin, anthraquinones or phenolic compounds, vitamins, minerals, enzymes, carbohydrates, saponins, sterols, amino acids, and salicylic acid. In order to meet the pressing demands of environmental friendliness and public health, this study develops bamboo fabric with long-lasting antibacterial, antifungal, and deodorant properties.

The value of textiles and users' quality of life may both be successfully improved. *Aloe barbadensis* is a multipurpose plant that has been used for ages in many cultures for both beauty and therapeutic uses. Because of its therapeutic qualities, *Aloe barbadensis* gel is one of its most widely used applications.

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Aloe barbadensis is a great natural cure for a variety of health issues because of its many nutritional and therapeutic qualities. Rich in vitamins, minerals, amino acids, and antioxidants,*Aloe barbadensis* gel aids in skin healing and relaxation. Because of its anti-inflammatory qualities, it may help reduce burn or wound pain and swelling. *Aloe barbadensis* also possesses antibacterial qualities that help shield wounds from infection.

Therefore, people choose to use natural sources of medicines for the safe use of medications and the control of germs that are resistant to drugs. In place of other antibiotics, plants provide a safer, more natural, more affordable, and tried-and-true source of antibacterials. Many plants are known to have strong therapeutic properties, and people have long used them to treat a wide range of illnesses all throughout the world. Since 2000 BC, both the Eastern and Western worlds have been very interested in using plants as phytomedicines. Every advanced society places a strong emphasis on using herbs.People who have skin allergies to other natural fibers, such as hemp and wool, do not react in the same way while wearing bamboo next to their skin. Bamboo fiber also has no free electrons, which makes the fabric created from it anti-static. As a result, it fits very well next to the skin and flows over the body without sticking stated (Das, 2014).

When bamboo is transformed from a plant to a fiber, its antibacterial properties are its most advantageous feature. **"Bamboo-kun,"** a bacteriologist bio-agent, is found in bamboo plants. Because of their strong bond with the bamboo cellulose molecule, these materials are kept in place even after mechanical processing. Because of this, germs and mildew are killed on bamboo fabric, as opposed to other cellulose cousins of bamboo, which allow them to proliferate and cause unpleasant odors and, in more extreme situations, fiber deterioration.

This characteristic really led to the usage of bamboo in traditional Chinese medicine. Bamboo cloth shows significant antibacterial properties even after 50 washings, according to a study by the Japan Textile Inspection Association, Shanghai, Microorganism Research Institute, and National Textile Inspection Association, China (NTIA). Furthermore, unlike chemical antibacterial treatments, it is natural and does not pose a risk of creating skin allergies stated by (Das, et al .2014).

Last, the organic bamboo cloth doesn't break down into pollutants like methane and is entirely biodegradable in soil.The environmental impact of garments made entirely of bamboo is very minimal. As a result, it may be composted naturally, in contrast to synthetic fibers that take decades to break down in landfills.For many years, bamboo fiber has been employed in a variety of applications, including high-performance composites, design, slope management, and building and construction.

The mechanical qualities of regenerated bamboo fibers include great moisture absorption, softness, brightness, superior tensile strength, outstanding UV protection, antibacterial and biodegradable qualities, and high flexibility under compressive and flexible loads. For a variety of applications, regenerated bamboo cellulose fiber's high moisture absorption capacity, breath-ability, and quick drying behavior provide outstanding comfort. Bamboo textiles' antibacterial qualities, biodegradable qualities, high moisture absorption capacity, softness, and UV protection make them highly sought after in the market. In its raw state, bamboo offers a lot.

There are currently two applications for bamboo in the textile sector. One method is to use physical and chemical processes to turn bamboo into natural fiber. Alternatively, once the bamboo is retted into bamboo pulp, the regenerated fiber is spun. since the latter is processed similarly to viscose. There are some benefits to the advancement of bamboo fiber in textiles. First, bamboo fibers are a sustainable, quickly growing, biodegradable, and land-free fiber that is derived from bamboo.

II. OBJECTIVES

- To ensure the comfort and softness of the infant.
- To encourage the use of sustainable practices and natural fabric treatments.
- Swaddle wrap’s antibacterial qualities can be enhanced by using *aloe barbadensis miller.*
- To Evaluate Treated vs. Untreated Bamboo Fabric Performance.
- The wrapper assures that the baby is safe in the swaddle wrap.

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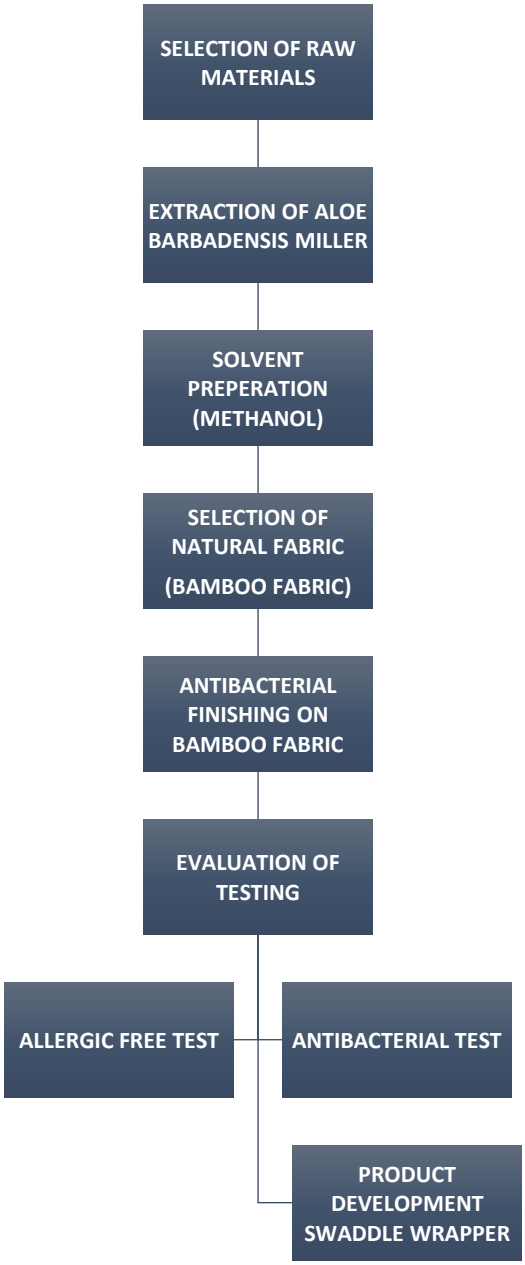
III. METHODOLOGY



SELECTION OF RAW MATERIALS

To ensured proper sourcing of the raw material needed for the antibacterial finishing treatment. The Aloe Vera (Aloe barbadensis miller) has been acquired my village, Panyampalli, to ensure it is fresh and organically cultivated. This choice ensures a natural and efficient antibacterial agent.

The bamboo cloth utilized in this project was sourced from an internet supplier, bearing in mind its environmental-friendliness and aptness for use in baby products such as swaddle wrappers. The fabric utilized has a GSM (grams per square meter) of 150, meaning a light, airy, and smooth texture, thus being perfectly suitable for use on infants.

For the methanol, which is required as a solvent during the finishing process, acquired it from an internet-based chemical supplier, where it was guaranteed laboratory-grade quality for use in textile processes. The methanol will be applied during extraction and application steps to complement the antibacterial function of the cloth effectively.

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EXTRACTION OF ALOE VERA GEL

To ensure the highest quality of antibacterial treatment, The aloe vera is carefully selected and harvested a mature Aloe Vera plant (Aloe barbadensis miller) village, Panyampalli. Using a mature plant is crucial, as it contains a higher concentration of bio-active compounds, which contribute to its antibacterial properties.

FIG-1 ALOE VERA

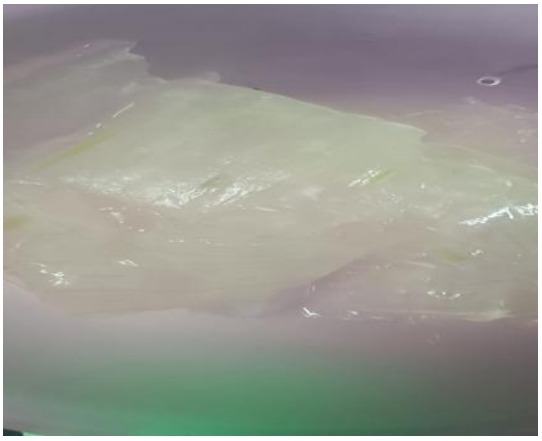

FIG-2 EXTRACTION OF ALOE VERA

After harvesting, the aloe gel from the leaves carefully removed by slicing them open lengthwise. The gel, which is the primary component used for extraction, was then separated from the outer green rind. Since fresh Aloe Vera contains natural impurities such as latex (aloin), dirt, and other residues, it was essential to wash the extracted gel thoroughly under running water.

To ensure complete purification, It washed the gel 7 to 10 times in clean, running water. This step is particularly important to remove any remaining aloin—a yellowish-brown, bitter substance found in the outer layers of Aloe Vera leaves, which can cause irritation or unwanted reactions. The multiple washes helped eliminate impurities while preserving the gel's natural antibacterial properties.

After the thorough cleaning process, the purified Aloe Vera gel was ready for further processing and incorporation into the antibacterial finishing solution.

SOLVENT PREPARATION

After proper cleaning of the Aloe Vera gel,continued with the solvent preparation step, which consisted of mixing the gel and adding methanol to dissolve its bioactive constituents efficiently.

The purified Aloe Vera gel was first transferred to a blender and blended until it became a smooth, homogeneous liquid. Blending is useful in breaking down the structure of the gel, thus allowing the active constituents to be easily released into the solvent.

FIG - 3 EXTRACTION OF ALOE JEL AND METHANOL

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After the gel had attained a fluid state, It was gently blended it with methanol, a commonly used solvent for extraction. Methanol dissolves the bioactive compounds found in Aloe Vera better, increasing their efficiencies at antibacterial finishing. The two were mixed gently to ensure even distribution of the Aloe Vera extracts within the solvent.

At this point, the solution of Aloe Vera-methanol was ready to be applied on the bamboo fabric during the antibacterial finishing process.

SELECTION OF NATURAL FABRIC

For this research, specially picked 100% bamboo fabric, which was bought through an online source. Bamboo fabric was used because it is environmentally friendly, soft, and naturally breathable, hence making it the perfect material for infant swaddle wrappers.

FIG - 4 BAMBOO FABRIC

The chosen fabric carries a GSM of 150 (grams per square meter), suggesting a light and smooth texture that is comfortable without compromising durability. This weight is appropriate for baby products since it allows for ample airflow, minimizing the chances of overheating yet retaining warmth. The fabric is also imbued with natural antibacterial and hypoallergenic qualities that enhance the antibacterial finishing treatment with Aloe Vera and methanol.

IV. EVALUATION AND TESTING

Antibacterial Testing: This test assesses how well the treated cloth inhibits the growth of germs. The antibacterial property is evaluated using conventional methods such as the AATCC 100 or ISO 20743 test against common pathogens such as Staphylococcus aureus and Escherichia coli. The effectiveness of the aloe vera treatment in boosting the antibacterial activity of bamboo fabric is confirmed by a significant reduction of bacterial growth.

Allergy-Free Testing: Since the cloth will be used by babies, it should be ensured that the bamboo fabric coated with aloe vera won't irritate, irritate, or cause pain. To make sure the treated fabric maintains its softness and safety for babies while maintaining bamboo's hypoallergenic qualities, it is put through dermatological and skin sensitivity testing.

PRODUCT DEVELOPMENT – SWADDLE WRAPPER

At the final product development stage, I dedicated myself to sewing the raw edges of the bamboo fabric for the sake of improving durability and minimizing fraying. Once uneven edges were trimmed, I reinforced them with an efficient edge-finishing method like overlocking or hemming.

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FIG - 5 DEVELOPMENT OF SWADDLE WRAPPER

V. RESULT AND DISCUSSION

ANTIBACTERIAL ACTIVITY:

Organisms Concentration	***E.Coli***	***S.aureus***	***Candida albicans***
fabric	1 mm	5 mm	*6 mm*
Standard	5 mm	5 mm	3 mm

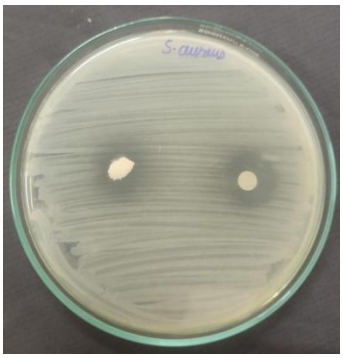

FIG - 6

FIG - 7

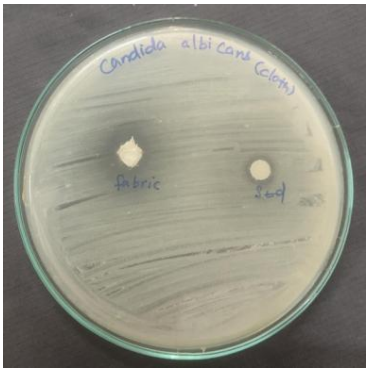

FIG - 8

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SAMPLES OF ANTIMICROBIAL TEST

Report:

The fabric sample shows the Anti-bacterial activity against the Pathogenic bacteria like E. Coli and S. aureus fungus like *Candida albicans.* The fabric shows Higher activity of *candida albicans* 6 mm. The results are finds depending upon the zone formation.

4.2 ALLERGIC TEST:

Inhibition of protein denaturation

Inhibition of protein denaturation was evaluated by the method of Mizushima and Kobayashi 1968 and Sakat *et al.* 2010 with slight modification. 500 µL of 1% bovine serum albumin was added to fabric sample. This mixture was kept at room temperature for 10 minutes, followed by heating at 51°C for 20 minutes. The resulting solution was cooled down to room temperature and absorbance was recorded at 660 nm. Acetyl salicylic acid was taken as a positive control. The experiment was carried out in triplicates and percent inhibition for protein denaturation was calculated using:

$$\text{Percentage inhibition} = \frac{100 - (\text{O.D. of test} - \text{O.D. of product control}) \times 100}{\text{O.D. of Control}}$$

Concentration	OD Values Control-690	% of the Denaturation
Fabric	0.290	70.0 %
Standard (Aspirin)-1 µg/ml	0.779	86.00 %

Report:

The Protein denaturation assay shows no allergic to the human skin.

VI. CONCLUSION

In order to create swaddle wrapping cloths, this study explores the antibacterial qualities of methanol and aloe vera as finishing agents on bamboo fabric. The goal of the study was to use these materials' inherent antibacterial properties to improve the safety and hygienic qualities of infant textiles. The study successfully demonstrates that methanol and aloe vera are in charge of a notable reduction of bacterial development on bamboo fabric through a thorough procedure of fabric treatment, antibacterial efficacy testing, and qualitative assessment. Additionally, the study notes that the treatment has no effect on the fabric's comfort, breath-ability, or softness—all crucial factors for baby clothing and accessories This work is in line with the growing need for sustainable and ecologically friendly textile solutions by using naturally occurring antibacterial agents rather than synthetic chemicals.

VII. ANNEXTURE

FIG-9 END PRODUCT

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FIG-10 DEVELOPMENT OF SWADDLE WRAPPER

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