International Journal of Recent Advances in Multidisciplinary Topics
Volume 2, Issue 6, June 2021
https://www.ijramt.com | ISSN (Online): 2582-7839

Development of Mask Using Bamboo Fibre

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***Abstract*: This paper highlights a study to assess the anti-bacterial and anti-fungal properties of face mask made out of bamboo fibers. Bamboo fiber is a cellulosic fibre and is obtained by regenerating cellulose extracted from the bamboo plant. It is 100% eco-friendly. Biodegradable and natural anti-bacterial. This paper highlights a study conducted at SITRA to assess the anti-bacterial and anti-fungal properties of bandage fabrics made out of bamboo fibres, compared with those made from cotton and rayon. Results indicate the prevalence of indigenous anti-microbial property in bamboo, making it a better suited material for use in medical gauze bandages.**

***Keywords*: mask, biodegradable**

1. Introduction

Natural fibres have become popular reinforcement material for fibre reinforced polymer composite developments. Bamboo were compared and it was found that the bamboo fibers have much higher tensile and flexural properties than other fibers. Wearing face masks is recommended for the prevention of contracting or exposing others to cardiorespiratory infections, such as COVID-19. We used a randomized, counterbalanced cross-over design to evaluate the effects of wearing a surgical mask, a cloth mask, or no mask. The textile materials used in medical applications are called medical textiles. Textile materials plays a major role in medical field. The applications may vary like surgical, beddings, sheets, pillows, outwears, masks, blankets, implants etc.

2. Product Development

1. Yarn Sourcing
2. Loose Fabric
3. Dyeing
4. Unravel
5. Cone Winding
6. Mask Knitting

1) Yarn sourcing

- Fabric sourcing department is basically engaged in determining how and where its merchandise i.e fabric will be obtained. It works in coordination with the merchandising department and looks after the delivery of the required goods at the scheduled time and cost. A fabric source must have a knowledge about all varieties of fabric in order to execute their function effectively.

We bought 4 kgs of 100% bamboo yarn of 40s count from rk yarns, tirupur.

2) Loose fabric

Loose fabric is prepared especially for dying purpose, as the striped collar and cuff cannot be dyed in the flat knit form.as, we are developing a mask in flat knit machine so we are preparing loose fabric for dying purpose.

3) Dyeing

- Bamboo is a regenerated cellulose fiber usually dyed with reactive dyes. This paper presents results of the batch wise dyeing of bamboo fabric with reactive dyes by ultrasonic (US) and conventional (CN) dyeing methods.
- We are using reactive dye for our bamboo fabric. Which is mostly widely used for cotton fabric.

4) Unravel

Unraveling is the process where yarn is undone from the loose fabric.

5) Cone winding

- The winding is the process of creating large yarn packages called “cone” from a number of small yarn packages (ring cops) in order to make use of yarn in subsequent machinery. The Winding process not only make bigger yarn packeges, it also corrects spinning faults like neps, hairiness, and waxes.
- Unraveled yarn is wound on the cone of desired package weight for feeding flat knitting machine.

6) Mask knitting

- Knit fabrics are made by connecting loops of yarn, rather than straight laces. In fact, you can see these loops if you look closely enough at your mask. You'll notice that the surface of the fabric looks almost 3-dimensional, with “peaks” and “valleys” between the rows of yarns.
- We going to make mask in dollphin knitting,tirupur ”master of flat knitting”.


Cone Winding

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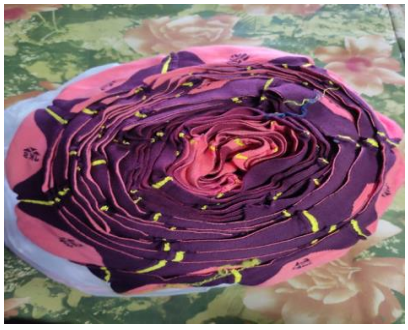
Loose Fabric Knitting

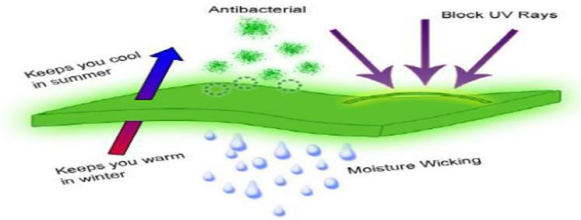
Flat Knitting



3. Properties of Bamboo Fiber

1) Anti-Bacterial Property

Bamboo fiber has natural functions of anti-bacteria and deodorization character. Bamboo possesses a unique anti bacteria agent named “bamboo Kun". This Substance imparts the natural functions of anti-bacteria and deodorization.



2) Anti UV Radiation

Due to anti-ultraviolet nature, it is suitable for making summer clothing for the protection of human skin from damages of ultraviolet radiation.

3) Thermal regulating property

Bamboo fabric is thermal regulating. It reduces temperature in hot weather and warms the body in cool weather.

4) Antistatic

A characteristic of bamboo fiber is such that it absorbs moisture due to micro-gaps and static electricity is hard to be generated. Bamboo fiber does not contain free electron and thus it is antistatic.

4. Materials and Methods Materials

1) Antibacterial test

The antibacterial activity was tested with the shake flask test. Evaluation for antibacterial activity is Shake flask method. In the test for investigating the natural antibacterial property of natural bamboo fiber and the effect of bamboo shape on it, the untreated cotton was used as the negative control sample and the antibacterial cotton was used as the positive control sample. The antibacterial properties of test samples were evaluated by calculating the bacteriostatic rate as In the test for investigating the effect of extractive on the antibacterial activity of natural bamboo fiber, the bacterial growth in the flasks containing the natural bamboo fiber extracted and untreated was compared.

2) Tensile test

Tensile test is used to measure the force required to break a material and the extent to which the specimen elongates to breaking point. Tensile test produces a stress-strain diagram which is used to specify a material or design parts to with stand applications of force and quality control check. Tensile test is used to determine the tensile strength of a material with unit as N/mm2.

5. Bamboo is Naturally Anti-Bacterial

- This substance, combined with the tight molecular structure of bamboo fibres, are believed to give it its

anti-bacterial and bacteriostatic properties – which is not diminished even after more than 50 washes! It is also quite different from chemical additives which can often cause skin irritations and other problems.

- In bamboo fabric, bacteria numbers were reduced to less than 0.2%.

Whereas in cotton fabric, bacteria number increased to 550 times the original.

6. Benefits of Bamboo Fabric

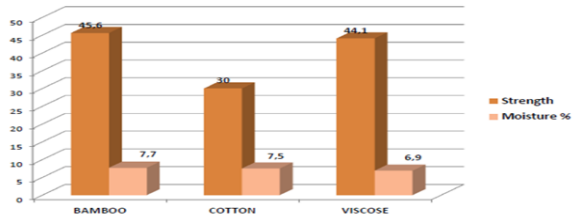
- Antibacterial - keeps you odour free and feeling and smelling fresh
- Highly sweat absorbent Powerfully insulating - keeps you cooler in summer and warmer in winter
- One of the softest fabrics on the planet you'll love the way it feels
- Naturally UV protectant - protect yourself from skin cancer
- Hypoallergenic - natural bamboo does not cause allergic reactions
- Most eco-friendly fabric on the planet - help save your planet

7. Eco Friendly and Anti-Microbial

- The existing manmade fibers which are used in medical textiles are non-bio degradable.
- They also do not possess any medicinal properties.
- Hence, we trying to replace products with bamboo products.

Physical Properties of Bamboo, Cotton & Viscose

Properties	Bamboo	Cotton	Viscose
Strength (gm/tex)	45.6	30	44.1
Elongation (%)	15	5.3	14.3
Short Fibre Index	5.28	9.07	5.57
Uniformity Index (%)	92.8	81.1	92.9
UHML(mm)	38.21	29.91	36.97
ML (mm)	35.45	24.25	34.34
Moisture (%)	7.7	7.5	6.9
Micronaire	5.18	3.26	5.19



1) Comparison between Bamboo and Cotton

QUALITY	COTTON	BAMBOO	COMMENTS
Absorbency	100%	300%	Bamboo is 300% more absorbent than cotton
Resiliency	NO	✓YES	Bamboo is very resilient
Luster	NO	✓YES	Bamboo is naturally lustrous
Elasticity	NO	✓YES	Bamboo has much more elasticity than cotton
Pesticide-free crop	NO	✓YES	Bamboo grows without need for pesticides or fertilizer
UV Protected	NO	✓YES	Bamboo is naturally blocks UV rays
Antibacterial	NO	✓YES	Cotton is not anti-bacterial
Soft	NO	✓YES	Bamboo feels like cashmere. Cotton is abrasive against the skin

TYPE	E.coli(bacteria) (reduction %)	S. aureus(bacteria) (reduction %)
BAMBOO	30	68.85
COTTON	0	0
RAYON	1.3	68.0

Tab.4 Antibacterial Efficiency of different extraction method

Extraction dissolvent name	anti bacteria Efficiency (%)		
	Escherichia coli	*Staphylococcus aureus*	*Candida albicans*
Cold-water	64.35	10.91	0
Hot-water	69.57	30.91	0
Ethanol	18.26	7.88	0
Benzene	0	0	0
Benzene/ethanol	4.35	36.36	0
1% NaOH	58.26	67.88	0

8. Conclusion

In this study, the antibacterial property of natural bamboo fiber and its influencing factors were investigated. The antibacterial test results show that natural bamboo fiber has no natural antibacterial property compared with other textile fiber. Some extraction method could improve the antibacterial property of natural bamboo fiber against bacteria, Bamboo textiles have many unique properties which fulfill all the requirements of present scenario of human beings. "Bamboo fiber comes from nature and completely returns to nature in the end" therefore bamboo fiber is praised as "the natural, green and eco-friendly new-type textile material of 21st century". “In Future, BAMBOO can be An Excellent Alternative Source for Production of Textiles”.

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