International Conference on Systems, Science, Control, Communication, Engineering and Technology 2015 [ICSSCCET 2015]

ISBN	978-81-929866-1-6	**VOL**	01
Website	icssccet.org	**eMail**	icssccet@asdf.res.in
Received	10 - July - 2015	**Accepted**	31- July - 2015
Article ID	ICSSCCET016	**eAID**	ICSSCCET.2015.016

TO STUDY THE WOVEN FABRIC OF BAMBOO&TENCEL FOR COMPFORT PROPERTIES

M. D. Jothilinkam[1], T. Ramachandran[2], G.Ramakrishnan[3]
[1]Karpagam University, Coimbatore, India
[2] Karpagam Institute of Technology, Coimbatore, India
[3]Department of Fashion Technology, Kumaraguru College of Technology, Coimbatore –641049 India,
(KCT-TIFAC CORE in Textile Technology & Machinery)

ABSTRACT: This research work aims at investigation of mechanical and moisture properties of fabrics made from bamboo and microtencel fibres. Woven fabrics made from these fibres were evaluated for mechanical properties such as tensile strength and elongation and moisture properties such as water vapour permeability, wicking. The. results indicated that 100% bamboo fabric showed very good water vapor permeability. Fabric wicking was similar in all samples. Tensile tests (warp way) conducted on all the 5 samples revealed that 100% bamboo fabric yielded the lowest strength and 30:70 bamboo: tencel blended fabric yielded the highest fabric strength. Tensile tests conducted in (weft way) for all the 5 samples revealed that 100% bamboo has lowest strength and 100% Tencel had the highest strength.

The material for research will include natural, regenerated and synthetics fibers such as cotton, viscose, modal, tencel, bamboo and polyester of both conventional and micro denier. This fiber will be made into yarn using ring and open end spinning method. The yarn will be converted into woven and knitted fabric using different woven and knitted structures suitable for use in apparel. The fabric will be treated with different types of plasma gases, dyed and finished. The fabric will be tested for thermal and moisture properties using of thermal and moisture testers and will be evaluated for thermal resistance and water vapor permeability in addition low stress mechanical properties for studying apparel comfort.

The result thus obtained will be very useful to textile/apparel manufacturing industry

1. INTRODUCTION

Bamboo fiber has particular and natural functions of anti-bacteria, bacteriostasis and deodorization. It is validated by Japan Textile Inspection Association that, even after fifty times of washing, bamboo fiber samples still possesses excellent function of anti-bacteria, bacteriostasis. Its test result shows over 70% death rate after bacteria being incubated on bamboo fiber samples. Bamboo fiber's natural anti-bacteria function differs greatly from that of chemical anti-microbial.More important, bamboo fiber is a unique biodegradable textile material.

As a natural cellulose fiber it can be 100% biodegraded in soil by micro organisms and sunshine. The decomposition process does not cause any pollution in the environment. "Bamboo fiber comes from nature and completely returns to nature in the end" Bamboo fiber is praised as "the natural, green and eco–friendly new type textile material of 21st century".Bamboo can thrive naturally without the use of pesticides as it is seldom eaten by pests or infected by pathogen. Scientists have found that bamboo contains a unique anti-bacteria and bacteriostasis bio-agent named "bamboo Kun". This substance

is maintained in the finished bamboo fabric as it is bound tightly to the bamboo cellulose molecule. Bacteria will propagate rapidly in

Cite this article as: M. D. Jothilinkam, T. Ramachandran, G.Ramakrishnan. "TO STUDY THE WOVEN FABRIC OF BAMBOO&TENCEL FOR COMPFORT PROPERTIES." *International Conference on Systems, Science, Control, Communication, Engineering and Technology (2015)*: 73-78. Print.

cotton and other fibers obtained from wood pulp, forming bad smell and even cause early degradation of the fiber in some cases. But it will be killed 75% after 24 hours later in bamboo fiber.

Tencel is the registered trade name for Lyocell, which a biodegradable fabric is made from wood pulp cellulose the fabric to be environmentally friendly and a good choice for people with sensitive skin. Yet this may not always be true. While Tencel is made from wood fibers and is biodegradable.

Tencel fabric is an amazing eco friendly fabric that represents a milestone in the development of environmentally sustainable textiles. Tencel is a natural, manmade fibre which is also referred to as Lyocell. Made with wood pulp from sustainable tree farms, tencel textiles are created though the use of nanotechnology in an award-winning closed-loop process that recovers or decomposes all solvents and emissions.

2. MATERIALS AND METHODS

The bamboo and tencel yarns were spun on a miniature ring frame with 22.57 twists per inch. Table 2.1 shows the properties of bamboo and tencel spun yarns. The fabrics were woven from 30s count warp and weft, bamboo and tencel yarns on a miniature weaving machine. The construction details of woven fabric were 30 ends per inch and 20 picks per inch for woven plain gauze fabric.

Table 2.1.Fiber Properties

SL.NO	FIBER	TEX	STAPLE LENGTH
1	Bamboo	1.33D tex	38mm
2	Tencel	0.8 D tex	38mm

The blending ratio of fibre both bamboo and tencel fibre staple length of 38mm with five different combination are mentioned below the table 2.2.

Table 2.2 Blending Ratio

Sl.no	FIBRES	BLENDING RATIO
1	Bamboo	100%
2	Tencel	100%
3	Bamboo/Tencel	50%/50%
4	Bamboo/Tencel	70%/30%
5	Bamboo/Tencel	30%/70%

The geometrical details of woven gauze fabric for medical textiles product using the functional fibers for wound dressing and bandages are shown in below Table 2.3.

Cite this article as: M. D. Jothilinkam, T. Ramachandran, G.Ramakrishnan. "TO STUDY THE WOVEN FABRIC OF BAMBOO&TENCEL FOR COMPFORT PROPERTIES." *International Conference on Systems, Science, Control, Communication, Engineering and Technology (2015)*: 73-78. Print.

Table 2.3 Geometrical Details

1	Warp	30Ne
2	Weft	30Ne
3	EPI	30
4	PPI	20
5	Cover factor	8.5
6	GSM	53 gms
7	Thickness	2.5 mm

3. RESULTS AND DISCUSSION

The testing method is shown below table 3.1 for the experimental work.

Table 3.1 Testing Method

SL NO	TEST PARAMETER	STANDARD
1	Tensile Properties	ASTM D 5035
2	Thickness	ASTM D 1777
3	Water vapor Permeability	ISO 11092 BS EN 31092:199
4	Fabric Wicking	INHOUSE METHOD

3.2 Wickability test

TESTING METHOD	Bamboo-100%	Tencel 100%	Bamboo/ Tencel 50%/50%	Bamboo/ Tencel 70%/30%	Bamboo/ Tencel 70%/30%
WICKABILITY IN MM AFTER 24 HRS	10	10	10	10	10

Discussion

It is observed from above table the Wickability is similar in all sample=10mm.

3.3 Tensile Strength

The tensile strength means the material under tensile stress in the largest deformation of homogeneous material stress. Material tensile strength is the maximum uniform plastic deformation of the stress. In the tensile test, the specimen until fracture suffered the biggest so far is the tensile strength of tensile stress.

Cite this article as: M. D. Jothilinkam, T. Ramachandran, G.Ramakrishnan. "TO STUDY THE WOVEN FABRIC OF BAMBOO&TENCEL FOR COMPFORT PROPERTIES." *International Conference on Systems, Science, Control, Communication, Engineering and Technology (2015)*: 73-78. Print.

Defaults Table	
Text Inputs: Specimen label	100% Bamboo - Warp
Number Inputs: Gauge Length (mm)	75.
Number Inputs: Speed (mm/min)	300.

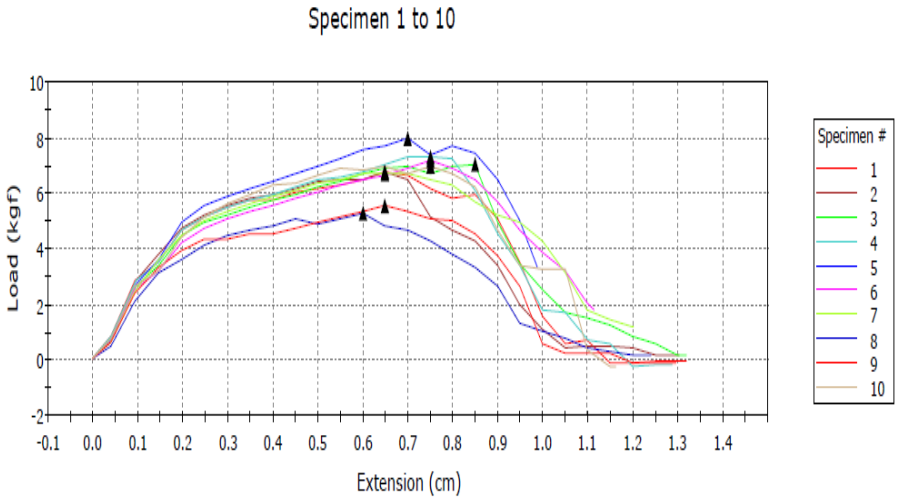

Figure1 Tensile Strength

Warp way
Discussion

It is observed from the table the Tensile Strength in warp way the following sample value are.

	Bamboo 100%		Tencel 100%		Bamboo/Tencel 50%/50%		Bamboo/Tencel 70%/30%		Bamboo/Tencel 30%/70%	
	Maximum Load (kgf)	Extension Load (cm)	Maximum Load (kgf)	Extension Load (cm)	Maximum Load (kgf)	Extension Load (cm)	Maximum Load (kgf)	Extension Load (cm)	Maximum Load (kgf)	Extension Load (cm)
maximum	8.00	0.85	11.84	0.65	11.13	0.65	9.26	0.90	12.48	0.65
minimum	5.26	0.60	6.59	0.55	7.10	0.40	6.64	0.65	8.69	0.45
mean	6.75	0.70	9.85	0.60	9.17	0.56	8.19	0.70	10.42	0.55

The warp way Maximum Load is bamboo/Tencel 30%/70% = 12.48 (kgf) is higher than other sample and lower value is bamboo100%= 8.00(kgf).
The warp way Extension Load is bamboo/Tencel 70%/30% = 0.90 (cm) is higher than other sample and lower value is bamboo 100% = 5.26(cm).

Weft Way
Discussion

It is observed from the table the Tensile Strength in weft way the following sample value are

Cite this article as: M. D. Jothilinkam, T. Ramachandran, G.Ramakrishnan. "TO STUDY THE WOVEN FABRIC OF BAMBOO&TENCEL FOR COMPFORT PROPERTIES." *International Conference on Systems, Science, Control, Communication, Engineering and Technology (2015)*: 73-78. Print.

	Bamboo 100%		Tencel 100%		Bamboo/Tencel 50%/50%		Bamboo/Tencel 70%/30%		Bamboo/Tencel 30%/70%	
	Maximum Load (kgf)	Extension Load (cm)	Maximum Load (kgf)	Extension Load (cm)	Maximum Load (kgf)	Extension Load (cm)	Maximum Load (kgf)	Extension Load (cm)	Maximum Load (kgf)	Extension Load (cm)
maximum	4.43	1.15	7.22	0.70	6.06	0.95	5.77	0.85	7.11	0.70
minimum	3.62	0.80	4.70	0.45	3.60	0.65	3.70	0.60	4.62	0.60
mean	4.11	0.90	6.44	0.62	5.03	0.81	4.85	0.73	5.27	0.66

Table 3.3.2 Weft way tensile strength

The weft way Maximum Load is Tencel 100% = 7.22(kgf) is higher than other sample and lower value is bamboo100%= 4.43(kgf).

The weft way Extension Load is Tencel 100% = 4.70(cm) is higher than other sample and lower value is bamboo /Tencel 50%/50% = 3.60(cm).

3.4 Water Vapor Permeability

The fabrics with hydrophilic components change their properties under different humidity conditions. The purpose of this study was to measure the water vapour permeability and evaporative resistance. The water vapour transmission rate (WVTR) was measured using the ASTM

Table3.4Water Vapor Permeability

Sample	Water Vapour permeability(gm/m²/day)
Bamboo-100%	4243
Tencel-100%	2894
Bamboo/tencel 50%/50%	3440
Bamboo/tencel 70%/30%	4208
Bamboo/tencel 30%/70%	3277

Discussion

It is observed from above table the water vapour permeability in bamboo 100% =4243 (gm/m²/day) is very high other samples. It has lowest value in Tencel 100% = 2894 (gm/m²/day).

4. CONCLUSION

- 100% bamboo fabric showed very good water vapor permeability.
- Fabric wicking was similar in all samples

Cite this article as: M. D. Jothilinkam, T. Ramachandran, G.Ramakrishnan. "TO STUDY THE WOVEN FABRIC OF BAMBOO&TENCEL FOR COMPFORT PROPERTIES." *International Conference on Systems, Science, Control, Communication, Engineering and Technology (2015)*: 73-78. Print.

- Tensile tests (warp way) conducted on all the 5 samples revealed that 100% bamboo fabric yielded the lowest strength and 30:70 bamboo: tencel blended fabric yielded the highest fabric strength.
- Tensile tests conducted in (weft way) for all the 5 samples revealed that 100% bamboo has lowest strength and 100% Tencel had the highest strength.

5. REFERERENCE

1. Textile-based smart wound dressings By: Bhuvanesh gupta Department of Textile Technology, Indian Institute of Technology, New Delhi Indian Journal of Fibre & Textile Research.
2. Bamboo fiber and its application in textiles - An Overview, By: K.Saravanan &C.Prakash, Sona College of technology, Salem, http://articles.fibre2fashion.com
3. Medical textiles by; chet ram meena, nitin ajmera, and pranaya kumarsabat http://articles.fibre2fashion.com
4. Tencel fibres, by:Lenzing Fibers Inc. http://www.lenzing.com
5. Handbook of medical textiles By: V. T. Bartels Woodhead Publishing Limited, 2011
6. Medical and health care textiles By: S. C. hand, J. F. Kennedy, M. Miraftab and S.Rajendran,Woodhead Publishing Limited, 2010
7. Green Story of Lyocell fiber, Ajay Sardana (Head – TRADC), Sanjay Vishwakarma (Head – QA, TRADC) the authors are M.Tech in Textile Engineering from IIT Delhi.
8. Physical, Chemical and mechanical properties of bamboo and its utilization potential for fiber board manufacturing By:Xiaobo Li, B.S. Beijing Forestry University, 1999M.S. Chinese Academy of Forestry, 2002
9. Ajay Sardana & Sanjay Vishwakarma "Green Story of Lyocell fiber" from IIT Delhi, 2009.
10. Dr.Jayalakshmi.I & Dinesh. B "Antimicrobial and MechanicalActivity of Eupatorium Dye on Tencel and Tencel-Viscose Fabrics"www.fibre2fashion.com

Cite this article as: M. D. Jothilinkam, T. Ramachandran, G.Ramakrishnan. "TO STUDY THE WOVEN FABRIC OF BAMBOO&TENCEL FOR COMPFORT PROPERTIES." *International Conference on Systems, Science, Control, Communication, Engineering and Technology (2015)*: 73-78. Print.