DEVELOPMENT OF NON-WOVEN FABRIC USING ARECA HUSK FOR TEXTILE APPLICATION

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ABSTRACT

The research and development results dealing with the idea of creating Areca Catechu L. needle punched non-woven fabric. Areca Catechu L. fiber is the most comfortable natural fiber and also has good breathing properties besides being skin friendly and easy to care. Needle punched Areca Catechu L. Non – woven blended fabrics made out of using one of the Recycled Polyester and Regenerated Viscose Rayon in different proposition of 50:50, 60:40 and 70:30 wt% were manufactured using needle punching techniques respectively. Morphological study (FESEM analysis, EDX analysis), physical, mechanical and colourfastness properties of the needle punched non-woven fabrics were studied.

KEYWORDS: Areca catechu L., Recycled Polyester, Regenerated Viscose Rayon, Needle Punching, Non-Woven and Dyeing

INTRODUCTION

Eco-friendly or natural fiber clothing is one of the hottest trends in the world of fashion. Areca is a plant. The nut is used to make medicine. Areca fiber (Areca nut husk fiber) is characterized as extremely strong and light weight. The fibers are predominantly composed of cellulose and varying proportions of hemi cellulose, lignin, pectin and protepectin. Recently the recycling of polyester has become very popular and even tougher cycling polyester is not a new technology subject being able to successfully recycle bottles into fiber and get attention from consumers to support the idea by buying it in large scale quantities is unheard of until now. Rayon fibers and fabrics made from them have many desirable properties. Rayon is often used in fashion and home furnishings, but the fiber is also found in sanitary products, diapers, and medical supplies.

The present aim of the study about Areca Catechu L. blended Non-woven fabric best property and physical and chemical characteristic among the two blends with six different ratios, and to achieve the sustainable Non-woven fabric composites for different application in textile industry.

Experimental

This research work aims at developing needle punched Non-woven fabric for Technical Textile application by combining fibers in different proportions as 50:50, 60:40, 70:30 wt % of Areca Catechu L. with Recycled Polyester and Viscose Rayon then dyed with Areca nut and study the characteristics of the blend.
Selection of Fiber

Areca husk were collected in and around Mettupalayam, Coimbatore district, Tamil Nadu. The collected Areca husks were authenticated by Mr. Sridhar, Researcher, Karpagam Engineering College, Coimbatore. Recycled polyester (rPET) was procured from PSG foundry, Coimbatore district, Tamil Nadu. Viscose Rayon was procured from supplier of Viscose Rayon manufactured by Adithya Birla groups, located in Veraval, Gujarat, India.

Areca Fiber Extraction Method

Selected variety of tender Areca from Mettupalayam locality was used for the study. Different methods were adopted to extract the Areca fiber from its shell but only one method (hand stripping method) provides satisfactory results keeping the strength, lustre and the other desirable properties as good as possible.

Figure 1: Hand Stripping Method Softener Washing

Fiber extracted from Areca Catechu L. fruit shell was soaked in 5% of cationic softener solution for approximately half an hour. The softener washed sample was also washed by distilled water several times. At last the treated fiber was dried in shade for 24hrs and was subjected for needle punch non-woven composite preparation.

Preparation of Non Woven Fabric

The separated soft fibers were converted into fabric using needle punched technology. It has undergone 2 processes. Lap formation and Production of Needle punched Non-woven fabrics. The appropriate technology of manufacturing Areca needle-punched non-wovens not only produces the diversified products from Areca but also creates the value addition. Areca needle punched non-woven fabric development for Technical Textiles was produced using the following fiber combinations.

- Areca blended with Recycled Polyester (50:50; 60:40; 70:30 wt %)
- Areca blended with Viscose Rayon (50:50; 60:40; 70:30 wt %)

Selection of Dye

The well known Areca Catechu L. seeds were chosen for the study. Natural dyes can be used on most types of material or fiber but the level of success in terms of fastness and clarity of colour varies considerably.
Development of Non-Woven Fabric Using Areca Husk for Textile Application

Extraction of *Areca catechu* L. Dye

*Areca catechu* L. seeds were dried and ground to a fine powder. A hot water extract of the Areca nut was prepared by boiling the nuts (100 g) in 500 ml of distilled water for 1 hour. The temperature maintained between 80°C to 90°C for 1 hour. The hot solution was then filtered through a Nylon cloth.

Application of Dye on Non-Woven Fabric

Needle punched non-woven fabric of different proportion of ARP and AVR fabric were soaked in water and squeezed to remove any impurities if any. The *Areca Catechu* L. seed extract solution is taken in the ratio of 1:2 i.e., for 1 meter of the non-woven, 2 litres of solution is prepared. The non-woven fabric was dipped in the hot extract and left at room temperature for about 2 hours. Then it is taken out and dried in the shade.

RESULTS AND DISCUSSIONS

Morphological Study by FESEM Analysis

Morphological Study was done by using FESEM analysis of the ARP and AVR needle punched non-woven fabric before and after dyeing. The result reveal that *Areca nut* dyed non-woven fabric ARP and AVR, shows good attraction of dye particles on the surface of the dyed non-woven fabrics. It was clearly observed and concluded that the AVR obtained excellent absorption of dye particle on the non-woven fabric.

![Figure 2: Areca catechu L. Seed](image)

![Figure 3: FESEM Analysis of Undyed and Dyed ARP and AVR Blend Fabric](image)
EDX Analysis of Dyes Areca catechu L. Fiber

Elemental analysis of biological fiber was done to find out the element present in the dyed Areca Catechu L. fiber. The summary of elements detected in energy-dispersive X-ray (EDAX) present in the dyed Areca Catechu L. fiber. Spectral 3 2583 is used to detect the elements present in dyed Areca Catechu L. fiber. Oxygen (O 8- 22.75), Chlorine (Cl 17 – 5.92 wt%), Sodium(Na 11 – 3.61 wt%), Gold (Au 79-0.58 wt%), Potassium (K 19- 0.58 wt%), Calcium (Ca 20-0.44 wt%), Aluminum (Al 13- 0.16 wt%), Magnesium (Mg 12 -0.01 n wt%), these are all the elements present in the dyed Areca Catechu L. fiber.

Anti-Bacterial Assessment (AATCC 100)

Anti-Bacterial Assessment (AATCC 100), the antibacterial activities of the dyed fabrics were tested according to AATCC 100 against S.aureus and K. pneum. The results show in the percentage reduction of bacteria in K. pneum which is moderate compared to S.aureus bacteria.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Type of Solution</th>
<th>Sample</th>
<th>Zone of Inhibition(Mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>S.AUREUS (ATCC 6538)</td>
</tr>
<tr>
<td>1</td>
<td>Aqueous extraction</td>
<td>DyedAreca fiber</td>
<td>0</td>
</tr>
</tbody>
</table>

The details of the Arecaanut Anti-Bacterial Assessment are shown in above table II.

CONCLUSIONS

The physical and mechanical properties of the non woven fabric were studied. The result showed that Areca Catechu L. with Recycled Polyester(ARP 50:50) showed good result compared to other ratio fabrics ARP 60:40, ARP 70:30, AVR 50:50, AVR 60:40 and AVR 70:30. Hence, the combination of Areca Catechu L. with Recycled Polyester is suitable for the textile application.

Recommendations of further studies are

• The similar study can be done using other regenerated fiber like acetate rayon, cuprammonium rayon.
• Since it has antimicrobial and anti-allergic property this can be developed for medical textile product.
• Using different natural mordants like Alum, Copper sulfate, Ferrous sulfate a study can be carried out using Areca Catechu L.

REFERENCES


AUTHORS DETAILS

Dr. S. Grace Annapoorani, Associate Professor, Department of Textiles and Apparel Design, Bharathiar University, Coimbatore, Tamil Nadu, India. She has a doctorate in Textile and Clothing. She is qualified with UGC NET. She has 15 Years teaching experience. She is specializes in Technical Textile, Fashion Designing. She is the recipient of Dr. Radhakrishna Gold medal award. She has presented an paper in “MEDTEX 07”, International Conference on medical Textile, University of Bolton, United Kingdom. She also visited University of Manchester, United Kingdom. She has published many research articles in international, National journal and e-journals for various universities. She has been invited as chairperson in many conferences and also for giving inaugural speech in department orientation at variousinstitutions. She acts as chairman BOS(PG) in Costume Design and Fashion Academic Council member to various colleges, Member of BOS, Member of Planning Board of Universities and colleges. Her aspiration is to motivate thestudent and improve the odds for retention and success.

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