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Efficacy of Areca Husk and Viscose Blended Needle Punched Fabric

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1.Introduction

Fibres are fundamental units in fabrication of textile yarns and fabrics. The modern word calls for eco-friendly textile product made out of natural Fibre. Plant Fibres from agricultural crops are renewable materials which have potential for creating green products and replacing synthetic materials which are currently being used such as glass Fibre, carbon Fibre and plastic Fibre[1]. Natural Fibres also have attractive technical, economical and environmental advantages[2]. Technical textiles and nonwovens are advanced materials engineered for many functions. They make an important contribution to the protection of our environment[3]. Nonwoven fabrics are engineered fabrics that may be a limited life, single use fabric or a very durable fabric and provide specific functions such as absorbency, softness and strength, flame retardancy, cushioning and filtering. These properties are often combined to create fabrics suited for specific jobs, while achieving a good balance between the product use – life and cost[4].

Needle punch non-woven fabric production line is one kind of methods for producing non-woven fabrics and used in wide range of technical applications areas which extended into many composite products[5]. Nature has abundant fibre sources out of which only few have been found potential textile Fibres which are biodegradable and eco friendly. The attention has been drawn to agricultural products, wastes and derivatives because of its renewability. India is endowed with an abundant supply of "unconventional natural fibres" such as coir, jute, sisal, pineapple, ramie, bamboo and banana, which has focused more on the research and development.

Lignocellulose Fibres offer several advantages over their synthetic Fibre counterparts and available in abundant in nature, renewable raw material, low cost. Viscose staple Fibre is one such Fibre which is soft and silky to the touch, moisture absorbing, sustainable, renewable, biodegradable, non-allergenic, anti-static, easy to dye and excellent at retaining colour brilliance. In the nonwoven sector, viscose staple Fibre provides high absorbency, high purity and bio-degradability, thus making it ideal for use in various technical textile applications.

India is traditionally an areca growing country. Areca nut is an important cash crop in the Western Ghats, Eastern Ghats, East and North Eastern regions of India. Areca plant family is a tall-stemmed erect palm, reaching varied heights, depending upon the environmental conditions. The arecanut separator helps to detach and segregate individual arecanuts from the bunch without damaging the nut and work faster. After areca nut was removed the husk is used as burner or left as waste. Therefore the study on **"Efficacy of Areca Husk and Viscose Blended Needle Punched fabric"** has been under taken with the specific objectives as given below:

* To collect and process areca nut husk and viscose Fibre
* To prepare needle punched fabric with the blend of areca nut husk and viscose Fibre
* To test the needle punched nonwoven fabric and find the suitable technical textile application.

2.Methodology

The areca husk was collected from different place like Thonmamuthur, Pollachi and Kerala, as these places have arecanuts farm. Ten kgs of areca husk (Plate 1) was sun dried for 20 days and stored for one month. From the areca husk, Fibres were separated by doing stagnant cold and hot water retting process. The fibres were evaluated for selecting the suitable stagnant process. Areca husk fibre was blended with viscose fibre and made into a needle punched fabric. The needle punched fabrics were tested to find out the physical properties. The samples were also subjected to absorbency and wettability tests. In addition selected advance nonwoven testing such as Air permeability and pore size of the needle punched fabric was also carried out. SEM analysis was done to find out the web interlocking

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arrangement.

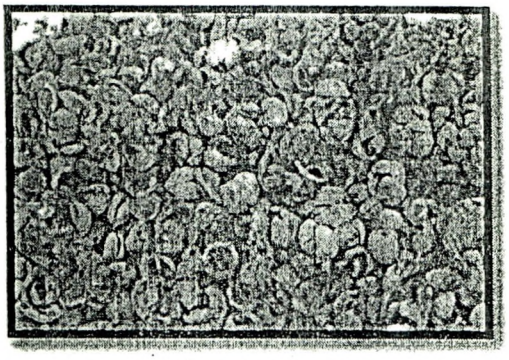

Plate 1 Areca Husk

3.Salient Findings of the Study

3.1 Fibre Extraction Method

From the two methods of extraction followed for the study namely stagnant cold and hot water retting, the cold water retting process was opted, even though it took more time for Fibre extraction, consumed maximum quantity of water. The Fibre quantity was appreciable when compared with hot water retting. The extracted quantity of Fibre is 2.75 kg from 5 kg of areca husk. The visual evaluation reveal that the Fibres extracted through stagnant cold water retting was good in appearance, lustre, bright in colour and texture. The length of the areca husk Fibres was found to be 4-6cms.

3.2 Needle Punched Fabric and its SEM Image

Two different fabric samples A and B were produced out of the retted Fibres. Sample A fabric width is of 20 inches with 300 GSM and Sample B fabric width is of 20 inches with 400 GSM. The swatches of the needle punched fabrics are presented in Plate 2. The entire fabric formation process was carried out at PSG Foundry, Neelambur, Coimbatore.

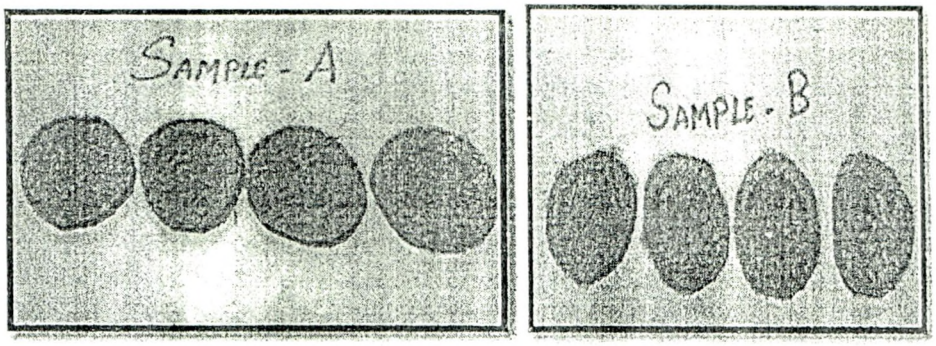

Plate 2 Needle Punched Fabrics

SEM Image of Needle Punched fabric

The SEM image (Plate.2) of the fabrics clearly shows the interlocking of Areca and viscose Fibres was more with the blend of viscose Fibre.

Plate 2 : *Interlocking of the Fibre*

3.3 Properties of Needle Punched Fabric

The elongation of the needle punched fabrics of two different thickness show that the sample B has good elongation along machine direction (2.70 inches) and cross machine direction(2.92) when compared with sample A in machine direction and cross direction. The fabric weight of sample B (5.10) is higher than the sample A (3.53). The fabric thickness of sample B was higher (4.77mm) than sample A (2.47mm). The fabric strength of sample B is more than sample A along machine and cross machine direction. The fabric stiffness of the samples A is 4.48 cms and B has higher stiffness of 5.10 cms compared with sample A. On comparing the sample A and B in abrasion resistant test, it was found that sample B has high abrasion resistance, as it could withstand upto 300 revolutions. Thus it can be used as interlining for packaging process. The bursting strength process was compared for both the samples and found that sample B can with stand the pressure, as it has better thickness than Sample A.

3.4 Absorbency and Wetability of Needle Punched Fabric

TABLE I : *Absorbency and Wetability of Needle Punched Fabric*

S.No	Needle Punched Fabric	Mean Drop Time (Seconds)	Mean Sinking Time (Seconds)	Mean Capillary Rise (Seconds)
1.	A	1.38	19.50	3.44
2.	B	2.66	18.18	4.68

Table I denotes the absorbency and wetability properties of the needle punched fabric. In water absorbency, the drop test was compared with sample A and B. The sample A took lesser time to absorb the water when compared with sample B. The sample B took lesser time to sink into the water when compared with sample A. In water absorbency, the capillary test was compared with sample A and B. The sample A absorbed water faster than sample B. Since the sample A has got good capillary rise, it could be prepared as a capillary mat used as a base for irrigation.

3.5 Air Permeability and Pore Size of Needle Punched Fabric

The sample A needle punched fabric has 98.4 % air permeable nature and the sample B needle punched fabric has 50.7% air permeability. In general, the air permeability decreases with the increase in fabric weight, while with the increase in fabric weight, the fabric becomes thicker as well as denser, resulting in consolidated fabric structure, though the amount of pores increases with the increase in number of Fibres, the pore size become smaller. This result reported that the air permeability is decreased with the increase in fabric weight of sample B when compared with sample A. This was an investigative study proposed for utilizing waste Fibre for developing inexpensive disposable filtration media for air filtration. Thus the sample A has higher air permeability and pore diameter micron, so it can be used as filters according to the pore size microns, such as typical atmospheric dust (0.001 to 30 microns), mold spores (10 to 30 microns), oil smoke (0.03 to 1 micron) and tobacco smoke (0.01 to 1 micron) process

in automobile industry. (Table II)

Table II :Air Permeability and Pore Size of Needle Punched Fabric

S.No	Needle Punched Fabric	Air Permeability (c.c/cm.sq./sec.)	Flow Pore Diameter (Microns)	Bubble Point Diameter (Microns)
1.	A	98.4	50.2	184.1
2.	B	50.7	40.3	118.1

From the Table II, it is also evident that the sample A has high pore diameter of 50.2 and bubble point diameter of 184.1. whereas the sample B has pore diameter of 40.3 microns and a bubble point diameter of 118.1. Thus sample A is applicable for automotive filter cloths. When compared with the properties of automotive cotton filters, the needle punched fabric made of areca husk Fibre and viscose combination has similar properties with strong air and water permeability, firm and durable, easy for removal and flame retardant.

4.Conclusion

India being a tropical country with abundant of renewable recourses obtained from plant and the second largest producer of Fibre in the world. Areca husk fibre is blending well with viscose fibre resulted in a usable non woven fabric. The areca husk and viscose fibre blended fabric possess appreciable physical properties besides having an excellent wettability and absorbency property. The fabric can be utilized for selected technical textile application as it has got good pore size. Utilization of non conventional fibre for technical textile applications proved to be worth experimenting.

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