Development of Non-Woven Fabric by Using Helicteres Isora Fiber and Recycled Cotton for Textile Application

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Abstract-Textile refers to any material made of interlacing fibers or Yarns. The yarn is produced by spinning raw fibres of wool, flax, cotton, or other material to produce long strands. Textiles are formed by weaving, knitting, crocheting, knotting, or pressing fibers together (felt). The related words "fabric and "cloth" and "material" are often used in textile assembly trades (such as tailing and dressmaking) as synonyms for textile. The subtle differences in these terms in specialized usage. A textile is any material made of interlacing fibers, including carpeting and geotextiles, which may not necessarily be used in the production of further goods, such as clothing, and upholstery.

Keywords: **textile, dressmaking, fibres, upholstery**

1. INTRODUCTION

A fabric is a material made through weaving, knitting, spreading, felting, stitching, crocheting
or bonding that may be used in the production of further products, such as clothing and upholstery, thus requiring a further step of the production. Cloth may also be used synonymously with fabric, but often specifically refers to a piece of fabric that has been processed or cut. The word 'textile' comes fromthe Latin adjective textilis, meaning 'woven', which itself stems from textus, the past participle of the verb texere, 'to weave'. Originally applied to woven fabrics, the term "textiles" is now used to encompass a diverse range of materials, including fibres yarns, and fabrics, as well as other related items. Textiles have an assortment of uses, the most common of which are for clothing and for containers such as bags and baskets In the household, textiles are used in carpeting, upholstered furnishing, window, shades, towels, coverings for tables, beds, and other flat surfaces, and in art. In the workplace, textiles can be used in industrial and scientific processes such as filtering. Miscellaneous uses include flags, backpacks, nets handkerchiefs, cleaning rags, transportation devices such as balloons, kites, sails. And parachutes; textiles are also used to provide strengthening in composite material, such as fibreglass and industrial geotextile Textiles are used in many traditional hand crafts such as sewing, quilting and embroidery. Textiles produced for industrial purposes, and designed and chosen for technical characteristics beyond their appearance, are commonly referred to as technical textile. Technical textiles include textile structures for automotive applications medicaltextile (such as implants), geotextile (reinforcement of embankments), geotextiles (textiles for crop protection), protective clothing (such as clothing resistant to heat and radiation for fire fighter clothing, against molten metals for welders, stab protection, and bullet proof vests). Due to the often highly technical and legal requirements of these products, these textiles are typically tested in order to ensure they meet stringent performance requirements. Other forms of technical textiles may be produced to experiment with their scientific qualities and to explore the possible benefits they may have in the future. Threads coated with zinc oxide nanowires, when woven into fabric, have been shown capable of "self-powering nano systems", using vibrations created by everyday actionslike wind or body movements to generate energy. Natural fibre, any hairlike raw material directly obtainable from an animal, vegetable, or mineral source and convertible into nonwoven fabrics such as felt or paper or, after spinning into yarns, into woven cloth. A natural fibre may be further defined as an agglomeration of cells in which the diameter is negligible in comparison with the length. Although nature abounds in fibrous materials, especially cellulosic types such as cotton, wood, grains, and straw, only a small number can be used for textile products or other industrial purposes. Apart from economic considerations, the usefulness of

a fibre for commercial purposes is determined by such properties as length, strength, pliability, elasticity, abrasion resistance, absorbency, and various surface properties. Most textile fibres are slender, flexible, and relatively strong. They are elastic in that they stretch when put under tension and then partially or completely return to their original length when the tension is removed. The use of natural fibres for textile materials began before recorded history. The oldest indication of fibre use is probably the discovery of flax and wool fabrics at excavation sites of the Swiss lake dwellers (7th and 6th centuries BCE). Several vegetable fibres were also used by prehistoric peoples. Hemp, presumably the oldest cultivated fibre plant, originated in Southeast Asia, then spread to China, where reports of cultivation date to 4500 BCE.The art of weaving and spinning linen was already well developed in Egypt by 3400 BCE, indicating that flax was cultivated sometime before that date. Reports of the spinning of cotton in India date back to 3000 BCE. The manufacture of silk and silk products originated in the highly developed Chinese culture; the invention and development of sericulture (cultivation of silkworms for raw- silk production) and of methods to spin silk date from 2640 BCE.

1.1 OBJECTIVES:

➢ To select isora plant into fibre by three ratios.

➢ To select recycled cotton for blending with isora fibre.

➢ For non-woven application for three ratio as 80:20,60:40,70:30.

➢ To identify the methods of testing air density, bulk density, thickness, tensile strength, abrasion moisture content for isora recycled cotton.

➢ To evaluate the physical, mechanical and noise reduction for isora recycledcotton

➢ To finalize the fibre extraction process of kai un fibre using three ratios.

2. MATERIALS AND METHOD

2.1 Extraction of Natural Fibre

There are three major fiber extraction methods: mechanical extraction, chemical extraction and retting process. After extraction of fibers by any of these methods, all extracted leaves are washed away before drying. Proper drying is important as the moisture content in fiber affects fiber quality. Fibres can be removed from the plant stems by retting. In field retting, the plant stems are cut or pulled up and left to rot in the field where microbial action breaks down the stalks. In water retting, stems are immersed in water. retting, process employing the action of bacteria and moisture on plants to dissolve or rot away much of the cellular tissues and gummy substances surrounding bast-fibre bundles, thus facilitating separation of the fibre from the stem. Natural fibres can be classified according to their origin. The vegetable, or cellulose-base, class includes such important fibres as cotton, flax, and jute. The animal, or protein-base, fibres include wool, mohair, and silk. Some known methods of extracting fiber from plant sources include dry processing, wet processing, chemical, gravimetric, enzymatic, physical, microbial, or a combination of these methods.

Recycled Cotton

Recycled cotton can be generally defined as converting cotton fabric into cotton fiber that can be reused in textile products. Recycled cotton is also commonly referred to as regenerated cotton, reclaimed cotton, or shoddy. Cotton recycling is the process of converting cotton fabric into fibers that can be reused into other textile products Recycled cotton is primarily made from pre-consumer cotton which is excess textile waste from clothing production It is less commonly made from post-consumer cotton which is discarded textile waste from consumers such as second-hand clothing. Researchers and governments are looking for new technologies and industrial management solutions to improve the social impact of the collection processes for recycled cotton.

Fabric Preparation of Non-Woven

The various methods for bonding are:

➢ Adding an adhesive.

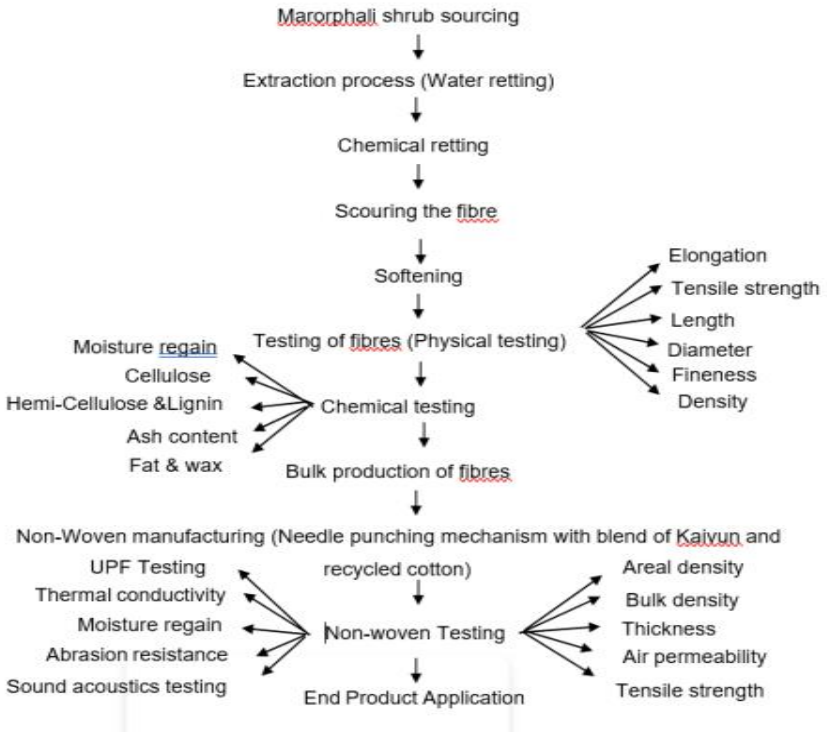
➢ Thermally fusing the fibres to each other or to the other melt able fibres or powders.

➢ Fusing fibres by first dissolving, and then re-solidifying their surfaces.

➢ Creating physical tangles or tuft among the fibres.

➢ Stitching the fibres or filaments in place

Flowchart



Marorphali shrub sourcing

Marorphali shrub is been sourced outskirts of Salem. The stem's skin is been peeled off and that has been taken for further process. The shrub is all over the place so the availability of the shrub is high. This shrub has many medical benefits also which can be used for antimicrobial finishes, anti-bacterial finishes and all. Now this fiber is been used for making nets, ropes and so on. But this can be used for textile because this has good durability, strength and also high moisture regain when compared to other natural bast fibers.

3. EXTRACTION PROCESS

3.1 Water retting

Water retting is a type of retting process in which the stalks of fiber plants are immersed in cold or warm, slowly renewed water, for 4 days to several weeks.

Procedure

Water retting process was tried out for a sample amount of 150 grams. The MLR ratio was taken as 1:60 and duration of 2 weeks period was choosenfrom the water retting process which is generally for a bast fibre. The top dry epidermis layer of stem was stripped before water retting process foreasier separation of fibres. The sample was about 110 grams after removing the top scaly layer. After the retting process the stem is been removed from water and been cleaned with warm water and been squeezed to remove the water. Then the fibre is been beaten up by the hammer or any weight material and then it has been kept into open air. After 2 weeks period of water retting, the fibres gets stripped off easily from the stem and there was a weight loss of about 41.5 grams.

Water retting details

Mlr Ratio

MLR ratio (Material: Liquor) - 1:60 (i.e., 60ml of water for 118 gram of fibre)Amount of water taken for 150 grams of fibre -

110*60 = 6.6 liters of water.

Temperature: Room temperature Duration: 2 weeks (14 days) FIBRE

WEIGHT DETAILS

Weight of fibre taken before stripping the epidermis stem layer - 150 grams.

Weight of fibre after stripping the epidermis stem layer -110 grams.

Weight of fibre after water retting for 2 weeks (14 days) - 68.5 gram

Chemical retting

Chemical retting involves immersion of the dried plants in a tank with a solution of chemicals, such as sodium hydroxide, sodium carbonate, high pH agents, pectin lytic enzymes or mineral acids. The fibers are loosened in a few hours, but close control is required to prevent deterioration and damageto the fibres.

Procedure

For chemical retting process, the sample weight was taken as 150 grams and after stripping the top scaly epidermis layer, the weight was about 105 grams.

Then, MLR ratio 1:60, and the chemicals used were sodium hydroxide (NaoH-5%) and sodium carbonate (Na2CO3-5%) was chosen from general chemical retting procedure of bast fibres. The time was fixed as 90 minutes and temperature was fixed as 60*c. After chemical retting process, the fibre was washed with acetic acid (CH3COOH- 2%) in order to remove the sticky nature of fibres since they are treated with NaOH and Na2CO3 and also to neutralize the fibres. Here, there was a weight loss of about 44.5 grams which is higher than in water retting and the fibres are stripped off well in chemical process than water retting.

Chemical retting details

MLR RATIO

MLR ratio (Material: Liquor) - 1:60(i.e., 60ml of water for 119 gram of fibre)Amount of water taken for 150 grams of fibre - 150*60 = 9 liters of water

CHEMICALS USED

Chemical weight calculation – (concentration/100) * fibre weightSodium hydroxide (NaOH) - 5% concentration - (5/100) *150- 7.5 gramssodium carbonate (Na2Co3) – 5% concentration – (5/100) *150 – 7.5 gramsacetic acid (CH3COOH) – 2% concentration – (2/100) *150 – 4ml (used for neutralization)

Temperature: 60*C Duration : 90 MINUTESFIBRE

Testing of Fabrics

The prepared nonwoven fabrics are tested for the physical properties such as areal density(ASTM D 3776),bulk density, thickness (ASTM D 5729), air permeability (ASTM D 1776-90), ,tensile strength(ASTM D 2832),abrasion resistance(ASTM D 4886- 10) ,moisture regain(ASTM D444).

4.RESULT AND DISCUSSION

Area density:

1. Sample (Kaivun Recycled Cotton) Areal Density (G/M2)

sample 1 (80:20) 1386
sample 2 (70:30) 1364
sample 3 (60:40)1360

2. Bulk Density of the fabric

Sample (Kaivun Recycled Cotton)Bulk Density (Kg/M3)
sample 1 (80:20) 128.12
sample 2 (70:30) 131.06
sample 3 (60:40)134.44

3. Thickness tester in mm

Sample (Kaivun Recycled Cotton)
Thickness(Mm)
sample 1 (80:20) 9.88
sample 2 (70:30) 9.15
sample 3 (60:40)9.62

5.SUMMARY AND CONCLUSION

The summary and conclusion pertaining to the study entitled “Development of textile non-woven by using newly extracted fibre kaivun plant bast with recycled cotton” Kaivun fiber is a useful natural fiber – yielding perennial shrub. It grows as an under shrub in regions where there is a high rainfall. The fibre can be extracted easily and could be used for various purposes. Large scale cultivation of this perennial plant would ensure a continuous supplyof useful fibre which compares favourably with jute. Nonwoven industry brings a wealth of advantages to people throughout the world by providing the superior products. And the large scale of continuous supply uses of fibre in large production. It can be compared with jute and it is also used for great value. Kaivun fibre are valuable cost that are extracted from the plant to fibre. Retting process of high quality of fibre are in the three major fibre extraction methods mechanical chemical and retting process. A fabric is a material made through weaving, knitting, spreading, felting, stitching, crocheting or bonding that may be used in the production of further products, such as clothing and upholstery, thus requiring a further step of the production. A natural fibre may be further defined as

an agglomeration of cells in which the diameter is negligible in comparison with the length. Most textile fibres are slender, flexible, and relatively strong. They are elastic in that they stretch when put under tension and then partially or completely return to their original length when the tension is removed.

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