Fabrics Produced from Sansevieria Roxburghiana

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Processability and Properties of Fabrics Produced from Sansevieria Roxburghiana L. Fibre and their blends with cotton

Sansevieria roxburghiana fibres were extracted from the leaves by decortications method. The fibres were blended with cotton and processed on the ring and jute spinning system. The produced yarns were converted into plain woven fabrics using handloom. The woven fabrics were analyzed for its mechanical and tensile properties.
It was observed that the blending of Sansevieria roxburghiana and cotton fibres improved the feel and comfort properties of the fabric.

Figure 1: Sansevieria roxburghiana plant

Now-a-days environmental issues are becoming vital factors during the selection of consumer goods allover the world remark Vasugi and Kanimozhi, 2011. Renewable resources are gaining popularity among the people due to their positive effects on agriculture, environment and economy. Thus the use of regenerating raw materials in industry could reduce this environment impact. Natural fibres being biodegradable are now considered as serious alternative to synthetic fibres for use in various fields.

India being a tropical country has wide range of plant sources which yield valuable fibres opine Kanimozhi and Vasugi, 2012. World wide there are more than 12 varieties of Sansevieria species present in different continents of which S. cylindrica and S. roxburghiana are commonly found says Kanimozhi, 2011. S. roxburghiana Fig.1 belongs to the family liliaceae. It is a xerophytic perennial shrubby plant with nearly 8 to 12 leaves in a cluster regard Kanimozhi and Vasugi, 2012. The flowers appear from the month of august - December in pale green tinged with violet colour. It appears in fascicles of 3-6 on 30-60cm long racemes. The fruit is a globose berry with 1 - 3 seeds ripening outside the pericarp.

Experimental procedure

Selection of plant

The S. roxburghiana leaves were collected from the waste lands in and around Salem district, Tamilnadu. The fibre is extracted from the leaves by eco-friendly decortication method. The leaves of same length of 3 - 4 numbers were fed between the drum and backing plate of the decorticator thus removing the pulp from the fibres. Finally the fibres were dried Fig. 2.

Figure 2: Sansevieria roxburghiana fibre

Steps involved in yarn preparation
Attempts were made to spin the S. roxburghiana fibre in various spinning systems. Finally 100% S. roxburghiana fibre yarn was produced using jute spinning system. S. roxburghiana fibre: cotton in 50:50 and 30:70 ratio were spun in ring spinning system. The various steps under yarn preparation are combing, roving and hand spinning.

Combing of the fiber
The extracted fiber has been combed to remove the short fiber Doraiswamy etal., 2007. In this process the fibers were combed against iron nails fixed to a wooden board to make the fiber parallel. The combed fibers were softened by spraying mineral oil and emulsion thus imparting cohesion to fibers.

Roving and spinning
The combed fibers were roved into sliver. The sliver is reduced to the required size by drafting and twisting. The yarn is finally wound onto a cone.

Selection of fabric formation
Due to yarn unevenness it is not possible to use power loom for weaving. Hence the produced yarn was made into a plain woven fabric using a handloom. In both warp and weft direction same yarn was used.

Testing of fabrics

Strength and elongation
The breaking strength and elongation were measured by cut strip method suggest Angappan and Gopalakrishnan, 1993. The samples were tested for tensile strength in Eureka cloth tensile strength tester. 10inches x 2inches specimen from each fabric samples were cut both in warp and weft directions. The specimen was placed between the upper and lower clamps. The dial reading was set to zero by adjusting the pendulum over the quadrant scale. The elongation pointer was checked for its position in zero. Before starting the machine the pendulum lock was released and machine was switched onto run. When the fabric started to break the machine was switched off and the dial reading in kilogram was noted. Elongation reading was recorded from the elongation scale. The specimen was removed and the machine positioned back to its original. Five specimens of both the directions for each sample were tested and the readings were noted as mentioned in ASTM D 5035.

Fabric weight and thickness
The weight of the fabric was measured by ASTM test method D 3776. Using GSM cutter the fabric were cut and weighed in a calibrated electronic balance. Fabric thickness was determined in accordance with test method ASTM D 1 777 2002. Thickness gauge was used to test fabric thickness. The samples were placed on the anvil plate and the lever of the pressure foot released slowly. Thus the thickness was indicated in the dial.

Stiffness and abrasion
Resistance to bending or flexural rigidity is defined as flex stiffness. This property can influence the aesthetic appearance as well as the comfort of a fabric. The bending length is a measure of the interaction between fabric weight and fabric stiffness in which a fabric bends under its own weight. The stiffness was measured using Eureka stiffness tester following ASTM D 1388. Abrasion is one of the major criteria to assess the

durability of the fabric. It was analyzed using Martindale abrasion resistance tester. For calculating the abrasion resistance of the samples ASTM D 3884 standard was followed.

Nomenclature

The nomenclature used for various samples were given in Table 1.

Table 1: Nomenclature

Sample	Nomenclature
S. roxburghiana fibre 1 00%	5
S. roxburghiana fibre: Cotton; 50: 50	SC
Cotton: S. roxburghiana fibre; 70: 30	Cs

Results and discussion

Evaluation of the fabric

The parameters like strength, elongation, weight, thickness, abrasion and stiffness were studied for the fabrics.

Tensile properties

From Fig. 3, it is seen that, the mean strength of 100 % S. roxburghiana fabric was found to be more both in warp and weft direction when compared to other samples. This is due to the reason that s. roxburghiana fibre is stronger than cotton fibre because of high hemicellulose content present in the fibre. Both the s. roxburghiana fibre blended fabric has nominal strength.

The mean elongation of the samples 5, Sc, Cs along warp direction were 1.46, 21.37 and 19.01 % respectively which depicts that the elongation increases for SC sample when compared to 5 sample since 100 % S. roxburghiana fibre lacks elongation when compared to other samples due to its lignin content. The sample Cs has medium elongation when compared to all the samples Fig. 3. The fabric elongation in weft direction shows decrease in the reading when compared to the warp direction for all the samples.

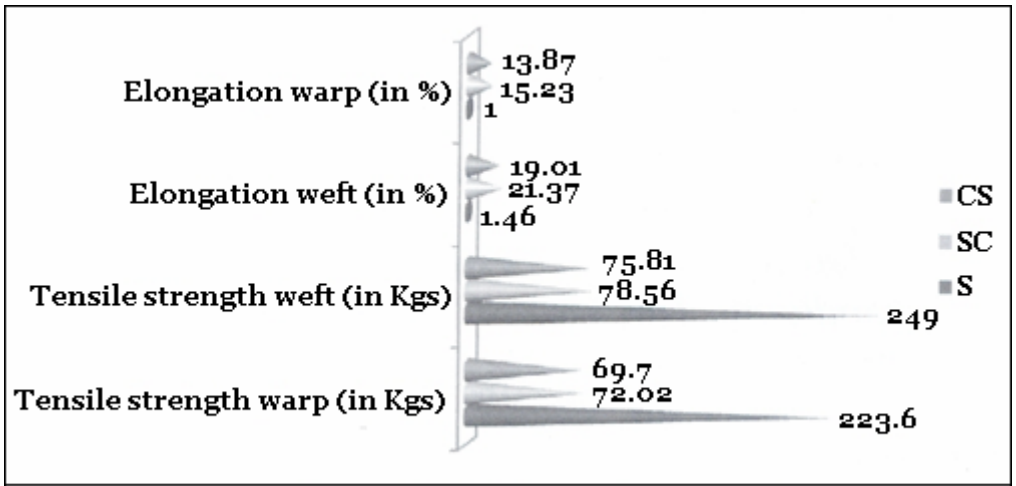

Figure 3: Fabric tensile properties

Physical properties

The thickness of the samples was shown in Fig. 4, which reveals that the mean thickness of the samples decreases with decrease in S. roxburghiana fibre percentage of the fabric. This is due to the fact that s. roxburghiana fibre has high diameter value of 278 µm when compared to cotton fibre.

The weight loss due to abrasion among the samples after 2500 cycles was minimum for cent percent S. roxburghiana fabric which was shown in Fig. 4. As the percentage of S. roxburghiana fibre starts decreasing in the blends the material resistance to abrasion was also decreasing.

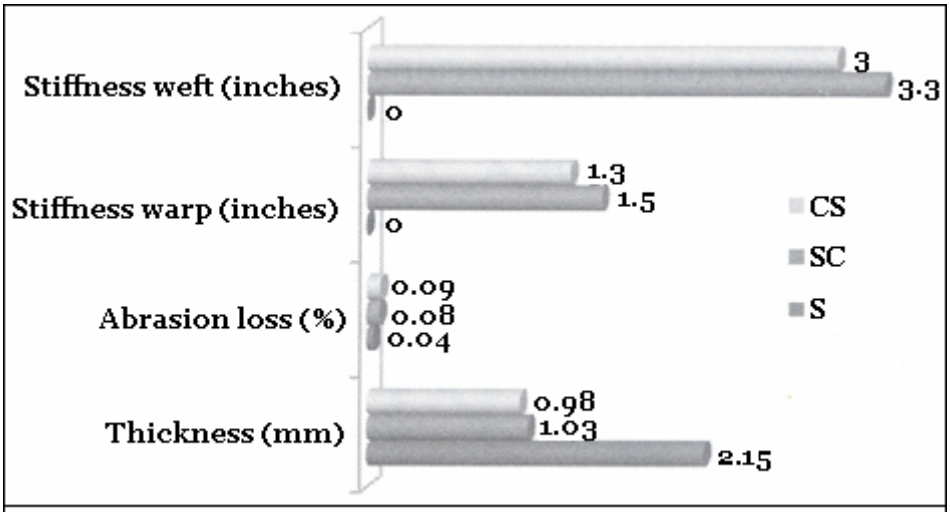

Figure 4: Fabric properties

It appears from the results given in Fig. 4 the bending length of cent percent S. roxburghiana fibre exceeds the stiffness limit due to low crimp of the fibre. The bending length along both warp and weft direction of the fabrics decrease as the percentage of S. roxburghiana fib1e was reducing in the fabric.

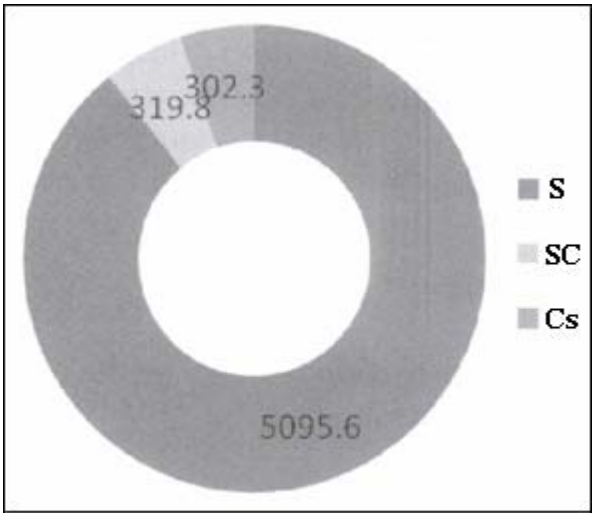

Figure 5: Fabric weight in mg

From the Fig. 5 it is clear that the mean weight of the cent percent fabric was recorded as 5095.6 mg which indicates that S. roxburghiana yarn is bulky due to the rough texture of the fibre when compared to the cotton blended fabrics. The GSM of samples SC and Cs have slight variation between them.

Epilogue

Sansevieria roxburghiana fibres are natural, biodegradable, cost effective, ligno cellulosic fibres with good strength and high length to breadth ratio which makes it suitable for

fabrication. It is found that S. roxburghiana fibres are compatible with cotton and are processable on jute and ring spinning system depending upon their blend ratio. The yarns were converted into fabrics using hand loom. Tensile properties reveal that 1 00% S. roxburghiana fabric has good strength with low elongation value when compared to its blends. Thus has a wide range of application in geo textiles, agro textiles as mulching and automobile textiles as composites for acoustic purpose, etc. The sample SC has good elongation with nominal strength which can be used in home textiles such as table mat, curtains, door mat, runners and as furnishing materials. The sample CS has smooth texture with good elongation hence finds its application in apparel as over coat during winter.

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