A STUDY ON DEVELOPMENT OF BANANA FABRICS FROM ITS PSEUDOSTEM FIBERS

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ABSTRACT

Banana fiber which obtained from the pseudo-stem of banana plant is a lingo-cellulosic bast fiber with relatively good mechanical properties and it has good specific strength properties comparable to those of conventional material. Banana fibers have high strength, light weight, smaller elongation, fire resistance quality, strong moisture absorption quality, great potentialities and biodegradability. Banana fiber has recognized for apparels and home furnishings. These fibers can be explored to develop various technical textiles which are the need of the hour. Therefore, banana fibers are chosen for this study and various properties of the developed composites are explored.

Keywords: Banana fiber,Cellulose,Technical textiles

INTRODUCTION

Mankind has been strongly dependent on plant fibers for all kind of purposes. The usage of natural fibers has been reported from earlier days and they have served a wide range of uses (Preethi and Balakrishna Murthy, 2013). The recent arrival of synthetic products is being looked over the natural once as they are readily available and its low cost. But the biggest problem with these synthetic fibers is that they harm the nature by causing serious pollution as they are non-degradable. Among the natural fiber known to man, banana is one of the earliest and important fruit crops cultivated by man in tropical parts of the world. Banana farming generates a huge quantity of biomass which goes as a waste due to unavailability of suitable technology for commercial utilization. This biomass is usually used as animal fodder and for fuel. India has about 8.3 lakh ha under banana cultivation according to the Indian Horticulture Database, 2011, producing approximately 51.18 million tons of pseudostem waste per year. This can be profitably used for extracting approximately 3.87 million tons of fiber. Apart from being food fruit crop, banana plant also serves as a source of various commercial products with respect to its utilities due to its versatility. Banana fibers are made of cellulose (43.6%), hemicellulose (14%), lignin (11%) and other substances (such as pectin, wax, and 31.4%) (Kumar and Kumar 2011).

OBJECTIVES

- To extract the fibers from Banana pseudostem .
    - To characterize the banana fibers.
    - To develop fabrics from fibers.
    - To physical and chemical properties of banana fabrics.

METHODOLOGY

PROCUREMENT OF RAW MATERIALS

Banana fabric was purchased from Ecostar unit, TNAU, Coimbatore, India. Polyester (200 GSM), Polyurethane (100 GSM) and Polypropylene (300 GSM) were purchased from PSG COE, Neelambur, Coimbatore, India.

PRETREATMENT OF FIBERS (BANANA FIBERS)

TREATMENT OF BANANA FIBERS

The procured banana fibers were pretreated with NaOH at various concentrations ranging between 0.5% to 7.5% at 100ºC for one hour at a pH of 12. Later the samples were cooled and rinsed 8-10 times with distilled water and dried at 50°C for 45 min in oven. The procedure was repeated if the fibers were not processed properly.

FROM FIBERS TO FABRICS – HANDLOOM WEAVING

Weaving is done by intersecting the longitudinal threads, the warp, i.e. "that which is thrown across", with the transverse threads, the weft, i.e. "that which is woven". The major components of the loom are the warp beam, heddles, harnesses or shafts shuttle, reed and take up roll. In the loom, yarn processing includes shedding, picking, battening and taking-up operations which are the principal motions.

Banana fabric were processed in handloom weaving, Erode, India.

CHARACTERIZATION OF THE SYNTHESIZED FABRICS

PHYSICAL TESTING OF BANANA FABRIC

PILLING RESISTANCE (ISO-12945-1-2001)

According to Gokarneshan et al (2011), the pilling resistance of the samples was measured using ICI Pill box tester using ISO-12945-1-2001 test method with standard abrading surface. This test method covered the resistance to the formation of pills and other related surface changes on textile fabrics.

The Pilling tester ISO-12945-1-2001 (plate -27) was used to measure the pilling resistance of the fabric. All tests were done in the standard atmosphere for testing textiles. Three specimens, all from the same sample, were placed and about 25 mg of 6-mm (0.2-in.) denim fabric into the test chamber. The chamber was covered, and the timer set for a running time of 30 min. the motor was switched “ON,” the “START” button pushed, and the air flow started. During the course of the run, each test chamber was checked at frequent intervals. If a specimen wedged around the impeller without tumbling or remained inert on the bottom or side of the chamber, the air was shut off, the machine stopped, the faceplate removed, and the specimen freed. Any hang-ups or other abnormal behavior of the specimens were recorded on the data sheet. When a specimen wedged around the impeller during arum, the test was stopped, the impeller blade was cleaned as directed, after each time run, each specimen was removed and the excess fiber that was not actually entangled in pills was cleaned away with the vacuum cleaner. The specimen was firmly grasped by a corner and all specimens were vacuumed in this manner. The test chamber was vacuumed .the shaft of the impeller was cleaned, using a sharp instrument, such as a pick needle to remove trapped detritus.

For evaluation, each specimen was placed on the double-faced tape in the viewing cabinet. Using the viewing apparatus and options selected subjectively, the appearance of the fabric of each specimen was rated, using the following scale. 5- no pilling, 4-slight pilling, 3-moderate pilling, 2-severe pilling, 1-very severe pilling.

Pilling Resistant

Resistance (ISO-12945-1-2001)

Box method (After 1800 revolutions. i.e. after 5 hrs)

S.No.	Resistance (Avg. rating)
1.	4

Remarks:

1- Very severe; 2 – Severe; 3 – Moderate; 4 - Slight; 5 – No

MEASUREMENT OF FABRIC WEIGHT (ISO 3801:1997)

The weight of the fabrics was measured as mass per unit which were expressed in grams per square meter, describes ISO 3801:1997 pointed out that the weight per unit area can be used as one of the qualities for defining the structure of fabric. The samples were cut using a template of 25 cm X 25 cm. Then the weight of the sample was measured using an Ohaus Adventure Balance. From this the weight of sample in grams per square meter was calculated by using the expression given below.

Grams per square meter (GSM) = Weight of samples X 16 (25 cm X 25 cm)

Grams/ Sq. Meter (GSM) (ISO 3801:1977)

S.No.	GSM
1.	65.0

MEASUREMENTS OF YARN COUNT (TC/LAB/TM-02)

Yarn count were measured on Statex yarn count system which is a combination of electronic balance and computer, Using this system, readings were taken from the yarn samples and the mean value was calculated.

Count of Yarn Removed from fabric (TC/LAB/TM-02)

S.No.	Count of Yarn Removed from fabric	
1.	Count Warp	78.1 D
2.	Count Weft	76.3 s Ne

RESULTS

The fabrics and fibers used for the study were procured and processed before the use. The obtained banana fibers were pre-treated with various concentration of sodium hydroxide for removing the components that hinder is activity. Among, various concentrations used 5 % of NaOH showed better yield and better processed

fibers. The pretreated fibers were then weaved using handloom weaving and it was done at Erode, which was used for the study. Weaved fabric was characterized physically and chemically. The physical parameters such as pilling resistance, fabric weight measurement, measurements of yarn count, twist per inch measurement, tensile strength, measurement of fiber strength and elongation and scanning electron microscopy were performed and the results are as follows. The score of pilling resistance was 4 which appeared to be slightly pilled. The fabric weight was found to be 65.0 Grams/Sq. Meter. The yarn count was measured in which the wrap count was found to be 78.1 D and weft count was found to be 76.3s Ne.

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