researchartiCle | International Journal of Plant Sciences, (July to December, 2009) Vol. 4 Issue 2 : 444-445

Bioprospecting of plants fibre of Coimbatore district of TamilNadu

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Accepted : April, 2009

SUMMARY

Certain plant fibre sample in and around Coimbatore showed that factors tensile strength,length, diameter, estimation of lignin, cellulose, pectin were found that *Sanseveria trifasciata* showed maximum yield and quality of plant fibre as compared to other plants.

Key words : Fibre, *Sanseveria trifasciata*, Tensile strength, Breaking load

Natural fibers are produced by plant, animal and insect sources. Plant fibers are extracted from stem, leaves and the inner bark of fruit/seed crop. Plant fibre is long narrow tapering cell, dead and hollow at maturity, thick cell wall composed mostly of cellulose and lignin, rigid for support, found mainly in vascular tissue. In general, plant fibres can be grouped into two categories: soft fibres and hard fibres. Most soft fibres come from the bast portion of the plant, also called the phloem fibre e.g. hemp, flax, jute and ramie. Hard fibres are comprised not only of the phloem but also partly of the hardened wood core of the plant *i.e.* xylem e.g. sisal, agave, fibre banana and diverse palms. Plant source of fibre include cotton, hemp, kenaf, ramie, sisal, flax, linen, lime, jute, sea grass and abaca. The aim of the project is to study the plausibility of unconventional properties of fibers are characterized. The plants chosen for the present study are: *Canana indica, Agave americana, Calotropis gigantea, Helianthus annus, Zea mays, Abutilon indicum, Sanseveria trifasciata, Cissus quadrangularis, Hibiscus rosasinensis, Annas comosus, Borassus flabellifer.*

MATERIALS AND METHODS

The above mentioned plant materials were used for the extraction of fibers and to study their physical and chemical properties. The plant materials (100g) were taken and cut into equal pieces (25cm long). It was immersed in a container containing 2 liters of tap water and allowed to retting process for 3 weeks and cleaned to extract the fibres. It was allowed to dry and the dry weight was taken. The dried fibre was scrapped off to remove the outer portions and green tissues, so as to extract the fibre (Sharma, 1996).

In physical properties, the length of the fibre was measured using a ammeter scale, 10 samples were selected and observed. The diameter of the fibre was calculated using the ocular meter. Tensile strength was expressed in terms of the length in kilometers of the fibre, which breaks under its own weight; this is termed as the breaking length. As the tension or weight is increased, the fibre is stretched or extended until it finally breaks and the amount of extension expresses as a percentage of the original length of the fibre is known as the percentage extension at break *i.e.*, elasticity. In biochemical analysis, estimation of cellulose was followed by Updegraff (1969)method, Zadrazil and Brunnert (1980) method was used for the lignin estimation, Maynard (1970) method for crude fibre estimation.

RESULTS AND DISCUSSION

Utilization of plant fibres for generating employment in rural sector is cost effective and ecologically sustainable. India has a vast resources for different natural fibres *viz.*, jute, sisal, banana, coir etc., which are abundantly available in many parts. Presently the production of natural fibres in India is more than 400 million tones (Rai and Jha, 2004).

The features of the fibre plant such as weight, length, diameter and tensile strength were found in the *Canna indica* (Stem and Laef), *Agave americana*, *Calotropis gigantea*, *Helianthus annus*, *Zea mays*, *Abutilon indicum*, *Sanseveria trifasciata*, *Cissus quadrangularis*, *Hibiscus rosasinensis*, *Ananas comosus* and *Borassus flabellifer*. By applying retting process with above-mentioned plants yield of fibres were recorded. Fibres were analyzed with various dimensions. The final yield of fibre plant determined after retting process, the maximum capacity of yields 18.10g and 16.40g in *Zea mays* and *Calotropis gigantea*, respectively

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Table 1 : Physical and Biochemical analysis of plant fibers

Name of the plant material	Plant part used	Weight (gm)	Length (cm)	Diameter (µm)	Tensile strength (kg)	Cellulose content %	Lignin %	Ash content %	Crude fibre %
Canna indica	Stem	14.60	25	120	1.11	18.4	16	0.22	7
Agave americana	Leaf	11.18	25	150	2.14	6.2	6	0.25	5
Calotropis gigantea	Stem	16.40	23	135	1.40	12.0	68	0.19	5
Helianthus annus	Stem	15.50	24	120	0.88	9.6	38	0.21	12
Zea mays	Leaf	18.10	25	90	4.0	18.0	22	0.24	7
Abutilon indicum	Stem	15.44	25	135	1.05	14.0	16	0.23	3
Canna indica	Leaf	13.58	25	150	0.99	11.6	14	0.19	5
Sanseveria trifasciata	Leaf	15.32	25	120	2.65	13.2	4	0.22	8
Cissus quadrangularis	Stem	13.2	22	105	1.44	16.6	46	0.23	8
Hibiscus rosasinensis	Stem	15.59	25	135	1.04	17.6	78	0.26	9
Ananas comosus	Leaf	11.14	25	105	2.02	8.4	6	0.20	7
Borassus flabellifer	Petiole	10.24	23	120	1.32	17.0	8	0.24	6

followed by *Hibiscus rosasinensis* (15.59 g). The length of the fibre more over equal to all plants expect *Cissus quadrangularis* (22cm), *Borassus flabellifer* and *Calotropis gigantea* are 23 cm. *Cissus quadrangularis* and *Ananas comosus* was showed that the minimum diameter 105µm when compared to others. Tensile strength of fibers was studied and *Sanseveria trifasciata* showed maximum strength (2.65 kg). The fibers are predominantly composed of cellulose and varying proportions of hemicellulose, lignin, pectin, protopectin and tannin. Lignin is the main constituent of fibre, responsible for its stiffness. Partial removal of pectin and lignin was observed from the fibre prepared after retting process. It reveals that cellulose content 18.4% in *Canna indica* (stem) followed by *Hibiscus rosasinensis* (17.6%) maximum 78% lignin content was observed in *Hibiscus rosasinensis* and minimum lignin content (6%) in *Agave americana* and *Ananas comosus*. The content of crude fibre was maximum (12%) in *Helianthus annus* followed by *Hibiscus rosasinensis* (9%) in *Hibiscus rosasinensis* under chemical treatment (Table 1).

Low density, low cost, environmentally harmless and good mechanical properties of natural fibers attracted the attention of scientist and engineers and many attempts have been made to prepare and evaluate natural fibers for various application.

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