SHORT COMMUNICATIONS

Physical Properties of Date-Palm Leaf Fibre

S K Ghosh, S C Saha and P Mojumder
Jute Technological Research Laboratories, 12 Regent Park, Calcutta 700040, India

Received 7 October 1985; revised and accepted 25 November 1985

The average fibre length, tensile strength, fineness and cross-sectional features of the raw fibres of date-palm leaf were studied. The length, breadth, lumen size and length/breadth ratio of the ultimate fibres were determined. Crimp frequency and crimp percent of alkali-treated fibres were also determined. The ultimate fibres were of higher length but of lower breadth than those of high-quality jute fibres. The length/breadth ratio also was much higher than that of high-quality jute fibre.

Keywords: Date-palm leaf fibre. Fibre properties

Different natural fibres are used for different end uses. But no work has been done on date-palm leaf fibre. The length of its leaves varies from 25 to 30 cm and breadth from 2.0 to 4.0 cm. An agro-waste, date-palm leaf fibre has the potential of being used for making needle-punched non-woven fabrics alone or in blends with jute and other natural fibres for different end products. Hence the present study of the physical properties of the leaf fibre.

The raw date-palm leaves were combed manually in a series of combs with pins of different diameters and then chemically retted by the method described by Dasgupta et al. The fibres were bleached with 0.7% sodium chlorite (Textone) and dried at room temperature. The length and breadth of the ultimate cell of date-palm leaf fibres were measured by a projection microscope. The dimensions of the ultimate cell are: length, 1.5-2.5 mm; breadth, 8-16 μm; lumen size, 3-5 μm; and length/breadth ratio, 150-190.

The average fibre length was determined by the length distribution method.

The breaking load of a single fibre at 1 cm test length was measured with a Baer automatic single-fibre strength tester. The rate of traverse was kept 12.5 cm/min. In all, 50 tests were carried out. The fineness, expressed as mass per unit length, was determined gravimetrically.

A bundle of date-palm leaf fibres was treated with alkali (18% sodium hydroxide w/v) solution at room temperature for 40 min and washed first with dilute acid and then with distilled water. The treated fibre developed crimp. The crimp frequency was determined by the projected image technique and the total crimp by the point of complete crimp removal technique as described by Samajpati et al. The physical characteristics of date-palm leaf fibre are: av. length, 17.7 cm; av. fineness, 4.0 tex; av. tenacity, 31.01 g/tex; crimp frequency, 1.85 crimps/cm; and crimp, 4%.

The cross-section of fibres was prepared by using a microtome and observed under a projection microscope. A tracing of fibre cross-section is shown in Fig.1.

The length of the ultimate fibre is higher than that of high-quality jute (2.5 mm) and the breadth is lower than that of similar jute (24 μm). So, the length/breadth ratio of date-palm leaf fibre (150-190) is much higher than that of high-quality jute (111) (ref.9). The transverse cross-section shows that the fibres are multi-cellular in nature.

The date-palm leaf fibre has very good tensile strength (31.01 g/tex), similar to that of sisal leaf fibre. The fineness of the fibre (4.0 tex) is comparable to that of other vegetable fibres in use. The average length of date-palm leaf fibre is 17.7 cm. higher than that of any other natural fibre except sisal fibre which has an average length around 50 cm (ref.10). The length distribution is shown in Fig.2. The crimp formation after alkali treatment is similar to that of jute fibre.
Acknowledgement

The authors are grateful to Dr C.R. Debnath, Director (officiating), Jute Technological Research Laboratories, for valuable suggestions.

References

2. Identification of textile materials (Textile Institute, Manchester) 1970, 23.