Chapter-3

ANALYSIS OF THE MICROSCOPIC STRUCTURE OF BANANA FIBRES

It was observed that banana fibres have very high linear density. Also, light microscopy was not able to give clear idea of the fibre morphology. Fibres from the Jalgaon region of Maharashtra were examined.

The banana fibers were microscopically examined using the scanning electron microscope for their cross section. For obtaining the cross section of single cells, the methyl-butyl methacrylate embedding method was used, as the cell lengths were only a few millimeters.

3.1. Procedure for preparing the embedded block:

Mixture of purified methyl and butyl methacrylate monomers was allowed to polymerize in the presence of benzyl peroxide, so as to obtain a polymer solution of relatively high viscosity. A few drops of this solution were spread on a glass slide over which was placed a small parallelized bundle of single fibers. A few more drops of the solution were added over the fibers so that after curing the fibre would remain embedded at the center of a solid transparent block of methyl butyl methacrylate. To obtain thin uniform sections, the polymer fibre block was trimmed and fixed vertical on a special mount. Sections were cut with the help of special surgical blades while viewing through a ‘zoom microscope’. Banana fibre cross sections prepared as outlined above was then later viewed under the stereo projection microscope to analyze the structures.

It was observed that banana fibres have very high linear density. It can also be seen that one technical fibre consists of a number of smaller fibres bundled into one. This number may vary from as few as ten to about hundred fibres. Each of these individual fibre cells are similar in shape and size to cotton fibres as far as cross sections are concerned. For example, diameters of
these fibres are of the order of 15 to 20 microns. It was difficult to examine the fibre length of individual cells as these were not clearly visible from sides. In addition, there are a large number of fibres almost cylindrical and have diameters less than five micron.

It may not be possible to separate fibre cells from technical fibres as these seem to be compact and tightly bound. But there are a large number of fine fibres finer than cotton fibres which if separated can be studied for their suitability in spinning in cotton system or at least blending with cotton to get blended yarns in cotton spinning system.

The appearance of cross sections as seen in (plates 25 & 26) of banana fibers varies from circular, to bean shaped. The cells show serrated sections, indicating the presence of striations along the length. A technical banana fibre is in the form of strands containing many individual fibers held together by natural gum. The strand length varies greatly depending on the precise source and treatment of the fibre during processing. Good quality banana fibre is often in the form of strands up to 5 feet long.

Individual fibre is cylindrical and smooth. They are as much as ¼” long and are regular in width. The individual fibre consists of many technical fibres wrapped in some sheath like structure. Removal of this sheath can free fibres which will be finer as compared to what are obtained at present. The end tapers gradually to a point. In cross section, the fibre is polygonal and the cell wall is thin. The lumen is large and distinct. It is round and uniform in diameter. Banana fibre contain epidermal cell, which is almost rectangle, which clings together forming a small portion of the fibrous cell. It may not be possible to separate the fibre cells from the technical fibres as these seem to be compact and tightly bound as can be seen in plates 25 & 26. But there are large numbers of fine fibres finer than cotton fibres.
The banana fibre length varies greatly depending upon the precise source, though the average length is 24-26 inches. Its colour depends on the condition under which it has been processed. Good quality of banana fibre like Nendran is off-white where as poor quality like Dwarf Cavendish is brownish gray or black colour. Banana fibre is rigid and less extensible; it is twice as coarse as Mesta (cellulosic fibre) and as strong as jute. Unlike jute its
structure is non messy and well separated. They are two and a half times as extensible as those of jute. The banana fibre being more porous appears to be soft, yet owing to its coarse dimension its filaments are less pliable than those of jute and Mesta. Banana fibre has a high percentage of cellulose, to obtain the superior quality of fibre quick drying is essential to accomplish the triple purpose of giving performance, the luster, prevention of the degradation of color and the implementing of a certain amount of strength to the fibre.

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