Chapter-7

CONCLUSIONS

The present study entitled “Development of preparatory processes for making of banana fibre blended fabrics and their evaluation” was conducted in the following steps.

1. Fibre stage  
2. Yarn stage  
3. Fabric stage

1. Fibre stage:

The banana fibres used in the experiments were the ones extracted by CIRCOT team at Jalgaon, Maharashtra. The Jute fibres used in the experiments were received from NIRJAFT, Calcutta. Cotton fibres available at CIRCOT, Mumbai were used for spinning of the yarns for the study. Various softening treatments to make the fibres pliable for spinning were carried out on banana fibres like; using different concentrations of alkali (NaOH), glycerin. Turkey red oil, Jute batching oil and various commercial softeners.

The cellulose content of the banana fibres was determined using the sulphuric acid method. The weight loss in the banana fibres before and after the alkali treatments is also determined. The optimum moisture parameters were determined. The mechanical and physical properties of the fibres like the bending rigidity using the Kawabata bending rigidity tester and the tensile parameters on Instron were found out. Analyzing the above work it may be concluded that,

- Any softening treatment with NaOH concentration higher than 1% should be avoided, since with concentrations above 1% the tenacity gets considerably reduced, and flexibility gets improved as the fibres become more pliable as is obvious with the values of the bending rigidity.
- Weight loss is least with lower concentrations of alkali, but as the concentration of alkali goes higher weight loss is observed. This...
reduction in weight could be attributed to the removal of some lignin from the banana fibres.

- As far as softening with commercial softeners is concerned, the tenacity gets reduced after each of these treatments.
- On an average banana fibres have around 12% Moisture content when conditioned at 27°C ±2°C and 65% ± 2% RH and conditioning for 24 hours is sufficient.
- Banana fibres are strong, soft and coarse. Individual fibres have linear density ranging from 2 to 15 tex which is similar to that observed for jute.

2. Yarn stage

Spinning of the banana fibres were tried out on both cotton spinning system by manually mixing it or by sprinkling it (sandwich) as well as the Jute spinning system. Few types of yarns with 100% banana fibres as well as banana/jute blended yarns were processed at NIRJAFT, (National Institute for Jute and Allied Fibres Technology), Kolkata. These yarns were tested on star testing machine, Breaking Load, Elongation, Tex and Tenacity values were found out. The various 100% banana fibre yarns and banana fibre blended yarns were further bleached and kiered and further tested for basic properties. Since fibre strength realization in banana fibre yarns is less than 20%, it was decided to soak the yarns in water at high temperature and pressure. The yarn sample was therefore kept in kiering vessel at 135°C and 15 psi. The sample was kept in two forms, in slack condition and also in stretched condition. Thus analyzing the above work it may be concluded that,

- Banana fibres being too thick cannot be spun on cotton spinning machineries.
- Though banana fibres could be spun on jute spinning system, the yarns produced were very coarse. Also, these yarns were very hairy.
- After some spinning trials, it was found that the spinnability of banana fibres is best with the 20cms to 30 cms staples.
- The results show that the banana fibres can be spun to the tex values matching to those for jute.
• The doubling of the banana yarns type (1) has improved in its breaking load and the tenacity by more than 50% without affecting the breaking extension.

• Addition of 20% jute in the banana fibres has also improved the breaking extension and the tenacity of the blended yarns.

• After both Kiering and bleaching together the banana yarn values for tenacity has remained the same but has shown a reduction in the breaking extension.

• Banana fibres per say may not require kiering.

3. Fabric stage

The fabrics use for the study are Cotton:Banana union fabric and 70:30 Jute:Banana blended fabrics. The above fabrics were all tested for their basic physical and mechanical properties in their grey state. The fabrics were firstly scoured, bleached, and OBA-treated and finished using various enzymes and resins through coating and padding methods and further tested for their basic physical and mechanical properties. Finally they were dyed using two hues (15% shade) of sulphur and reactive dyes each and tested for all the fastness properties.

• It can be seen from these results that good quality cotton – banana union fabrics can be woven. The fabric shows good strength values, and also property wise these fabrics can be used in upholstery.

• The fabrics have good flexibility in one direction (warp) and are stiffer or less pliable in the other direction (weft). This is one of the desirable properties in areas where unidirectional stiffness is preferred.

• As far as the strength is concerned, weft-wise the strength is higher because of the banana yarns and the breaking extension in weft is low. In case of warp, the breaking extension is higher but the breaking strength is low.

• The bending length values have also reduced both warp and weft ways, which shows that the fabric has actually become soft and pliable. The
weight per unit area is also reduced while the thickness has improved marginally.

- The thickness of the fabrics after finishing treatments in comparison with the control has increased which may be due to the deposition of the acting chemicals onto the fabrics.
- The enzyme CC applied through the padding technique has shown a slight reduction in their picks per inch.
- The bending length has considerably reduced both warp and weft ways.
- Abrasion resistance has reduced marginally for all the treated samples except for the scoured, biopolished and softened samples, where it has reduced considerably, this could be due to the adverse effects of the acting chemicals.
- It was noted that scouring and biopolishing treatments followed by enzyme treatment with CC (resin) which was applied through the padding technique gave the softest feel and more pliability, thus making it widely suitable for upholstery and other applications.

- **Bleaching** of the jute: banana fabrics have reduced the weight per unit area and the tearing strength tremendously along with slight reduction in the thickness also than its counterpart fabric.
- Significant reduction in the tearing strength values is observed and the abrasion resistance of the fabrics has also tremendously reduced after the OBA-treatment.
- The weight per unit area is affected as it seems to have reduced with the finishing treatment which is again evident from the change in the yarn count observed as the count has become finer as compared to the grey count.
- Jute/banana blended Fabrics show good colour fastness properties and excellent fastness to perspiration and rubbing.
- looking at the current expenditure involved in the processing of the banana fibers it seems that the fabric would be more apt for the niche market or rather the higher end market sector and the applications could
vary depending on the end use requirement like furnishings, upholstery, curtains and blinds, or even for automobile coverings and backings.