Chapter 6

Conclusions

1. Packing behaviour of fibres in yams is dependent on their linear density and cross-sectional shape. Yarn packing coefficient decreases with fibre linear density as well as using non-circular fibres. Circular fibres have highest packing coefficient followed by scalloped oval and then the tetrakelion. Similarly, trilobal fibres produce the yarn with packing coefficient lower than that of their equivalent circular one.

2. Non-circularity or increase in linear density of fibres causes unevenness in their yams. Among non-circular fibres, yams composed of scalloped oval fibres show less irregularity than that of its corresponding tetrakelion fibres, whereas, it is higher in trilobal than its equivalent circular one.

3. Tensile and bending rigidity of yams have a good positive correlation with respect to fiber denier i.e. both young's modulus and bending stiffness of yams increase with increase in fibre linear density. But in regards to twist, behaviour is different i.e. Yarn bending rigidity reduces with increase in twist level but tensile modulus exhibits an increasing trend.

4. Yarns spun from Trilobal fibers have higher tensile modulus and flexural rigidity than that of their corresponding circular fibers. Scalloped oval fiber owing to its low flexural rigidity produce yams of higher flexibility than its circular and tetrakelion counterparts. Further, tetrakelion outdo the circular both in flexural rigidity and young's modulus values.

5. Non-circular fibers i.e. scalloped oval and tetrakelion are having more imperfections both in all-polyester and 67:33 P/V blended yams than their corresponding circular one. Trilobal fibres show slightly higher imperfections than its equivalent circular fibers.

6. Count and other yarn particulars like twist and blend composition remaining the same; yams made of higher denier polyester are more hairy than those from lower denier. Scalloped oval fibers manifests highest hairiness indices (S3) among all analogous profiles in both the states of blending i.e. 100% and 67:33 P:V, which is followed by tetrakelion and circular in turn. Trilobal fiber yams are more hairy than its equivalent circular fibers.

7. Translation of fibre strength to yarn strength is influenced by fibre geometry. Increase in fibre linear density reduces down the contribution of its strength to the
resultant yarn strength. Among equivalent fibres, circular polyester fibre registers highest of translation efficiency followed by scalloped oval and which in turn, higher than tetrakelion. This trend is in line with their yarn packing coefficient.

8. Increase in fiber linear density as well as incorporation of non-circular fibers in place of circular cause higher fabric porosity with more air involved within leading to their higher thermal resistance, and lower thermal conductivity and absorptivity and feel warmer.

9. A decrease in fiber linear density gives rise to an increase in the horizontal wicking rate of a water droplet through the fabric. Fibers with non-circular profiles in comparison to their circular counterpart show lower wicking time.

10. The sensitivity of Thermal touch sensation of fabrics towards fiber profile is notable. Fabrics containing scalloped oval polyester fibers are cooler to touch, but trilobal and Tetrakelion are warmer in comparison to their circular equivalent.

11. Alteration in fiber fineness and profile influence significantly the moisture transfer characteristics. Coarser and modified profiles of polyester are comparatively more comfortable as regards their increased in-plain wicking and higher water-vapour permeability accreditable to their high porosity, since the pore structure of the fabrics has considerable influence on their wickability and water-vapour permeability.

12. The hygroscopicity of viscose fibers in the fabrics contributes more significantly to permeability of Moisture vapor transmission, hence polyester fabrics with high hydro-phobicity shows the largest water-vapor permeability whereas Viscose fabrics have the least and Polyester/Viscose blended fabrics take positions in between the two.

13. Fabrics made of Tetrakelion, scalloped oval and circular fibers possess the compressibility and thickness in the sequence of a decreasing order.

14. Trilobal and Tetrakelion being stiffer and producing bulky yarn, results in stiff fabric (bending and shear) as compared to their comparable circular and hence enhanced formability. Scalloped oval because of its less bending and torsional rigidity produce fabric of low rigidity and formability but moderate thickness and compression and high extensibility.

15. Blending with Viscose reduce down the stiffness (bending and shear) but improves extensibility and formability. 100% Viscose fabrics possess very low bending and shear rigidity, hence, show limpness in their handle.