Summary and Conclusion
Chapter 6

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Consumers’ demand for comfortable, wrinkle resistant, stretchable, snug fitting and easy to care for garment is successfully met by knitted fabric. That is the reason it is being used to produce garments that cover every part of the human body, in a wide range of garment types from socks, caps, gloves, T-shirts, formal jackets to dresses and skirts.

Knitted fabric has above tremendous qualities but has some drawbacks also such as dimensional instability and pilling tendency. For the apparel purpose, it is necessary that fabric should be free from shortcomings and be attractive and appealing to the consumer.

The present study was undertaken to modify characteristics of knitted fabrics by application of resins. Those properties were also studied which are relevant to garment making.

Performance in terms of pilling and dimensional stability was improved by conventional cross-linking agent such as DMDHEU and by high molecular weight film forming polymers such as silicone and acrylic. The closely related properties like stiffness, drape, elongation, and bursting strength were also examined.

The change in stiffness and drape of fabrics was utilized for designing garment especially to modify drape therein. Drape of a garment can also be influenced by stitch craft and construction. Two of the techniques to achieve this are, use of angular panels and seam flare which were utilized in the study.

Nine commercially available knitted fabrics viz cotton, nylon, polyester, viscose, cotton/nylon, cotton/polyester, cotton/viscose, wool and polyester/wool were treated with commercially available polymer based resins- self crosslinking acrylic emulsion, amino silicone and DMDHEU. Acrylic and DMDHEU were applied by pad dry cure technique,
and silicone was applied by pad dry method. Pilling, percent shrinkage, stiffness, drape coefficient, elongation and elasticity recovery and bursting strength of treated and untreated fabrics were determined with standard procedures.

Skirt was selected to study drape in garment. Skirts were drafted and stitched in nylon, cotton/nylon, viscose, cotton/viscose and cotton/polyester fabrics. Other fabrics were not found suitable to design skirt due to excessive spirality problem. Panels of varying length were attached at different levels in skirts. In addition, semicircular skirts were stitched. These were later on finished. Acrylic emulsion was used to study effect of localized application of finish on skirts with angular panels. Semicircular skirts were finished with acrylic, silicone and DMDHEU for comparison purpose. These finishes were applied on full skirt. Designed and finished skirts were draped on prepared dress form and drape property studied.

Major findings of the study are:-

1. Pilling tendency of knitted fabrics decreased after finishing with acrylic, silicone and DMDHEU but variation were found.
   Pilling problem reduced in all the fabrics after finishing with silicone finish. Considerable reduction in number of pills in polyester, polyester/cotton and polyester/wool blend was found.
   DMDHEU was most effective in reducing pilling in cotton/polyester, polyester, cotton and viscose. Viscose and wool formed zero pills after application of DMDHEU. Pilling tendency also decreased in polyester/wool, cotton and cotton/nylon.

2. Shrinkage resistance was found in most of the fabrics after application of all the three finishes.
   Most of the knitted fabrics showed improved shrinkage resistance after application of acrylic emulsion, silicone and DMDHEU but silicone increased
shrinkage in cotton/polyester and DMDHEU increased shrinkage in nylon. Effect of finishing agents on percent shrinkage of knitted fabrics was found significant.

3. Study of elongation of knitted fabrics showed that no particular trend was observed. Each finish gave different result on different fabric. Elongation of some fabrics increased and of other fabrics decreased after application of finishes. Generally acrylic emulsion increased wale wise elongation and decreased course wise in most of the fabrics. Silicone increased wale wise and course wise elongation in knitted fabrics except in wool. Elongation of nylon, polyester, cotton/nylon and wool fabrics was reduced by DMDHEU resin. Elongation of cotton/polyester in wale wise direction was enhanced whereas stretchability in course wise direction in cotton, cotton/viscose and polyester/wool fabrics was increased. All the three finishes significantly affected elongation of knitted fabrics.

4. Significant difference in elastic recovery in all finished fabrics was found. Acrylic emulsion increased elastic recovery in most of the fabrics except few. Silicone decreased recovery of cotton, cotton/nylon, cotton/polyester and cotton/viscose but increased recovery of nylon, polyester and polyester/wool fabrics. DMDHEU increased elastic recovery in cotton, nylon, polyester and viscose fabrics. Wale wise recovery decreased in cotton/nylon, cotton/polyester and cotton/viscose but increased in course wise direction. In wool and polyester wool, wale wise elastic recovery increased but course wise recovery decreased.

5. Stiffness of all the finished fabrics changed. Stiffness of nylon, polyester, viscose and cotton/polyester decreased after application of acrylic emulsion whereas stiffness of cotton/nylon and wool increased considerably. Stiffness of cotton was not affected by acrylic emulsion. Marginal increase in stiffness was found in cotton and polyester/wool after silicone application. Viscose, cotton/nylon and wool showed considerable
increase in stiffness. On the other hand nylon, polyester cotton/nylon and cotton/viscose showed decrease in stiffness. DMDHEU increased stiffness of viscose, cotton, cotton blend (which has high cotton proportion) and wool fabrics but decreased stiffness of nylon, polyester, polyester/wool and cotton/polyester (polyester ratio higher than cotton) fabrics.

6. Finishing agents modified percent drape co-efficient of knitted fabrics. Very little decrease in drape coefficient of cotton fabric was observed after application of acrylic emulsion. Whereas considerable decrease in drape coefficient of nylon, polyester, viscose, cotton/nylon, cotton/polyester and wool fabrics was noted. In polyester/wool drape coefficient increased by acrylic emulsion. No change was observed in cotton/viscose. Silicone decreased drape coefficient of cotton, polyester, nylon, cotton/polyester, cotton/nylon, cotton/viscose and polyester/wool. On the contrary it increased drape coefficient of viscose and wool. DMDHEU decreased drape coefficient in all the knitted fabrics.

7. Bursting strength of knitted fabrics increased in some fabrics and decreased in other fabrics after application of acrylic finish. Cotton, viscose, wool and polyester/wool showed decrease in bursting strength whereas polyester and cotton/viscose showed very marginal increase in bursting strength. Bursting strength of nylon and cotton/nylon remained almost the same. Only cotton/polyester blend fabric showed maximum increase in strength. Slight decrease in bursting strength was found in cotton, polyester, cotton/viscose, wool and polyester/wool after finishing with silicone. Increase in bursting strength was observed in viscose and cotton/nylon fabrics. DMDHEU resin increased bursting strength of polyester, cotton/nylon and cotton/viscose. Whereas it decreased strength of cotton, nylon, viscose and polyester/wool. On the other hand cotton/polyester showed considerable increase in bursting strength.
8. Study of drape in garment showed that panel length influences drape related properties of the garment. As length increased, drape coefficient decreased. Number of nodes increased when drape coefficient decreased. But after finish application drape coefficient increased with increasing length of panel.

9. In circular skirt, finishing treatments changed drape characteristics of garment. Drape coefficient of each skirts increased after application of acrylic emulsion, silicone and DMDHEU Number of nodes decreased with increasing drape coefficient.

Thus it can be said that finishing treatments improved pilling resistance and shrink resistance of knitted fabrics selected in this study. Finishes also gave good results with regard to elongation and elastic recovery in some fabrics. Stiffness and drapability of knitted fabrics were modified which has utility for garment designing as seen by change in drape coefficient and number and shape of folds of skirts. Moreover, this is a cost effective process of designing. Finishing agents can be locally applied or can be applied on full garment to modify drape characteristics.