ABSTRACT

The feasibility of spinning silk on cotton spinning system and knitting single jersey silk fabrics has been studied. Further the scope of producing silk blended fabrics by blending silk with man-made fibres like polyester and viscose, bulk silk fabrics by blending silk with shrinkable acrylic fibre and silk covered core-spun yarns and fabrics have also been investigated. For this purpose, it is necessary to obtain silk in staple form. Hence the silk hanks were cut, degummed and dried and then processed on cotton spinning system.

In the first study, properties of silk-polyester and silk-viscose blended yarns have been studied. All silk-polyester and silk-viscose blended yarns have good tenacity and evenness values. All silk-polyester and silk-viscose blended yarns were found suitable for knitting purpose as loop and knot strength ratio of all these yarns is greater than 70%.

From these yarns single jersey knitted fabrics were prepared on weft knitting machine at the same time without changing settings, so as to observe the effect of fibre type and blend % on the properties of fabric. For comparison a cotton fabric of same construction from the cotton yarn having same count and twist was also prepared with the same settings. 100% silk fabric exhibited maximum bursting strength and abrasion resistance among all the fabrics studied. Single jersey viscose knitted fabric has more bursting strength, air permeability but poorer abrasion resistance than cotton knitted fabric of equivalent construction. The skewness of viscose fabric is lesser than cotton fabric. Moisture regain and shrinkage is also maximum for viscose fabric. Wickability and water vapour transfer ability of viscose fabric is also better than cotton fabric.

Low stress mechanical properties of these fabrics were evaluated on Kawabata set of instruments for outerwear fabrics. The tensile, bending, shearing, compressional and surface properties of 100% silk and polyester single jersey knitted fabrics have been studied to investigate their hand values. It is observed that total hand value of all silk fabric is greater than cotton and polyester fabric but total hand value of viscose fabric is slightly less than cotton fabric of equivalent construction.
The second study was aimed at exploring the characteristics of bulk silk fabrics by preparing acrylic-silk yarns of different blend compositions. It is possible to produce silk-acrylic blends on cotton spinning system. Steam relaxation treatment of acrylic-silk yarn results in bulking of the yarn but at the same time, tenacity of the yarn has reduced and elongation percentage at break has increased. Yarn bulk was ascertained on the basis of values of yarn diameter, package density and fabric thickness. The results have revealed that yarn bulk is maximum when the silk-acrylic blend ratio is 50/50.

These yarns were further knitted to produce single jersey knitted fabrics. The abrasion resistance of acrylic knit fabric is better than cotton fabric but lesser than silk fabric of equivalent construction. The air permeability of acrylic-silk 50/50 blend was found to be minimum due to bulky nature of the constituent yarn and hence thermal resistance of this fabric was maximum among all the fabrics studied. The results of moisture transport properties have revealed that acrylic knit fabric has maximum wicking ability. Kawabata evaluation of four fabrics (silk, cotton, acrylic and silk/acrylic 50/50) was performed. It has been observed that total hand value of all acrylic and acrylic-silk 50/50 blend is greater than silk and cotton knit fabrics.

Single-jersey knitted fabrics for various end-uses can be produced from silk covered core-spun yarns. Three types of silk covered core spun yarns of same count and twist from three different types of filaments in the core (Polyester, Viscose and Spandex) were prepared. To demonstrate the unique characteristics of this core-spun fabric, 100% silk and cotton fabrics were also prepared at the same time. The handle properties of core-spun fabrics for outer-wear were also evaluated on Kawabata system.

Silk covered polyester filament core-spun yarn had more strength, elongation, abrasion resistance than silk and cotton yarns. Viscose filament core-spun yarn had lesser strength, abrasion resistance but slightly higher elongation percentage at break.

Fabric produced from silk covered polyester filament core-spun yarn has more bursting strength and abrasion resistance than cotton fabric but it's total hand value is lesser than 100% silk and cotton fabric. Hence it can
be used for upholstery purpose. The silk covered viscose filament core-spun fabric had lesser bursting strength, abrasion resistance than silk and cotton fabric. Total hand value of silk covered viscose filament core-spun fabric is greater than 100% cotton fabric. Silk covered viscose filament core-spun fabric may be an excellent new material for garment manufacturer at lower prices than pure silk.

Two way stretch fabric for apparel use can be efficiently produced by using silk covered spandex core-spun yarns. Silk covered lycra core yarns were produced on a conventional ring-frame equipped with special attachment for feeding Lycra to the front roller nip after a pre-draft of 2.5. The core-spun yarn contained approximately 92% silk and 8% spandex.

Single jersey weft knitted fabric were produced from silk covered spandex core spun yarn, 100% silk and cotton yarn on the same knitting machine and same machine particulars without any special attachment. The presence of lycra in the yarn has caused contraction of the fabric immediately after knitting, resulting is dense and compact structure of spandex core spun knitted fabric. It caused reduction of loop length, increase in course/cm and wales/cm of spandex core fabric in comparison to silk and cotton fabric. Hence the silk covered spandex core-spun knitted fabric has more abrasion resistance, bursting strength, thermal resistance but reduced air permeability and moisture regain values. The results of stretch and recovery test have revealed higher values of extension and considerably lower values of residual extension of silk covered spandex core fabric in comparison to silk and cotton fabric. Another unique property of spandex core fabric is that total hand value of lycra core fabric is maximum among all fabrics studied. Hence silk covered lycra core fabric may be an excellent new material for sports-wear and skin-fit garments.