

## ABSTRACT

Consumers need apparel that provides comfort, enhanced performance, style, fit and versatility. The woven fabrics have limitations in certain applications due to stretch and recovery. It is widely recognized that elastic fibers (lycra) are used to impart stretch and recovery to fabrics.

Sari blouse is a traditional and close fitting garment worn by Indian women under a sari and is shaped to fit exactly the contour of the body. The fit factor is disturbed, when there is a change in the physical dimensions of the human body. Considering the problems faced by majority of the women, it was imperative to develop a suitable material that will adhere to body giving right shape, comfort and fit to the wearer.

This research aims to study the effect of woven stretch fabrics for women's sari blouse that can adhere to the shape of the body better with comfortable fit and pressure comfort and hence woven stretch fabrics are developed. As a first part of the thesis, fit rating scale has been developed for analysing the fit of sari blouse with the fit attributes such as ease linear index value, number of folds and seam line deviation. Seventeen commercially available blouse materials and six woven stretch fabrics (selected from twelve samples developed), a total of twenty three blouses have been constructed into blouses and worn by three figure types to study the fit assessment on fit attributes. The developed woven stretch fabrics are , one set with 50<sup>s</sup> and 60<sup>s</sup> cotton yarn in warp with 40<sup>s</sup>, 50<sup>s</sup> and 60<sup>s</sup> cotton core spun lycra in weft and another set with 2/75Nm and 2/120Nm silk in warp with 40<sup>s</sup>, 50<sup>s</sup> and 60<sup>s</sup> cotton core spun lycra yarn in weft. In addition the respective control samples are developed with 60<sup>s</sup> cotton yarn in warp and weft and another set with 2/75 Nm silk in warp with 60<sup>s</sup> cotton in weft for comparing the results. The influence of fabric specifications on thermal comfort properties, tactile, total

hand value and stretch properties of cotton core spun lycra fabrics are studied. The study analyses the effect of fabric specifications, low stress mechanical properties, primary and total hand value, stretch properties on the fit of woven stretch blouse. Further the pressure comfort analysis has been carried out on blouses constructed using these stretch fabrics and pressure values of woven stretch fabrics are compared with the commercially available sari blouse materials. The finer yarn counts of cotton and cotton core spun lycra that gave better results in the first phase of developing woven stretch fabrics are taken for further study in the second phase.

In the second phase, cotton, silk and polyester stretch fabrics are developed using 60<sup>s</sup> cotton core spun lycra and polyester lycra. To develop Polyester lycra yarn, polyester yarn of 21denier and lycra yarn of 40 denier are doubled using a TFO. The woven stretch fabrics are developed with cotton, silk and polyester yarns in warp with cotton core spun lycra and polyester/lycra doubled yarn in weft. The handle, comfort, stretch, fit and pressure values are evaluated and totally eighteen blouses are constructed to study the fit assessment using the standardized fit rating scale.

Finally, lustrous woven stretch fabrics are developed using silk, silk/nylon lycra hybrid yarns. Silk yarn of 20 denier in warp and hybrid yarn having a resultant count of 69 denier is used as weft yarn and stretch fabrics are woven in plain, crepe and sateen weave. The effect of weave on handle, comfort, stretch, fit and pressure values are studied using these materials. Nine blouses are constructed to analyze the fit and pressure measurement.

Three different figures namely slim, normal and stout are chosen as subjects for fit analysis and objective pressure test. A pattern with negative ease value is used for the construction of woven stretch blouses. Wearers perceived fit evaluation are used to attain feedback from the subjects regarding wearing comfort and fit. Visual fit of the garment is evaluated

separately by five judges on nine subjects. Fit of stretch blouses are assessed by judges using the standardized fit rating scale on the fit attributes such as ease linear index value, number of folds and seam line deviation. The Pressure values of the woven stretch blouses are assessed objectively using pressure sensors at different body locations in standing position and in four postures, bending, twisting, flexing the arms to  $90^{\circ}$  and flexing the arms to  $180^{\circ}$ .

The fit rating scale has been standardized based on ease linear index value, number of folds and seam line deviation. The ease reduction allowance for woven stretch fabrics is optimized based on percentage of stretch, subjective mean fit rating and zero ease linear index value obtained. Amongst the cotton core spun lycra fabrics, sample  $S_6$  ( $60^s$  Ne cotton warp with  $60^s$  Ne cotton core spun lycra in weft) and  $S_9$  ( $2/75Nm$  silk warp with  $60$  Ne cotton core spun lycra in weft) show higher total hand value due to higher tensile strain, lower value of bending, shear properties and geometrical roughness. These fabrics also showed good fit and lower pressure values while standing and in dynamic postures and best suitable for sari blouse. The woven stretch samples ( $S_6$  &  $S_9$ ) received higher mean fit ratings at each parameter set than their respective control samples ( $CS1$  &  $CS2$ ). The presence of lycra in the woven stretch samples makes the fabric to stretch and fits well on all subjects of different figure types and form the profile of the body. Among the cotton, silk, polyester stretch fabrics, Sample  $T_2$  (polyester/cotton core spun lycra) and  $T_5$  (polyester/polyester lycra) showed higher total hand value and good fit for blouse. Amongst the silk/hybrid yarn stretch fabrics developed with different weave types, sateen ( $P_2$ ) and crepe weave ( $P_3$ ) fabrics showed higher total hand value and received higher mean fit rating in wearer's perceived fit analysis. All the woven stretch fabrics developed exerted pressure in the comfortable range of 3-15mmHg. Thus fabric physical properties, stretch properties, mechanical properties and total

hand value significantly influenced the fit, pressure distribution and comfort of the stretch blouses.

This newly developed woven stretch fabrics being new and unique of its kind are suitable for sari blouse, as the weft yarn stretches the fabric horizontally at ease in accordance with body movement at the areas such as bust, waist and upper arm and spring back to their original size and thus avoiding wrinkles giving proper fit and pressure comfort to the blouse. Further, the constructed woven stretch blouses in size 12 fitted well on subjects with sizes 10 and 14, size 16 fitted well on subject of size 18, and size 22 fitted well on size 20 and 24.