ABSTRACT

Today moisture comfort is an important aspect for any garment used for sportswear and leisurewear. An average consumer may not understand what wicking is or the characteristics of a good wicking fabric. This research is expected to provide an insight not only to consumers, but also to industry, on fabric properties that make up a good wicking garment. The thesis is concerned with development of new vertical wicking tester and the influence of the fabric parameters on the wicking behavior of fabrics.

Quantification of wicking has been done by many test methods. Unfortunately these inputs have led to a lot of confusion because of the diversity of the results. The existing manual vertical wicking test, which is widely used to measure the capillary rise of liquid in the fabrics by many researchers, has its own drawbacks such as gravity, inaccuracy, absence of data recovery etc.,

In the present work, a technique based on open and closed electrical circuit principle has been developed to determine the capillary height of liquid at various levels without using dye and as a function of time. This technique helps carrying out an in-depth study of the wicking behavior of the various fabrics, which differ in structure and is considered as a major achievement. A
survey of the literature showed the absence of published research work on the development of a method of measuring wickability of the fabric using multi probe.

The effect of count and fabric density on the wicking was analyzed for six types of plain woven cotton fabrics. The wickability was measured by using the newly developed tester called Multi probe vertical wicking tester and the results were compared with the conventional manual vertical wicking tester. The results also confirm that the wicking height and penetration rate are reduced by making the weft yarn count finer and increasing pick density in the woven fabrics. A very good correlation was found between the Multi probe Vertical wicking tester and the manual wicking tester.

The influence of weave factor on the wicking was examined for polyester/viscose blended fabrics consisting of twelve different weaves. As weave factor increases, the rate of wicking also shows an increasing trend. Wicking rate of fabrics in weaves with evenly distributed floats is lower than those of horizontally striped weaves. The overall dependence of weave factor on the fabric wickability was not established. Among the all the weaves, the plain weave shows poor wickability.

The effect of fabric integrated firmness factor on the wicking was examined for twelve polyester/viscose blended fabrics differing in weave structures. As integrated fabric firmness factor increases, the rate of wicking
decreases. A good correlation was observed between the integrated fabric firmness factor and the rate of wicking for evenly distributed floats both in warp and weft directions. In view of this, the overall dependence of fabric integrated firmness factor on wicking could not be established.

In order to establish the best fit of equation for fabric wickability, vertical wicking tests were carried out for twelve different weaves of polyester/viscose blended fabrics. The correlation coefficient was found to be higher when the relationship between height versus square root of time was examined compared with the logarithmic method. Washburn’s equation was obeyed quite well as the time constant was near 0.5. Values of time constant k showed an increase for weft way wicking and with horizontally striped fabrics indicating that the wickability has improved.

To determine the effect of fabric integrated firmness factor that has been computed for eight weaves of polyester/viscose blended fabrics, vertical wicking test was conducted. It has been established that, although fabric wickability depends on pick density and weave factor, it is possible to achieve the same wickability of different fabrics by maintaining the fabric integrated firmness factor constant. Hence, it is possible to design a fabric according to the fabric firmness factor to achieve the same wickability.

The influence of weave factor, pick density and polyester/viscose blend composition on their wickability was examined. A three variables Box
and Behnken factorial design technique was used to study the interaction effects of the above variables on wickability. The interactive effect of these variables on wickability was studied and the response surface equations for the wicking properties have been derived. It was observed that all the factors influenced wickability. Also, it was found that an increase in polyester proportion increased wickability.

The important industrial implications of the study have been fully discussed.