

1.INTRODUCTION

1. INTRODUCTION

The comfort of textile materials has been the focus of many investigations since the concern for personal well-being and improving the quality of life started to become more significant. In active and endurance sports, the performance of a sportswear is synonymous with its comfort characteristics. For instance, an active sportsperson that wears poor breathable sportswear will experience an increase in their heart rate and rectal temperature more rapidly than one who wears breathable sportswear. Hence fabric breathability (moisture and air permeability) and thermal properties should be tailored in order to meet the requirements of sportswear.

The type of fibre (natural, synthetic or blend), the fabric structure (woven or knitted) and fabric constructions (densities of yarns, fabric thickness, etc.) are amongst the parameters that may affect the thermal and breathability properties of sportswear fabrics. Generally four different aspects can define wear comfort: physiological, psychological, ergonomic and skin sensorial aspects. Thermal insulation, breathability and the heat and moisture transportation process are a fabric's physical properties that can affect the comfort sensation from a physiological point of view. Owing to their looped structure, knitted fabrics have good stretchability, which is an important element in the achievement of optimal sensorial comfort.

For sportswear one can find that the physiological aspect is extremely important because of its major effect on the efficiency and performance of athletes. Thermal comfort refers to sensations of hot, cold or dampness in clothes and is usually associated with environmental factors such as heat, moisture, and air velocity. Water/moisture vapour transport and air permeability are important factors that affect the thermal comfort of sportswear. Fibre content and fabric geometry are two primary factors that may affect water/moisture vapour transport.

The human body has its own mechanism for cooling itself when overheating through sensible perspiration in form of liquid sweat. Body heat evaporates the perspiration; however, if the vapour cannot escape to the surrounding atmosphere, the relative humidity inside the clothing will increase, which will cause a wet feeling on the skin and an uncomfortable sensation. At a

given activity level and defined environmental conditions, an important feature of any fabric is how it transports water from the body surface so as to make the wearer feel comfortable.

The main objective of this work was to explore the possibility to manufacture / develop knitted fabric with high potential for sports and active wear application with improved water transport properties by changing the structural parameters of the knit, i.e. the linear density of yarns, fibre types, tightness factor and structure. The secondary objective was to investigate the influence of knitting structure parameters and raw materials on air permeability, water transport and thermal properties of knitted fabrics and to establish correlation, obtain best fit equations by applying linear and multiple regression analysis.

Most of the previous studies investigated the relationship between the air permeability, thermal properties and structural characteristics of plain or rib knitted fabrics. The effect of the some of parameters on air permeability and water transport properties (in terms of moisture and thermal transfer) of most cellulosic fibres or knitted fabric structures has not been researched systematically yet. Cotton and man-made cellulosic fibres are both based on the same polymer-cellulose-which provides moisture uptake as an essential factor for comfort. Experts believe that cotton production is limited by 28 million tons in 2020 due to a reduction of arable land and limitations in water availability as cotton is grown in warm climates – irrigation of freshwater is often prerequisite. Due to these limitations of growth for cotton, cellulosic fibres are perfect alternatives for filling that gap.

The fibres chosen in this work include natural fibre – cotton as well as regenerated cellulosic fibres, such as viscose, modal and excel. Combed Cotton Ring, Regular Viscose, Modal and Excel yarns having linear densities 15Tex, and 20Tex were produced. The two structures important for reference are the Plain Jersey fabric and a variation of the Plain Jersey called Pique. Knitted fabrics in single jersey and pique structure with different tightness factor, fibre type and yarn count showed different moisture management properties and performance attributes, thus potentially it is possible to engineer fabrics of such construction to the required moisture management performance.