1.INTRODUCTION

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Ultraviolet (UV) protection with textiles has become more important due to the thinning of ozone layer in the atmosphere. The overexposure to UV rays causes serious damage to human health, mostly affecting the eyes and skin. In some climate zones, this has become a serious problem, since people have to work outdoor and are exposed even when the UV index is extremely high (people operate daily in construction, agriculture, waste management and catering). Single layer woven fabrics are difficult to engineer and produce having excellent ultraviolet protection factor (UPF) with good air permeability at the same time. In attempting to provide radiation protection, one approach to dealing with the ratio of threads to apertures, is to fabric having a relatively tight weave, or a very high thread count. If a woven fabric construction is very tight, the fabric will probably have very good or excellent UPF, and very poor air permeability. Another approach involves coating the fabric. These approaches greatly reduce or eliminate the apertures in the fabric. While this may increase ultraviolet protection results in a fabric which is uncomfortable. The optimization of both at the same time can offer only fairly good UPF and air permeability. The precondition for good UPF is namely that the fabric surface is closed enough not to allow a direct penetration of UV light. If this condition is not met, the fabric will probably not offer good UPF, regardless of the material it is made of, what colour it is and how much it is treated with UV finishing. On the other hand, the more the fabric construction is closed, the more we diminish the permeability, which is one of the most important requirements for lightweight summer clothes.

Textiles can be constructed in a way to ensure they give very good or excellent UV protection. It is especially effective when they are used in several layers. Nevertheless, several layers do not go along with other permeability properties of textiles that contribute to better comfort during work and leisure time.

The main purpose of textiles designed to protect against ultraviolet radiation is to reduce the open area portion and, consequently, increase the portion of covered skin. Since the transmitted UV radiation of textiles is composed of a diffuse component, which is modified by the fabric absorption properties, and an unchangeable component, which directly passes through the spaces between fabric yarns, the reduction of UV transmission can be achieved by changing the construction parameters of textile materials. The optimal combination of thickness, density, mass per unit area, and weave of woven or knitted fabric, as well as yarn

type (mono- or multifilament) and fineness, allow production of textile products with high UV protection properties.

Woven fabrics are made from different types of yarns. Raw material of yarn or fibre composition is the initial yarn parameter which has an effect on UV radiation protection. Fibres have different ability to absorb UV radiation and to block most of the incident radiant energy and those prevent it from reaching the skin.

Research has been investigating the influence of raw material, structure (and consequently physical characteristics, i.e. mass per unit area, thickness, bulk density, porosity, etc.), colours of yarns, as well as the effect of different finishing additives that block the penetration of UV rays through textiles. Most researches into UV protection properties have focused mainly on synthetic fibres such as polyester, nylon and in natural fibres - cotton. Not much work has been carried out on regenerated fibres. 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. Cotton and man-made cellulosic fibres are both based on the same polymer-cellulose-which provides moisture uptake as an essential factor for comfort. There is lack of studies dealing with the effect of fibre composition.

The main objectives of this work were (i).to engineer a blended yarn of correct linear density from different blend ratios (ii). to develop woven fabric which provides adequate protection from UV radiation present in the sunlight specially for workwear along with required comfort property.

The fibres chosen in this work include regenerated cellulosic fibre (Viscose), and manufactured fibres (Polyester and Lycra). Regular Polyester/Viscose blended yarns with three different blend ratios: 75/25, 60/40, 45/55 and Regular Polyester/Viscose /Lycra blended yarn with blend ratio 70/25/5 having linear densities 13 Tex, 20 Tex and 37 Tex were produced.

Woven fabrics in Twill and Satin structure with different tightness factor, fibre type and yarn count were produced, showed different UV shielding property, moisture management properties and other related properties.