Introduction
1. INTRODUCTION

Clothing along with food and shelter has been recognized as one of the primary needs of mankind. The art of clothing dates back to centuries, starting from a primitive way of wearing leaves, barks, animal skin and later on using the nature’s gift of cotton, linen, jute and so on. Earlier clothing was used primarily for protection from cold and rain. The evolution of clothing has been closely interlinked with the factors such as social, economical and technological progress of each period in the history of mankind. Clothing is an important interface between the human and environment. Climate has obviously played an important role in determining the necessity for inventing the various kinds of clothing worn by humanity.

The Indian Textile Industry has an overwhelming presence in the economic life of the country. Apart from providing one of the basic necessities of life the textile industry also plays a pivot role through its contribution to industrial output, employment generation and the export earnings of the country. Currently it contributes about 14 percentage to industrial production, 4 percentage to the GDP and 17 percentage to the country’s export earnings quote Das and Hati (2009).

Today consumers demand more durability, and functionality from their clothing. In recent years great interest is shown on the development of innovative technologies for producing protective clothing which offers enhanced comfort and protection to the wearer.

Protective clothing refers to garments and other fabric related items designed to protect the wearer from hazardous environment. The most prevalent hazard encountered in everyday life is the threat from the natural environment. The hazards include heat, cold, rain, snow, wind, abrasion, dust, microorganisms, nuclear radiation, the effects of static electricity and ultraviolet rays. These can cause problems during occupational, recreational
and routine activities. Hence protective clothing is now a major part of textiles and classified as technical or industrial textiles.

Apparel manufacturer and the finishing industry are thus faced with a daunting job of producing superior fabrics that are technically advanced. Today’s requirement is no longer about spinning, weaving or knitting but rather about flexible material engineering. Yarn and fabric producers and finishers too must be extremely well informed about the materials to be processed. It is essential to know how these materials will perform in the sun, wind and rain.

The solar radiation that reaches the earth surface consists of infrared, visible light and ultra violet rays. Solar radiation including its ultraviolet component has always been an important environmental factor for life on earth. Exposure to minimal doses of sunlight is beneficial for organisms since it contributes to the development of bones and the assimilation of vitamins. With less atmospheric ozone, a higher level of Ultraviolet light reaches the earth's surface. The level of UV light today is higher than it was 50 or 100 years ago.

The ultraviolet rays are normally filtered in the atmosphere, but with the depletion of ozone layer by continued atmospheric pollution caused by industries, the UV rays are not blocked. Over exposure to the sun increases the risk of permanent damage to the skin caused by Ultraviolet radiation. In the last two decades, the media and the scientific community have highlighted the depletion of the ozone layer and the resulting elevation in the levels of ultraviolet radiation (UVR) reaching the earth's surface.

UV radiation can be divided into three categories, dependent on wavelength: UVC, 200-280nm; UVB, 280-315nm; UVA, 315-400nm. Each one percent decrease in ozone concentration is predicted to increase the rate of skin cancer by two percent to five percent. Thus it is important to protect the human being from excessive exposure to UV radiation.
Life style change such as increased overseas travel and greater outdoor leisure activities have led to an increase in human exposure to sunlight. Humans have three major organ systems whose cells and tissues are commonly exposed to sunlight; the eye, the immune system and the skin. There is considerable evidence that over exposure to ultra violet radiation can cause sunburn, skin damage, premature skin ageing, eye disorders, suppress immune system and skin cancer. Skin cancer is the most common form of malignancy today and its incidence is rapidly increasing worldwide express Hedges and Scriven (2008).

The incidence of skin cancer due to exposure to ultraviolet rays is expected to increase by an annual rate of 7-10% per annum within the next few years point out Jhaver et al. (2007). High levels of exposure to sunlight in childhood / adolescence have been associated with greater proneness to develop skin cancer. Children and adolescents are at particular risk for sun damage partly because they spend significantly more time outside than adults do. It is estimated that 80% of a person’s life time sun exposure and damage occurs before 18 years of age, American Academy of Dermatology (2004). A high level of sun exposure in childhood is a strong determinant of melanoma risk in adulthood. Exposure to UVR is most dangerous to youth.

For many years various methods like sunscreens, wearing hats, glasses and clothing was used to protect the skin. For many years people around the world have relied on sunscreen alone as a primary source of sun protection, but it has to be reapplied after every three hours since it wears off with sweating. Some sunscreens block only UVB rays (290-320nm) and not UVA rays (320-400nm). They must be applied frequently and are also expensive and hence they are unaffordable by common people express Yadav et al. (2009). Hence, it becomes necessary to protect adolescents who spend long hours exposed themselves to direct sunlight by using appropriate clothing to reduce the dose of UV rays on the skin expresses Achwal (2000). Wearing clothing appropriate to the thermal conditions of the environment and level of activity can ensure protection of the skin.
Fabrics provide simple and convenient protection against UV protection but not all fabrics offer sufficient UV protection. It has recently being proposed that the protection factor for the various textiles used in clothing should be provided in order to give the public useful information feels Cesarini (2001). Textiles are intrinsically suited for use as UV protection, as they are able to offer particularly good protection against intense radiation from the sun if suitable materials and constructions are used along with UV finish state Kathirvelu et al. (2009).

Protection of the skin against the action of solar radiation is a relatively new objective of textile finishing, since the textile does not always guarantee adequate protection. The unfinished fabric has the limitation to guarantee adequate protection states Sivaramakrishnan (2007). It is widely accepted that UVA and UVB rays have harmful effects on human skin and appropriate textiles are one of the best protections against their detrimental effects reveal Gorensek et al. (2007). There is a need for light weight functional, stylish, economical clothing that also provides exceptional protection from over exposure to the sun.

In recent years there has been increasing interest shown in the protective properties of clothing against harmful effects of UV radiation from the sun. Designing and modifying fabrics in such a way that they offer high protection against UV radiation is a relatively new application opinion Xin et al. (2004). Sun protective clothing provides a better shield than sunscreen. Thus clothing acts as a physical barrier that blocks radiation. Sun protective clothing is an excellent sun protection tool as it provides a physical block that doesn’t wash or wear off and can shade the skin from both UVA and UVB rays. UV protection of textiles is quite actual and recommended by dermatologist especially during summer states Pusic and Soljaic (2009).

In order to meet the clothing needs of the fast growing population and changing demand on textile fabrics, supplementing cotton with other fibers is the
need of the time. Bamboo fibre has many excellent properties that make it ideal for processing into textiles. It is exceptionally soft, light and almost silky. It has unique ability to breathe and it is very cool because the cross section of the bamboo fibre is filled with various micro gaps and micro holes. Hence bamboo garments make people feel extremely cool and comfortable in hot summer points out Devi (2007). Bamboo fibre is a new material developed at the beginning of the 21st century. It has received considerable attention from scientists all over the world state Yueping and Xushan (2005).

Bamboo is a kind of environmental protection textile material with the functions of natural anti-bacteria and anti-ultraviolet and moisture absorption. It is also known as “breathing eco-fibre” and “queen of fibres”. Bamboo fibre’s ventilation and dampness absorbing ability rank first in all textile fibres – New Cloth Market (2009). Bamboo is a non-violent fabric that is on par with silk but less expensive. The bamboo fabric has a natural sheen and drapes like silk. It is also more durable and easy to launder.

Tencel is a natural, man-made fibre produced in an environmentally-friendly process from wood pulp that has become popular in clothing because it is absorbent and comfortable for wear, especially in conditions of high humidity – lotusorganics.com. Tencel shows good thermal properties, it has a cooling effect when temperature gets hot and a warming effect when it is cold - Modern Textiles (2007). According to dermatological study, wearing Tencel significantly improves comfort and promotes a feeling of well being state Diepgen and Schuster (2006).

Tencel can be used universally both in the active sports and sports lifestyle sectors. Moisture management, optimum skin sensory properties and reduced bacterial growth are the multifunctional performance requirements of the demanding outdoor market, The Indian Textile Journal (2009). Hence Tencel has many qualities and properties that make it an excellent fabric.
Today apparel fabrics are expected to meet all requirements related to comfort, health care, handle and easy care properties as well as performance. This had led researchers to develop new materials to provide designers with advanced tools for their specific design highlights Yueping (2005).

In a country like India, with extremes of temperature and humidity garments made from natural fibres in cotton or blends of manmade and natural fibres are certainly preferred to pure synthetics for the reason of environment and health, feel Sangwan et al. (2006). The blends are made to produce yarns with quality that cannot be obtained by using one fibre alone.

Modern lifestyle is becoming more and more informal. Informality helps to relax and ease the tension to a great extent. It is for this reason that knitted casual wear, sportswear, T-shirts, ladies tops, skirts, overalls, jackets, suits are catching up and replacing fast the woven wear to some extent feel Khare et al. (2004). There were days when the word knitting was associated with undergarments alone but over the past few years knitting has almost become synonymous with comfort wear and fashion wear and now is even venturing towards formal wear opines Dutta (2003).

Knitting is the second most frequently used method of fabric construction. The popularity of knitting has grown tremendously in recent years because of the increased versatility of techniques, the adaptability of the many new man-made fibres, the growth in consumer demand for wrinkle resistance, stretch-ability, snug-fitting fabrics, particularly in the greatly expanding areas of sports wear and other casual wear segments state Nawaz et al. (2000). Knitted fabrics have superior elastic recovery and are best suited for body fit garments.

Due to the influence of fashion, the production of knitted have been expanded, with new fabric designs created with different fibre blends and knit structures state Onal and Candan (2003). As casual look is catching up among the youths and middle aged consumers demand for cotton T-shirts has also
gone up in domestic market. Apart from soft pleasing handle, customers are demanding comfort properties that are moisture management.

Clothing for sports and leisure wear is a functional product par excellence. Manufacturers of innovative sports fashion and leisure wear offer clothes with special functions for nearly every activity for example humidity transmission, breathing capacity and thermo regulation for an almost perfect air conditioning of the body - Textile Excellence (2009). Nowadays, textile materials made from cellulosic fibres are dyed in most cases with the reactive dyes that have significant preferences like high colour fastness to wet treatment, brightness and wide spectrum of colours. Reactive dyes are the youngest and most important dye-class for cellulosic materials. The consumption of these dyes is on the rise and is expected to remain so in near future. The increase in their popularity is mainly due to their acceptable price, good colour value and reasonable good fastness properties express Shrivastava and Keskar (2005).

The Ultraviolet Protection Factor (UPF) of the fabrics can be improved by applying UV absorbers to fabrics. UV absorbers are colourless compounds that absorb UV radiations and emit the energy back in the form of harmless heat and also deactivate the excited chromophores by catching up the radicals formed. UV absorbers are applied along with dyes as usual method of dyeing; hence separate application process is not needed. Recently interest has increased in quantifying the degree of protection offered by textile materials and in identifying factors that affect it. The use of UV finished clothes can provide excellent protection against the hazards of sunlight.

In recent years the new developments in speciality finishes sector are driven by consumers changing life styles towards a more casual clothing look, with a greater preference for higher standards of aesthetics comfort, health and safety, protection and easy care performance points out Rao (2003).
In recent years there has been increasing interest shown in the protective properties of clothing against harmful effects of UV radiation from the sun. More innovations in clothing ranges, dyes and UV absorbers are promised for the years ahead, as the issue of ultraviolet protection through textiles is set to gain greater significance. Novel textile materials with particular functions that can provide healthy benefits to people have attracted much attention from researchers in recent years. Only few studies have been carried out to find the ultraviolet protection factor of natural fabrics using UV absorber finish. Hence the investigator desired to study the “Effect of Dye and UV Absorber Finish on Bamboo Cotton and Tencel Cotton Knitted Fabrics” with the following objectives,

- To elicit information among adolescents regarding awareness of UV protection.
- To blend Bamboo and Tencel with Cotton fibres.
- To produce single jersey knitted fabric using the blended yarns.
- To wet process the produced knitted fabric with reactive dye and UV absorber finish.
- To subject the finished fabrics to wear study.
- Evaluate the fabrics for visual, mechanical, geometrical, comfort and colour fastness properties.
- Analyze the Ultraviolet Protection Factor.