MOISTURE MANAGEMENT IN SPORTSWEAR

A PROJECT REPORT

Submitted by

ADHARSH. T (0810202001)

CHARAN KUMAR. S (0810202009)

DHARANI. D (0810202011)

NAVEEN RAJ. R (0810202307)

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BONAFIDE CERTIFICATE

Certified that this project report **"MOISTURE MANAGEMENT IN SPORTS WEAR"** is bonafide works of "T.ADHARSH, S.CHARAN KUMAR, D.DHARANI, R.NAVEEN RAJ" who carried out the project work under my supervision.

SIGNATURE	**SIGNATURE**
Dr.BHAARATHI DURAI	MR.P.CHANDRASEKARAN
HEAD OF THE DEPARTMENT	**SUPERVISOR**
Department of Textile Technology**,**	Department of Textile Technology,
Kumaraguru College of Technology,	Kumaraguru College of Technology,
Coimbatore- 641006.	Coimbatore- 641006.

Viva- voce examination is conducted on ……………

INTERNAL EXAMINER **EXTERNAL EXAMINER**

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We the students of this project elated to thank the persons those who directly and in directly helped us to complete this project.

We take this opportunity to thank the management and our principal **Dr.S.Ramachandran** for their support to carry out the project.

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ABSTRACT

The influence of polyester/ cotton fibre blends on the drape properties of knitted fabrics for sport clothing's applications have to be studied. Several knitted fabrics have to be produced using polyester fibre blended, in different percentages, with functional fibres like Outlast, Dry release, Aquator, Polybutylene terephthalate and Bioactive. The drape and flexural rigidity behavior of the materials produced have to be evaluated to optimize the composition of functional knitted fabrics based on polyester/functional fibre blend. It is observed that the knitted fabrics produced with Polyester/Outlast blends show the most interesting drape behavior. On the other hand, polyester /polybutylene terephthalate and Polyester/Acquator fabrics show lower drape behavior due to the types of fabrics used. Moreover, relationship between the amount of functional fibre and the drape and flexural rigidity behavior are also established. The study is useful to design sport clothing's for sports players. The wetability characteristics of different cotton, polyester and multi layered cotton/polyester fabrics have been studied to manage human perspiration well. The vertical capillary action behaviors of these fabrics have been compared by measuring the capillary height as a function of time. Wicking coefficients in multi layered fabrics are found to be much better than in other fabrics of 100% cotton. The yarn and the bonding weave between the two layers are very important for the capillary rise.

CHAPTER 1
INTRODUCTION

Moisture Management is the newest concept in the textile industry. This is the latest concept of the fabric which gives comforts. The market of moisture management fabric is not the same as the apparel industry. The Moisture Management fabric is for the high-performance end of the market and it drew the attention of the high-end performance users. Now-a-days Moisture Management Fabric is the new and demanding concept in the Textile Industry. It is a kind of fabric which absorbs the moisture from the wearer and moves it away from the garment. This kind of action helps to make skin moisture free. The action of this fabric helps in preventing the moisture next to the skin. During hard physical activity body sweats and the moisture traps out in conventional clothing like cotton. The moisture locks out between clothing and body and then it increases body temperature and perspiration even more. Excessive perspiration can lead one to diminished performance and fatigue. In very hot conditions this is the usual condition which happens due to the trapped moisture. Hypothermia and chilling is the common condition happen in the cold temperature due to the trapped moisture. The moisture near to the skin makes skin cold when wind blows in the cold days. Excessive moisture can add weight to the garment and even it irritates the skin of the wearer and increases the chances of the skin diseases. This Moisture Management fabric is very useful if worn next to the skin at the time of the exercise. It keeps skin dry. This is the fabric of new age technology and its usage in new technology is expanding day by day. It proves its worth in the sportswear also. Moisture travels by the capillary action. The spaces between the fibres act as tubes and moisture travels through it. The fabric which has narrower spaces gives up moisture more quickly. So these fabrics are best for moisture transport. The moisture absorbent capacity of fabric also affects the moisture management. The higher absorbency leads to the more comfort levels. Little water absorbent capacity helps to maintain muscle performance and delay exhaustion. Moisture management fabrics are high tech synthetic fabrics. These fabrics are normally made of polyamide or polyester microfibers. These light weight fabrics are easy to handle and they dry quickly compared to the other fabrics. One can enhance the affectivity of this fabric by doing various processes on it.

1.1 SCOPE OF THE PROJECT:

It proved to be a resounding success, providing equal access to excellence in the new path breaking and trail-blazing technologies in the manufacture of functional sports apparel for all attendees. Today's sports clothing is engineered to maximize comfort through enhanced moisture management and temperature regulation. High-tech fabrics and apparel designed for high performance wear have increased performance levels of sportspersons world-wide and have made them more competitive. Such properties are built into garments using specialized fibres, yarns, fabric, finishing techniques and garment construction. The demand for such materials provides huge scope for innovative suppliers of technical textiles and functional sportswear and active wear.

1.2 OBJECTIVES:

1. To develop the moisture behavior of sportswear
    - Rate of absorbency
    - Rate of drying
    - Water vapor transmission.
2. To construct different blends of sportswear for improving the moisture behaviors.
3. To apply chemicals for improving the moisture behavior of sportswear.
4. Test the various properties of chemically treated fabric and compare with non treated fabric

CHAPTER 2

LITERATURE REVIEW

1. According to Araguacy Filgueiras, Drape behaviour of functional knitted fabrics for sport clothing .The influence of polyester/functional fibre blends on the drape properties of knitted fabrics for sport clothing application has been studied. Several knitted fabrics have been produced using polyester fibre blended, in different percentages, with functional fibres like Outlast, Dry release, Aquator, Polybutylene terephthalate and Bioactive. The drape and flexural rigidity behaviour of the materials produced have been evaluated to optimize the composition of functional knitted fabrics based on polyester/functional fibre blends. It is observed that the knitted fabrics produced with polyester/Outlast blends show the most interesting drape behaviour. On the other hand, polyester/polybutylene terephthalate and polyester/Aquator fabrics show lower drape behaviour due to the types of fibre used. Moreover, relationships between the amount of functional fibre and the drape and flexural rigidity behaviour are also established. The study is useful to design sport clothing for professional football players. Comfort can be defined as a pleasant physical, physiological and psychological equilibrium state between the human being and the environment. However, many authors consider the following views for comfort 1-7.Thermophysiological. It is related with the good thermal balance between heat generation and heat loss of the human body. Some factors related to this comfort parameter are metabolism, thermal regulation mechanism and individual health conditions. The parameters related with apparel properties include moisture absorption and release, air and vapour permeability, thermal conductivity and insulation. Psychological comfort – This refers to intrinsic characteristics of the clothing visual design as texture, colours, shapes and others features related to the user's feelings. Some associated factors with aesthetic specifications are the self confidence, self image social interaction and respecting others. Sensorial comfort. It involves the tactile perception of sensations obtained by mechanical or thermal contact between skin and clothing. Surface characteristics of fabric and the mechanical properties, such as flexural rigidity, are some of the characteristics perceived through the human body sensory mechanisms. Drape is defined as 'the extent to which a fabric will deform when it is allowed to hang under its own weight' (BS 5058: 1973, 1974). Some parameters, such as thickness, shear, mass per unit and surface properties, significantly affect the drape behaviour.

2. According to Pandurangan,8 the factors influence the drape behaviour in the following order: compression < surface < weight < shearing < tensile < bending. The drape coefficient (*F*) is the most fundamental parameter for quantifying drape and the most widely used for textile materials. Drape capacity of knitted fabrics is an important factor which interferes and influences the functionality and aesthetic of clothing. For sports clothing, drape is a fundamental factor once it determines the adjustment and formability of clothing to shapes and movements of the human body. Other important property in knitted fabrics is the flexibility from which the flexural rigidity coefficient (*G*) can be calculated using integrating length, weight and thickness. Drape and flexibility provide a sense of fullness and a gracefulness appearance, which distinguishes knitted fabrics from other materials.

3. According to Cary, North Carolina, the 100% Cotton Moisture Management is Moisture management often refers to the transport of both moisture vapour and liquid away from the body. Moisture vapor can pass through openings between fibers or yarns. In the case of cotton or other hydrophilic fibers, the fibres can serve as a buffer by absorbing moisture vapour and adding to the comfort properties of a fabric. This study is an example of ongoing research and development at Cotton Incorporated related to moisture management. Results indicate that it is possible to create a whole spectrum of performance properties on 100% cotton for different activities in a wide range of environments. Wetting is an important aspect for textile processing and performance. The comfort properties of clothing made from cotton are related to moisture absorbency. Wetting and wicking are synonymous. A liquid that does not wet fibres cannot wick into a fabric and wicking can only take place when fibres assembled with capillary spaces between them are wetted by liquid. The resultant capillary forces drive the liquid into the capillary spaces. Fibre wick ability is, therefore, a prerequisite for wicking. Wick ability describes the ability to sustain capillary flow. When liquid is taken up in a yarn or fabric, apparently two aspects can be distinguished, namely (i) the amount of liquid absorbed per unit of surface of mass; and (ii) the velocity with which wicking takes place. The vertical wicking test, i.e. the determination of the height of rise (*H*) in a yarn as a function of time (*t*), that cover both the above aspects which are characterized by simplicity and acceptable duration of determination has been selected. A liquid wicks in a textile yarn or yarn system such as a woven fabric under the circumstances where the effect of gravity is described by the equation $S = Kt^{½}$, where *S* is the distance travelled; *t*, the time in second; and *K*, a constant characteristic of the yarn liquid system. There are numerous mechanisms that can operate to move fluids through porous materials, but the viscous flow of water by capillary action accounts for the major portion of the flow that actually occurs.Washburn's1 fundamental work in the hydrodynamics of capillary flow has been used to describe water movement in a number of porous materials including paper, soil and leather.

4. According to S N Subramanian, Wicking behaviour of regular ring, jet ring-spun and other types of compact yarns wetting is an important aspect for textile processing and performance. The comfort properties of clothing made from cotton are related to moisture absorbency. Wetting and wicking are synonymous. A liquid that does not wet fibres cannot wick into a fabric and wicking can only take place when fibres assembled with capillary spaces between them are wetted by liquid. The resultant capillary forces drive the liquid into the capillary spaces. Fibre wick ability is, therefore, a prerequisite for wicking. Wick ability describes the ability to sustain capillary flow. When liquid is taken up in a yarn or fabric, apparently two aspects can be distinguished, namely the amount of liquid absorbed per unit of surface of mass; and (ii) the velocity with which wicking takes place. The vertical wicking test, i.e. the determination of the height of rise (H) in a yarn as a function of time (t), that cover both the above aspects which are characterized by simplicity and acceptable duration of determination has been selected. A liquid wicks in a textile yarn or yarn system such as a woven fabric under the circumstances where the effect of gravity is described by the equation S = Kt½, where S is the distance travelled; t, the time in second; and K, a constant characteristic of the yarn liquid system. There are numerous mechanisms that can operate to move fluids through porous materials, but the viscous flow of water by capillary action accounts for the major portion of the flow that actually occurs.Washburn's1 fundamental work in the hydrodynamics of capillary flow has been used to describe water movement in a number of porous materials including paper, soil and leather. Hollies et al.2,3 have applied Adam's work to develop a theoretical model for water transport in yarns and fabrics and demonstrated with experiments that the model is a good representation of actual condition that can occur in textile materials. They have shown that the yarn construction features, such as size, number of fibres, fibre size, and randomness. Moisture management often refers to the transport of both moisture vapour and liquid away from the body. Moisture vapour can pass through openings between fibers or yarns. In the case of cotton or other hydrophilic fibers, the fibre can serve as a buffer by absorbing moisture vapour and adding to the comfort properties of a fabric. Liquid water (or perspiration) must be wicked into a fabric structure, and then evaporate from the outside of the fabric. There is much hype in the market about fast drying fabrics. In general, all flat or normalised surface fabrics when saturated will dry at the same rate, independent of fibre type. Fabrics used in athletic and recreational end users should have the ability to transport moisture to the fabric surface for evaporation. There are very few, if any, 100% cotton garments that are advertised as recreational performance apparel for athletic activities. Consequently, research and development is ongoing at Cotton. Incorporated to develop such garments to allow cotton to participate in this market. For cotton fabrics and, therefore, garments to offer the performance desired for athletic endeavours, innovation and enhancement of the cotton fabric must take place. Innovation is today's catch phrase. The consumer wants something different, and the industry must

respond. Innovation is also known by many other names such as hightech, intelligent textiles, nano-technology, and functional finishes.

6.According to T Sharabaty, Investigation on moisture transport through polyester/cotton fabrics inner layer of sports garments was made with special PET fibres (e.g. Coolmax, which has a special shape that enhances the capillary action) to keep a dry contact surface between the human body and the garment. Outer layer of sports garments was selected to transport the sweat away from the internal one to transfer it to the atmosphere. To apply the above techniques to bed sheets, several multi-layered fabrics were produced to have a good management of human sweat, considering the following aspects. Hydrophobic layer (upper one)—This layer must have the capability to transfer the moisture out of contact surface while maintaining its hydrophobicity at the same time to keep a dry contact surface between patient body and bed sheet. But the migration of moisture stops when the other side is wet. So, to increase the moisture transfer, its chemical potential has to be decreased, e.g. making the external layer of cotton .Hydrophilic layer (lower one)—This allows obtaining an effective moisture management of human sweat. The objective of this investigation is to study the wettability characteristics of cotton, polyester and cotton/polyester multi-layered fabrics.

7. According to Raul Fangueiro Moisture management performance, Liquid transporting and drying rate of fabrics are two vital factors affecting the physiological comfort of garments. The moisture transfer and quick drying behaviour of textiles depend mainly on the capillary capability and moisture absorbency of their fibres. These textiles are especially used in sport garments next to the skin or in hot climates. In essence, the human body generates heat more quickly during exercise or vigorous activity. The body's cooling system attempts to dissipate this extra heat by producing perspiration. Perspiration should be removed readily from the skin surface or from the micro climate just above it, for maintaining comfortably cool and dry conditions. Wicking is the spontaneous flow of the liquid in a porous substance, driven by capillary forces. Washburn proposed the well-known Lucas–Washburn kinetics equation to describe the relationship between wicking length and wicking time. Crow and Randall, Kissa8, Weiyuan *et al* investigated wetting and wicking behaviour of textiles. As capillary forces are

Caused by wetting, wicking is a result of spontaneous wetting in a capillary system. Wicking takes place only in wet fabrics and the contact angle decides the wicking behaviour. According to Sailen, wool is highly moisture absorbent because its constituent keratin is very rich in amino acids which easily bind together the water molecules. Wool can absorb water vapour (30% of its own weight) without feeling wet.

8. According to Gautam Roya & S C Saha, Development of digital moisture meter A new type of digital instrument has been developed using the resistance measurement method with a new concept of built-in lookup table form, which has been proved as more accurate than other available moisture meters. The operations are controlled by a microprocessor unit and provide the result on a digital display. The test is non-destructive and process of sample preparation is free from human errors. The same instrument can also be used for other fibres simply by changing the lookup table for that particular fibre. Like most of the other natural fibres, jute fibre absorbs moisture due to the presence of hydrophilic molecules and a large amount of exposed surface in the fibre1. Since the humidity condition varies so widely, the moisture content value does not remain constant. The quantity of moisture normally retained by jute fibre and its products under equilibrium conditions depends mainly on relative humidity and temperature of the surrounding atmosphere. When jute fibre is kept in an atmosphere of definite humidity, it gradually attains a constant moisture content. The time for attaining equilibrium depends on various factors like the type of packing of the material, air circulation, moisture regain, humidity of the atmosphere, past history of the fibre, quality of the fibre and temperature. It is well known that adsorption of moisture by fibre or its products is accompanied by changes in physical and physic-chemical properties, such as evolution of heat, swelling, and change in strength and extensibility due to variation in crystallinity. The moisture content in the fibre plays an important role in mechanical processing and commercial applications. To measure moisture content properly and accurately, it is very much needed to use a very sensitive and accurate instrument, which can show the result digitally and can retain the result until and unless it is reset for next experiment. Moreover, the method should be a non-destructive and with quick response. This kind of technique is not available in the literature and in the market so far. Therefore, in the present study, a moisture measurement meter has been developed to measure the moisture content and moisture regains in the jute and jute products at lower cost with higher accuracy.

9.According to O L Shanmuga sundaram, Development and characterization of polyester and organic cotton fibre blended This paper reports study on the development and characterization of baby diapers made from four different fibrous compositions, namely pure cotton, pure organic cotton, polyester/organic cotton (70/30), and bamboo/organic cotton (50/50). Antibacterial activity tests have been carried out on sportswear against *S aureus* and *E coli*. Superabsorbent polymer sodium polyacrylate has been incorporated into the diapers to enhance their absorption capacity. Various tests such as product density, thickness, absorption capacity, liquid strike- through, acquisition time under load and diaper rewet under load have been carried out to study the performance of the diapers. It is found that the diaper made from polyester/organic cotton (70/30) exhibits best performance. An important area of textiles is the healthcare and hygiene sector among other medical applications. The range of products includes both disposable and no disposable items such as surgical gown, mask, surgical drapes, towels, gloves, baby diapers, sanitary napkins and so on used in hospitals1. Bamboo fibre has excellent properties that make it ideal for processing into textiles. It has been found2 that bamboo contains a unique antibacterial and bacteriostasis bio-agent named 'bamboo Kun'. It is highly water absorbent, able to take up three times of its weight of water. The bamboo fibre has a natural effect of sterilization, moisture vapour transmission property and easy drying. Therefore, this fibre will not cause skin allergies and its application in sanitary materials such as baby diaper, absorbent pads and sanitary towels is found to increase. Superabsorbent polymer (SAP) absorbs up to 200 times of its own weight of water, whereas the conventional wood-pulp and cotton-filler absorbents absorb only six times of their weight4. SAP granulates retain large quantities of liquid by forming a gel when in contact with it. SAP granulates are not used alone but are combined with other materials to form a component capable of absorbing liquids. Disposable diapers are generally composed5 of a top sheet, SAP that forms the absorption part (fluff pulp+tissue+polymer), fastening tape and water proof film (back sheet). Superabsorbent disposable baby diapers are sophisticated, well-engineered products that provide many benefits including convenience, comfort, exceptional leakage protection, improved hygiene and skin care as compared to cloth diapers. Baby diaper utilises cellulose fluff combined with superabsorbent polymer to create the absorbent core, which acts as the storage structure in the product. In some products, wet laid cellulose tissue may be used as containment wrap around the cellulose pulp. As diapers come in contact with the skin, consumers are concerned about whether they cause dermatitis or not. Water transport properties such as absorption capacity and strike-through time are important as regard the wet comfort of diapers. In the present work, an attempt has been made to produce baby diapers from bamboo fibres, organic cotton and their blends. It is expected that the incorporation of bamboo fibres will impart antibacterial property and enhance the absorbency of diapers. The performance of the baby pads, such as absorption capacity, liquid strike-through and diaper rewet under load has also been studied.

MATERIALS AND METHODOLOGY

CHAPTER 3

MATERIALS AND METHODOLOGY

3.1 PROCESSING SEQUENCE:

Raw Yarn

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Fabric Production (Single jersey-C/L & P/Y)

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Scouring

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Bleaching

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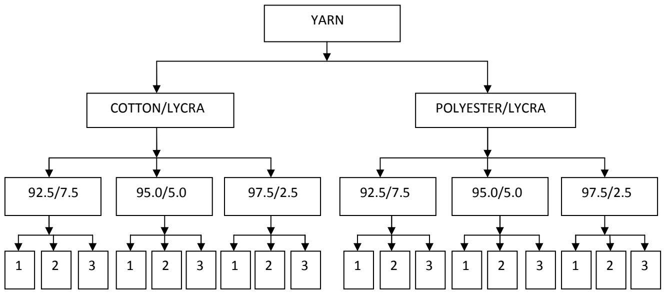
Chemical Treatment

↓

Testing

3.2 CLASSIFICATION:



CHEMICALS USED:

1. Ultravon RW

2. Innocelle Uniq

3. Ultravon RW+Ultraphil HSD

3.3 MATERIALS:

FABRIC:

The yarn was sourced from Cheran Spinners, Vardhman Groups and was sized. In each loom cycle the tip of the single rapier is inserted across the whole width of the shed and then withdrawn. The main advantage of this system is that the problems of weft transfer do not arise and normal range of fabrics can be woven. Weft insertion rate followed is 400 mpm.

- Coarse/ cm- 22
- Wales/ cm- 18
- GSM- 110
- Tightness factor- 1.5
- Stitch length- 2.5 mm
- Stitch density (22*18= 396 cm^2)

Desizing:

The given fabric sample is weighted and initial weight is noted. Based on fabric weight, recipe is prepared. The fabric is pre-washed and immersed in recipe. The temperature is set at 80°c and the fabric is treated for 60 min. The pH value of recipe is measured using litmus and is maintained at 5-6. The pH and temperature are kept as constant. Finally the processed fabric is removed and washed. Finally weight of the fabric is removed loss is calculated.

Recipe:

M: L =1:50

Time – 1 hr

Temp -80°c

Enzyme – 4ml/lit

PH: 5-6

Scouring:

Scouring is the process of treating grey cotton in a boiling solution of weak alkali in order to remove natural impurities like wax, oil, fat etc. Pure bamboo normally needs no scouring; sometimes washing with a little alkaline soap may serve the purpose. The scouring process should be made in terms if fiber blend contains cotton. When pure bamboo fabrics are scoured, the alkali should not be over 10 g/liter but can be applied in accordance with the thickness of fabrics. The required amount of chemicals taken according to the recipe. The grey cotton sample is entered in scouring liquor quickly and rotated continuously in the bath. After a specified time the material is taken out and squeezed. It is then washed with a hot and then with cold water.

Recipe:

Sodium hydroxide – 4% owm

Sodium carbonate – 2%owm

Wetting agent -0.5%

M:l :1:20

Temperature- 100°c

Time – 1 hour

Bleaching:

The temperature for bleaching is 85°c and pH of 0-5. The solution is made alkaline with NaOH. Sodium silicate is mostly used as a stabilizer. After bleaching the material is washed with cold water and dried.

Hydrogen peroxide – 0.5 -2 vol

Sodium silicate – 2 gms/ lit

Temperature: 80-85°c

M: L: 1:20

3.4 TESTING METHODS:

3.4.1 VERTICAL WICKING TEST:

Vertical Wicking Testing is been carried out by the standard SGS/IN/CTS LAB/012.The rate of water transport is measured according to a vertical strip wicking test. One end of a fabric strip is secured vertically while the opposite end dangles in a dish containing distilled water. The height to which the water was transported along the strip is measured at intervals of 1, 5, and 10 minutes, and reported in centimeters (cm). Higher wicking values show greater capability for transporting liquid water. Thermal imaging is used to monitor moisture transport when wicking cannot be easily detected with the naked eye.

3.4.2 MOISTURE CONTENT:

Moisture Content Testing is been carried out by the standard ASTM D2654:1989.Moisture content is the quantity of water contained in a material, such as soil. Water content is used in a wide range of scientific and technical areas, and is expressed as a ratio, which can range from 0 (completely dry) to the value of the materials' porosity at saturation. It can be given on a volumetric or mass (gravimetric) basis. The basic method is to carefully weigh the specimen in its original state, drying the water contained in the specimen, then re-weighing. Precisely HOW this is done depends upon the material. Usually this is done in a large oven-like chamber at a temperature above the boiling point of water, but for especially sensitive materials, other techniques can be used, for example long drying times at reduced temperatures, or by heating the material in a vacuum chamber. The reduced atmospheric pressure causes a lower boiling point in the water, but often has no effect on the material; this brings the required test temperature below the point where damage to the sample would occur.

3.4.3 ABSORBENCY OF TEXTILES:

Absorbency OF Textiles is been carried by the standard AATCC 79:2010.Sample is placed in a embroidery hoop with all creases out of it. A burette dispenses a drop of water onto the surface of the fabric from a distance of 9.5mm below the burette. Time is recorded until the water drop is absorbed completely.

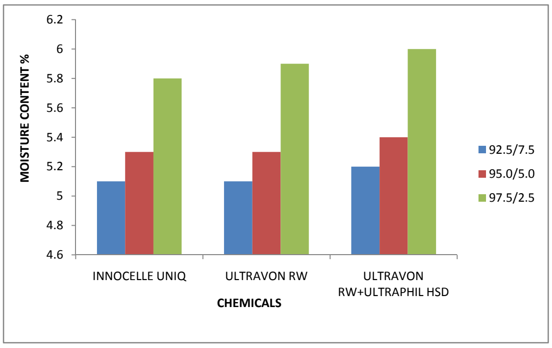
RESULTS AND DISCUSSION

CHAPTER 4

RESULTS AND DISCUSSION

4.1 COTTON/LYCRA:

4.1.1 MOISTURE CONTENT:



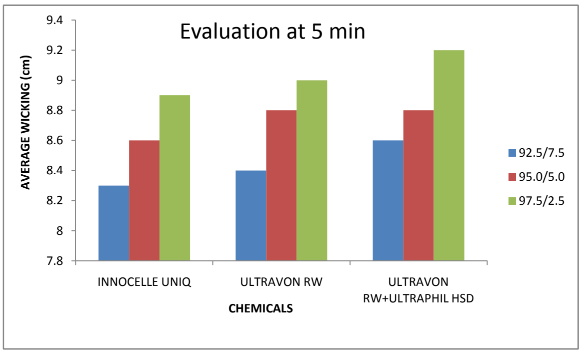
The moisture content % of the fabric 92.5/7.5 (cotton/lycra) treated with Innocelle Uniq,Ultravon RW and Ultravon RW+Ultraphil HSD are 5.1,5.1and 5.2 respectively.

The moisture content % of the fabric 95.0/5.0 (cotton/lycra) treated with Innocelle Uniq,Ultravon RW and Ultravon RW+Ultraphil HSD are 5.3,5.3and 5.4 respectively.

The moisture content % of the fabric 97.5/2.5 (cotton/lycra) treated with Innocelle Uniq,Ultravon RW and Ultravon RW+Ultraphil HSD are 5.8,5.9and 6.0 respectively.

From the above graph, it is known that the 97.5/2.5 (cotton/lycra) fabric has more moisture content % when it is treated with the chemical Ultravon RW+Ultraphil HSD, because of the chemical consist of more water absorbing Hydrophilic groups.

4.1.2 VERTICAL WICKING TEST-EVALUATION AT 5 MINUTES:



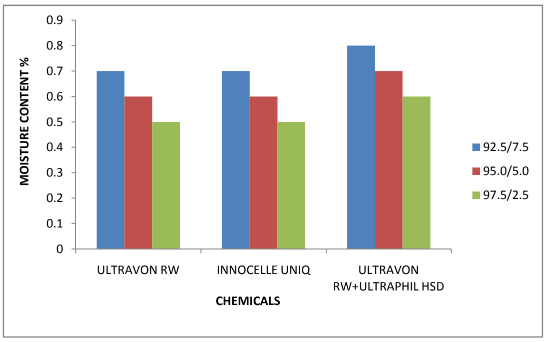
The average wicking evaluation for 5 mins of the fabric 92.5/7.5 (cotton/lycra) treated with Innocelle Uniq,Ultravon RW and Ultravon RW+Ultraphil HSD are 8.3,8.4and 8.6 respectively.

The average wicking evaluation for 5 mins of the fabric 95.0/5.0 (cotton/lycra) treated with Innocelle Uniq,Ultravon RW and Ultravon RW+Ultraphil HSD are 8.6,8.8and 8.8 respectively.

The average wicking evaluation for 5 mins of the fabric 97.5/2.5 (cotton/lycra) treated with Innocelle Uniq,Ultravon RW and Ultravon RW+Ultraphil HSD are 8.9,9.0and 9.2 respectively.

From the above graph, it is known that the 97.5/2.5 (cotton/lycra) fabric has more average wicking evaluation for 5 mins when it is treated with the chemical Ultravon RW+Ultraphil HSD because the chemical consist of more water absorbing Hydrophilic groups.

4.1.3 VERTICAL WICKING TEST-EVALUATION AT 30 MIN:



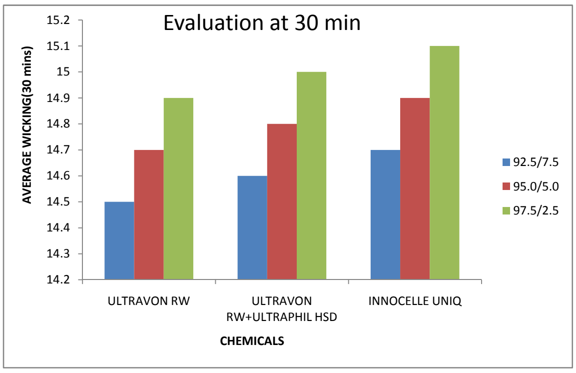
The moisture content % of the fabric 92.5/7.5 (polyester/lycra) treated with Innocelle Uniq,Ultravon RW and Ultravon RW+Ultraphil HSD are 0.7,0.7and 0.8 respectively.

The moisture content % of the fabric 95.0/5.0 (polyester/lycra) treated with Innocelle Uniq,Ultravon RW and Ultravon RW+Ultraphil HSD are 0.6,0.6and 0.7 respectively.

The moisture content % of the fabric 97.5/2.5 (polyester/lycra) treated with Innocelle Uniq,Ultravon RW and Ultravon RW+Ultraphil HSD are 0.5,0.5and 0.6 respectively.

From the above graph, it is known that the 92.5/7.5 (polyester/lycra) fabric has more moisture content % when it is treated with the chemical Ultravon RW+Ultraphil HSD , because the chemical consist of more water absorbing Hydrophilic groups .

4.2.2 VERTICAL WICKING TEST-EVALUATION AT 5 MIN:



The average wicking evaluation for 30 mins of the fabric 92.5/7.5 (cotton/lycra) treated with Ultravon RW , Ultravon RW+Ultraphil HSD and Innocelle Uniq are 14.5,14.6and 14.7 respectively.

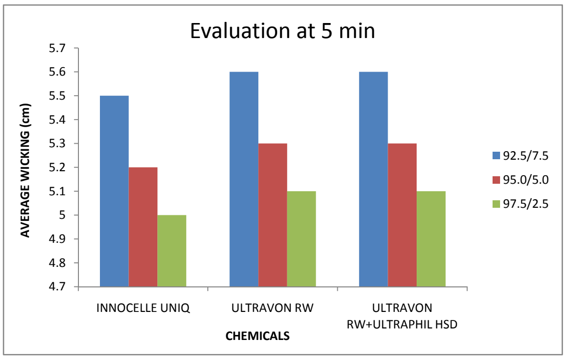
The average wicking evaluation for 30 mins of the fabric 95.0/5.0 (cotton/lycra) treated with Ultravon RW, Ultravon RW+Ultraphil HSD and Innocelle Uniq are 14.7,14.8and 14.9 respectively.

The average wicking evaluation for 30 mins of the fabric 97.5/2.5 (cotton/lycra) treated with Ultravon RW,Ultravon RW+Ultraphil HSD and Innocelle Uniq are 14.9,15.0and 15.1 respectively.

From the above graph, it is known that the 97.5/2.5 (cotton/lycra) fabric has more average wicking evaluation for 30 mins when it is treated with the chemical Ultravon RW+Ultraphil HSD , because the chemical consist of more water absorbing Hydrophilic groups.

4.2 POLYESTER/LYCRA:

4.2.1 MOISTURE CONTENT:



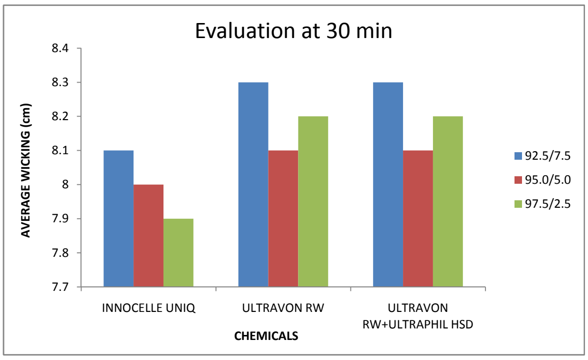
The average wicking evaluation for 5 mins of the fabric 92.5/7.5 (polyester/lycra) treated with Innocelle Uniq,Ultravon RW and Ultravon RW+Ultraphil HSD are 5.5,5.6and 5.6 respectively.

The average wicking evaluation for 5 mins of the fabric 95.0/5.0 (polyester/lycra) treated with Innocelle Uniq,Ultravon RW and Ultravon RW+Ultraphil HSD are 5.2,5.3and 5.3 respectively.

The average wicking evaluation for 5 mins of the fabric 97.5/2.5 (polyester/lycra) treated with Innocelle Uniq,Ultravon RW and Ultravon RW+Ultraphil HSD are 5.0,5.1and 5.1 respectively.

From the above graph, it is known that the 92.5/7.5 (polyester/lycra) fabric has more average wicking evaluation for 5 mins when it is treated with the chemical Ultravon RW+Ultraphil HSD and Ultravon RW , because the chemical consist of more water absorbing Hydrophilic groups.

4.2.3 VERTICAL WICKING TEST-EVALUATION AT 30 MIN:



The average wicking evaluation for 30 mins of the fabric 92.5/7.5 (polyester/lycra) treated with Innocelle Uniq,Ultravon RW and Ultravon RW+Ultraphil HSD are 8.1,8.3and 8.3 respectively.

The average wicking evaluation for 30 mins of the fabric 95.0/5.0 (polyester/lycra) treated with Innocelle Uniq,Ultravon RW and Ultravon RW+Ultraphil HSD are 8.0,8.1and 8.1 respectively.

The average wicking evaluation for 30 mins of the fabric 97.5/2.5 (polyester/lycra) treated with Innocelle Uniq,Ultravon RW and Ultravon RW+Ultraphil HSD are 7.9,8.2and 8.2 respectively.

From the above graph, it is known that the 92.5/7.5 (polyester/lycra) fabric has more average wicking evaluation for 30 mins when it is treated with the chemical Ultravon RW+Ultraphil HSD and Ultravon RW , because the chemical consist of more water absorbing Hydrophilic groups .

CONCLUSION

Moisture management property is the prerequisite for active sports performance. This can be achieved in many ways, namely, by changing the fibre polymer chemistry and by fabric chemical treatments such as enzymatic or alkali treatment. Micro denier fibre and its fabric is one method to improve the moisture management property, which comprises of wetting, wicking and moisture vapour transmission. The advantage of these fabrics is that no additional finishing is required. From the results, it is clear that the Cotton/Lycra-97.5/2.5 % fabric which is treated with ULTRAVON RW + ULTRAPHIL HSD (Softener) consist of good Moisture Content, Wicking and Absorbency character.

CONCLUSION

CHAPTER 5

REFERENCES

CHAPTER 6

REFERENCES

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